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SIGNATURE

**The Cachet of the “Invisible” Translator:
Englishwomen Translating Science (1650-1850)**

By
Michele Healy, M.A.
Accredited Translator (ATA)

Supervised by
Professor Luise von Flotow

A Doctoral thesis submitted to the
Faculty of Graduate and Postdoctoral Studies
in partial fulfillment of the requirements for the
Ph.D. degree in Translation Studies

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Acknowledgements

*It has all been most interesting.*¹

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My dissertation supervisor, Professor Luise von Flotow, has - by gracious example of her firm optimism and even-temperedness - led me to affirm the possibility of professional success and personal fulfillment combined. I am proud to have been her first doctoral student.

Thanks are also due the School of Translation and Interpretation and the University of Ottawa for their contribution to my academic path.

Finally, in describing the process of the dissertation, I note the words of Charles Babbage, who figured so prominently in the reform of English science: "I was thus obliged to put into language the various views I had taken, and I observed the effect of my explanations on different minds. My own ideas became clearer, and I profited by many of the remarks made by my highly-gifted friends".²

¹ Attributed to Lady Mary Wortley Montagu (see also Portrait 2, Carter), on her deathbed.

² Charles Babbage, "Life of a Philosopher". Reprinted in Morrison and Morrison 1961:64.

Abstract

In a counter-argument to the invisibility of translators and of women in the history of science, this dissertation asserts the presence and examines the influence of a set of 5 female translators of scientific materials in England from 1650 to 1850. The translators are Aphra Behn, Elizabeth Carter, Mary Somerville, Ada Lovelace, and Elizabeth Sabine. The source languages are French, Italian, and German.

These five portraits (each of which includes biographical information on the translator and source text author, contextual features, and translation samples and commentary) are considered against two main backdrops: **first**, the image of the “invisible translator” prevalent in modern Anglo-American translation studies, and its superimposition on historical expectations of the translator for the period 1650-1850; and **second**, the changing face of science in the broad wake of the Scientific Revolution (i.e., the modernization and professionalization of science, the increased use of vernaculars in science communication networks, the rise of (scientific content in) the London periodical industry, topic shifts - from heliocentric cosmology, to applied and industrial processes, to the Earth-based sciences, and language shifts - from Latin to French and English, to German). In addition, two through-running translation phenomena are highlighted and discussed: *translation as repatriation*, and *concurrent translation*.

Overall, the dissertation demonstrates that female translators of scientific materials have in fact existed in history, despite modern perception to the contrary, and despite a number of historical disadvantages against their rise to visibility and influence. On these two points, a rise, peak, and fall of translator *visibility* is seen, especially in line with changing opportunities for learned women, yet the *influence* of these translators in the

dissemination of scientific thought remains clear throughout. Further strengthening these portrait findings, and encouraging future research, is an appended set of 20 additional women (translators and authors) in science.

296 words

Résumé

En opposition à la notion de l'invisibilité du traducteur et de la femme dans l'histoire des sciences, nous nous proposons de mettre au jour la présence de cinq traductrices de matériaux scientifiques et leur influence dans l'Angleterre de 1650 à 1850. Il s'agit en l'occurrence d'Aphra Behn, Elizabeth Carter, Mary Somerville, Ada Lovelace et Elizabeth Sabine. Les langues de départ sont le français, l'italien et l'allemand.

Les cinq portraits présentés se divisent en esquisse biographique sur la traductrice et sur l'auteur du texte de départ, en analyse contextuelle, ainsi qu'en extraits de traduction et en commentaires; ils s'inscrivent sur fond de deux grandes notions : d'une part, l'image du "traducteur invisible" répandue dans le champ anglo-américain de la traductologie à l'heure actuelle et son rapport aux attentes placées sur le traducteur au cours de la période 1650-1850; d'autre part, l'évolution des sciences au lendemain de la révolution scientifique (modernisation et professionnalisation de la science, usage croissant de la langue vernaculaire dans les cercles scientifiques, augmentation du nombre de périodiques londoniens et de leur contenu scientifique, passage d'une cosmologie héliocentrique à des procédés industriels et appliqués puis aux sciences de la terre, du latin au français et à l'anglais, et ensuite à l'allemand). Tout au long de ces portraits, nous faisons en outre ressortir deux phénomènes importants : la traduction comme outil de rapatriement et les traductions concurrentes.

De notre propos, il ressort la présence avérée de traductrices de textes scientifiques au cours de l'histoire, en dépit des apparences actuelles et malgré un environnement défavorable à leur visibilité et à l'affirmation de leur influence. À cet égard, on constate

une visibilité accrue de ces traductrices dans le temps, suivie d'une baisse de visibilité, qui s'inscrit en parallèle avec la place accordée aux femmes de savoir dans la société. Il n'en reste pas moins que ces traductrices auront joué un rôle important dans la dissémination du savoir. Pour terminer se trouvent en annexe des informations bibliographiques sur vingt femmes auteures et traductrices de sciences. Ces informations, qui viennent confirmer ce rôle, pourront servir de point de départ à de nouvelles recherches.

Nombre de mots: 345
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NOTE TO THE READER

Based on feedback from the readers at my doctoral defence, I add the following two, brief comments:

1. Questions were raised generally about the use of Internet sources in a doctoral dissertation. My response included a number of thoughts. First, where I have used Internet resources, they are from recognized scholars, recognized educational institutions, or recognized research centres on a given topic, not from entirely unvetted sources, though, to be sure, not all material has been directly scrutinized through the peer-review publications process. Second, a number of the Internet citations in this dissertation provide links to on-line, and, hence, more easily accessed, versions of historical materials; the distance, time, and cost involved to personally view many of these materials would otherwise have been prohibitive. Third, certain Internet citations provide on-line links to material that already exists in standard print form; these citations, too, serve to offer the reader the option of faster access to referenced material.

2. Throughout the five portraits in this dissertation, readers will notice the use of *conditional* verb forms as I interweave the scientific and translation backdrops and the individual details on a given translator's contribution to her time. That there remains considerable room for speculation on certain aspects of each of these portraits, despite the very contribution this dissertation represents, was frustrating to some readers; still, it is a sign of how important it was for me to "begin at the beginning", establishing a space within which, from which, and in relation to which future researchers may continue to explore any number of "invisible" translators, and the "cachet" their works hold for translation studies and its many intersecting fields of interest.

General Introduction

*Felix qui potuit rerum cognoscere causas.*³
~Virgil

Research Motive

The idea that motivated this dissertation ran something along these lines: as a modern-day translator, especially a non-literary translator, I had often heard of, then personally experienced, the phenomenon of the invisible translator.

Earlier, as a student translator, I found this was evident mainly in the teaching of fluency as the desirable standard, an idea that spoke positively to me and still does, for I operate within the context of working to demonstrate both to the audience and to fellow colleagues (in science and translation both) that scientific, medical, technical, and other such forms of specialized translation can and ought to be written not just for communication of content, but also with a view to the ease and enjoyment of reading. The link between function and form, between medium and message, is to me as urgent in this line of work as in any literary form, and I find great pleasure in working toward this goal on any given translation project. So, the invisibility of the translator within the translated text, while clearly not the only possibility, nor even the best one for certain other translation projects, seemed to me a natural course to pursue, rather than any great disservice to the translator.

Of more concern over the course of 15 years of professional translating and teaching was the *paratextual* invisibility of the person of the translator, which I perceive to be the true disservice. From the exclusion of the translator from basic decisions about the flow

³ Happy is he who might know the cause of things.

of the cooperative work process, to a lack of contact with source text authors, from uninformed deadlines to an ignorance of professional accreditation, and, finally, to the anonymous publication of target texts, I and the colleagues I spoke with had to deal with a more fundamental and insidious message of personal invisibility that ran quite counter to how we actually perceived ourselves and our work. This became one of many reasons that led me to continue on for the PhD.

By this point, my dual background in languages and the sciences suggested a number of ways I could assert a different view of translators and their work. Though I had not initially intended to include a historical component in the dissertation, a positive experience in the History of Translation course at our school opened my thoughts to this direction, provided I could combine history with science (with language), and provided I could extend a clear line of influence/relevance from the historical findings to the present.

Even a cursory review of historical scientific materials (approximately 1650-1850, to reflect the Scientific Revolution and its aftereffects) confirmed the encouraging presence of many translators in this specialized domain⁴ - far too many, in fact, for closer examination within a dissertation format. Yet by refining the search to *female* translators, I arrived automatically at a more limited number of translators to portray. By further refining this first list (of approximately 20) to women who translated *into English*, my native language, a final set⁵ of five female translators of scientific materials crystallized

⁴ Generally, as one cross-reference, the library contents of (European) scientists from a particular period can be considered; such listings testify to the inclusion of scientific works in translation, and therefore necessarily to the presence of any number of translators of scientific materials. More specifically, the 18-volume *Dictionary of Scientific Biography*, which is among the definitive reference works in the field, and which covers the lifeworks of some 5400 scientists (in the majority male), includes in every entry a section on a given scientist's writings, including their translation output. From this documentation it is possible to compile a long list of translations done by scientists.

⁵ By "set" here I mean *not* that these five women, whose lifespans cover 1640-1879, constituted a working collective of translators (this could hardly have been possible, except in the case of Mary

into place: Aphra Behn, Elizabeth Carter, Mary Fairfax Somerville, Ada Lovelace, and Elizabeth Sabine.

By studying this set of women, in their roles as translators, expositors, champions of science, and disseminators, and for their place in the history of translation as well as the history of scientific thought, I could work against the view that translators are but an afterthought in the transmission of ideas. Instead, I could underscore the visibility and influence of translators (and their texts) during the scientific process, even the presumably most disadvantaged set of translators at that. For today it is generally held:

1. that translators are not authors⁶, and are therefore less visible, even invisible, compared to the former group;
2. that, because the status of the translator is often taken to derive from the status of the source text⁷, and because scientific source texts are taken to hold lesser status than literary works⁸, that the status of the scientific translator is below that of a literary translator; and, finally,
3. that women, certainly for the time period in question (1650-1850), were less visible, in some ways even invisible⁹, members of society, for reasons of gender.

Somerville and Ada Lovelace, who lived, worked, and corresponded during a shared period of time), but rather that they demonstrate a number of common characteristics (by virtue of their gender, their translation activities, and their subject matter, mainly) that link them across time and space as noteworthy members of a larger scientific community in history.

⁶ One example in the long history of what Chamberlain (2000:315) discusses as the *secondariness* of translation is Armando Pires' "At best an echo". In: *Américas* 4:9 (1952): 13-15.

⁷ Consider Goethe's slight, "Translators are like busy matchmakers who praise a half-veiled beauty as being very lovely: they arouse an irrepressible desire for the original. In: *Maxims and Reflections*, as cited in Antoine Berman, *The Experience of the Foreign: Culture and Translation in Romantic German*, trans. S. Heyvaert (Albany, NY: State University of New York, 1992), p. 53.

⁸ The history of association between literature/literary criticism and translation studies, as well as the sheer predominance of publications and associations dedicated to *literary* translation, rather than to what is variously lumped together as 'non-literary', or 'technical', or 'specialized' translation, or 'translation for special purposes', attests to the importance accorded the one form over these others. For more on the canonization of literary translation, see also José Lambert's entry thereon in Baker's *Encyclopedia of Translation Studies* 1998:130-133.

⁹ This point hardly needs to be belaboured here. For one of numerous scholarly articles, see Chapter Two, "Theory of Sexual Politics" in Kate Millett's 1969 *Sexual Politics*. Granada Publishing. Available on-line at <http://www.marxists.org/reference/subject/philosophy/works/us/millett.htm>

Therefore, female translators of scientific materials ought to have been the most invisible group of all translators, perhaps even absent altogether from the historical record. Yet were they? Or did they in fact play a valuable and recognized role in their scientific communities, ultimately surpassing any societal expectations of invisibility set for them - as women, as writers, as scientists, as translators - to lend a distinct cachet to the texts they translated? To refer to the title, was there a “Cachet of the ‘Invisible’ Translator”?

A counter-argument to invisibility in the form of five indisputably important such translators would represent at the very least not only a contribution to the historical record and an encouragement for additional research in that time period; it would also call into question how the status and visibility of scientific translators has perhaps changed (decreased?) over time, and how these translators - past, present, and future - might be accorded renewed prestige today, with continued implications for scientific dissemination across modern, global information networks.

Structure of the Dissertation

Because the topic, female translators of scientific materials, covers aspects of translation studies, of science, of history, and of women in all three areas, the dissertation is structured to begin with two introductory chapters of contextual material before proceeding to the individual portraits¹⁰.

¹⁰ As for the suitability of the portrait format *per se*, it is hardly unusual: I refer specifically to such recent works in translation studies as Delisle’s *Portraits de traducteurs*, and *Portraits de traductrices*. While it might be argued that portraits – as “case studies” – extract translators from their context, the women presented here in fact remain connected to their context (and in certain cases to one another) through the scientific progress and social changes within which they lived, developments which are seen in the content and translation expectations of their work. Selecting these women was not a matter of proving some *exception* or some *rule*, but rather of demonstrating the *possibility* of attaining visibility and/or influence through scientific translation. That their number was few does not obviate their inclusion as representatives of scientific translation in history. Certainly, had more women been given the opportunity (to publish

Chapter One (*Translation and Invisibility*) sets a foundation for my counter-argument by exploring the notion of invisibility in translation studies, as represented both by the expectation of fluency in the (Anglo-American) target text (think fluency as invisibility), and by the paratextual invisibility of the person of the translator. Comparing modern forms of invisibility with historical trends in England ca. 1650-1850, I address a hierarchy of visibility, within which translators are less visible than authors, scientific translators are less visible than literary translators, and female translators (of scientific materials) are less visible than their male counterparts, for the time period in question. The particular disadvantage of general female exclusion from the mainstream educational system is noted in this chapter as well, with issues of class serving to partially offset the gender gap. This background material foreshadows the considerable achievement, against expectation, of the female translators later portrayed in (1) acquiring access to major scientific source texts, (2) lending the texts a personal cachet through their status within intellectual society, and (3) disseminating these translations - and the pioneering ideas they safeguarded - throughout Europe and even into the Americas.

In particular for the benefit of readers who specialize outside the sciences, Chapter Two (*The Scientific Backdrop*) gathers together a chronology of selected scientific events as they relate directly to the five translator portraits. Divided into two sections, the chapter looks first at *The Science behind the Portraits*, then *The Society behind the Portraits*.

The Science behind the Portraits begins with a brief orientation to the various phases of scientific revolution and institutional change as mapped out by historiographer of science I. Bernard Cohen. Next, the fundamental place of Newton in the history of science is

scientific translations in English), they, too, would have represented here. For more examples outside my selection criteria, I refer the reader to the Appendix.

explained in three specific areas: heliocentric cosmology, optics, and the calculus. Each of these areas of influence relates to material subsequently seen in a portrait: Portrait One = heliocentric cosmology; Portrait Two = optics; Portrait Three = the calculus. Connected to this overview of Newtonian topics, or *what* we know, is information on the scientific method, or *how* we know, with direct reference to Descartes and Bacon as foundational figures.

From there, Chapter Two continues on into the increased mathematization, data collection, and progress in applied science seen in conjunction with the Industrial Revolution. A connection is made to Portrait Four and Charles Babbage's calculating engines, the precursors to modern computing. Finally, such mathematization and data collection are linked to the rise (around the 1830s and 40s) of the Earth-based sciences, including geomagnetism and large scale exploration in physical geography, a topic focus that highlights the concomitant rise of Germany and the German language as dominant influences, where once the English and French had held the upper hand. These new factors are reflected in the pattern of source texts (by Arago, Dove, Gauss, von Humboldt, and von Wrangell) in Portrait Five.

In the second part of Chapter Two, *The Society behind the Portraits*, a number of additional overarching features are introduced into the mix. The shift from amateur to professional science is considered, including its place in a general move toward modernization (i.e., the Quarrel of the Ancients and Moderns), as well as the implications of this move for outsiders, including women. Next, an overlap between the scientific and the general audiences is related to the reader in terms of the growth of London periodicals, the salon culture and scientific fads, and the use of vernaculars in scientific communication.

Finally, the chapter introduces two concepts that will be seen to resonate in each portrait: *translation as repatriation*, whereby translation can serve such functions as to successfully outmanoeuvre resistance to the scientific content of certain controversial source texts; and *concurrent translation* (as branding), whereby co-existing translations by several translators highlight the personal power of the translator (including our female translators) to appeal to a target audience through a historical sort of niche marketing. Both phenomena underscore the power of the translated text as well as the power of the translator, despite resistance to content, and competition in the marketplace.

Following these two introductory chapters are a sequence of five portraits, as listed here:

Portrait One = Aphra Behn translates Bernard de Fontenelle's *Entretiens sur la pluralité des mondes*

Portrait Two = Elizabeth Carter translates Francesco Algarotti's *Il Newtonianismo per le Dame*

Portrait Three = Mary Fairfax Somerville translates Pierre-Simon Laplace's *Mécanique céleste*

Portrait Four = Ada (Byron) Lovelace translates Luigi Menabrea's *Notions sur la Machine Analytique de M. Charles Babbage*

Portrait Five = Elizabeth Sabine translates works by Arago, Gauss, Dove, von Humboldt, and von Wrangell

Each portrait includes biographical material on the translator, her source text author, and the source text itself, against the backdrops of visibility and influence (Backdrop One) and science and society (Backdrop Two). These discussions are rounded off with translation commentary and samples, including reference to translation as repatriation and concurrent translation.

Over the course of all five portraits, a general rise, peak, and decline of visibility and influence is seen to mark this non-linear progression of translators. This larger trend is discussed in relation to the increasing institutionalization of science, the shifting societal expectations for learned women, and the change in scientific topics and source languages, all for the period of 1650 to 1850, and all against the relative constancy of historical expectations of the (Anglo-American) translator in this period.

In the *Conclusion*, the major threads of discussion first laid down here in the introduction and in the first two chapters (then followed throughout the portraits) are summarily reviewed, and confirmed or rejected on the basis of the portrait material. Concluding remarks are made on the “cachet of the ‘invisible’ translator”.

With a view to future research - in translation studies as in the history of scientific ideas - the dissertation ends with an *Appendix* on an additional twenty women in scientific translation; for details see the introduction to the appendix itself. Though they did not meet my dissertation criteria for time period and target language, these women - some authors, some translators, some both - remain (with few exceptions) a largely unexplored source of additional insight into the history of (women in) science and the history of (women in) scientific translation.

Backdrop One: Translation and Invisibility

Introduction

The title of this dissertation, *"The Cachet of the 'Invisible' Translator: Englishwomen Translating Science, 1650-1850"*, was conceived to elicit several initial reactions: First, that the concept of the invisible translator is generally familiar to readers in translation studies; second, that, whatever invisibility is attributed to the profession, translators may nonetheless, in certain circumstances, apply strategies to become more visible than is generally assumed to be the case; and third, that, whether or not these strategies are consciously chosen or not, some translators quite markedly surpass the societal or professional expectations placed on them, rising to positions of personal prestige and power, qualities which are conferred upon their translations, rather than the other way around.

Underlying this first interpretation of the title are a number of basic questions about translation, translators, and invisibility; it is the purpose of this first background chapter to explore relevant issues of invisibility and translation, scientific translation, and women in translation. Together with a second background chapter on science, and the opportunities its development offered the five translators portrayed here, this exploration is intended to set the portraits - and, of course, their translated texts - in context, for, increasingly, translation writers are arguing for the importance of context-based textual evaluation. By way of entry into the chapter, consider for example the comments of Vanderauwera ¹, who writes that

A work of literature consists of a text and context, i.e., the text and a series of relationships pertaining to it: the author's use of the literary inventory, [the author's]

¹ Ria Vanderauwera, "Texts and Contexts of Translation: A Dutch Classic in English". In: *Dispositio* VII (Translation issue) 19/20, 1982:111-121.

inventiveness, ideology, historical situation, the poetics of the period, etc. New, more or less modified contexts, new systems of co-ordinates pertaining to the text, are constructed by those who process it. Readers, critics, publishers, prefacers ... may reconstruct what they think the original context was, construct one of their own..., or one that is a mixture of both.

... [Yet] the attention paid to translation or, more specifically, to translated texts has been rather meagre in twentieth century literary scholarship, and is usually confined to vague comments about the quality of the translation. ... What the commentator fails to see is the obvious: that the translated text is the result of an encounter between a text originating in a particular language, literature, culture and period on the one hand and the constraints, needs, and wishes of another language, literature, culture and period on the other.

In the following three sections, then, the constraints and possibilities operating for our set of five English translators are considered.

Section 1. The Invisible Translator – Modern and Historical Views

The major concern of this dissertation is to understand how a particular set² of Englishwomen from 1650-1850 were able - despite the historically disadvantaged position of women - to gain access to scientific texts of major importance, and to achieve recognition from general and expert audiences for their translations, even lending a cachet to these texts along the way.

I begin here with a look at the central notion of **invisibility in translation**, i.e., representative modern and historical discourse on what degree of visibility the translator assumes, or is accorded, both in the *act* and in the *product* of translating. Sections Two and Three of this chapter then incorporate material on the relative invisibility of **scientific** translators and of **female** translators, respectively. As all five of the translators portrayed in this dissertation

² For more on how these five women came to be chosen for portraits, see the General Introduction, pp. 12-14.

were Englishwomen, I essentially restrict discussion to the Anglo-American tradition of translation.

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In the quote from Vanderauwera above, that author notes a relative lack of discussion on translation, and translated texts, within literary scholarship. Yet more recently, both scholarly and professional journals on translation often feature articles challenging the status and public perception of translators. Chesterman references the term "invisible translator" in a recent article on text typology ³; Bononno has discussed the professional aspects of invisibility in the ATA Chronicle ⁴, Schulte urges the recognition of translation criticism as a valid scholarly activity ⁵, and Indian translator P. Lal has underscored the unique position of the translator in the creative process by coining a new term altogether, "transcreation" (transcrição) ⁶.

Yet the author currently most closely associated with the term invisibility in translation is Lawrence Venuti. In his major text on the topic, *The Translator's Invisibility*, Venuti's goal is to demonstrate that, while each culture's tradition of translation includes a range of dominant

³ Andrew Chesterman. "Translation typology". In A. Veisbergs and I. Zauberga (eds), *The Second Riga Symposium on Pragmatic Aspects of Translation*. Riga: University of Latvia, 2000, 49-62.

⁴ "The Invisible Translator". Robert Bononno. ATA Chronicle 23 (Aug. 1994)13,21.

⁵ "...Yet, contrary to the natural assumption that translators would enjoy a privileged position in a world that has become more and more globally oriented, they encounter increased neglect in the circles of publishers and editors and in the world of language and literature programs at colleges and universities. ...It is time that the writing of translation criticism, which constitutes an extremely intense form of scholarly research, be elevated to the same level of importance in the eyes of academicians as the writing of scholarly articles." Rainer Schulte, "Editorial: The Reviewing of Translations: A Growing Crisis". In: Translation Review 48/49 (1995), 1-2.

⁶ *Transcreation*, by P. Lal (Out-of-print). First volume appeared in December 1968. Published by Writers Workshop, 162/92 Lake Gardens, Calcutta 700045, India. ISBN: 8171899420. Since Lal first coined this term, it has come to be used by any number of commentators, including, for example, Haroldo de Campos, one of Latin America's most distinguished poets and writers. De Campos discussed his ideas on the topic at a seminar hosted by Yale and the Oxford Centre for Brazilian Studies. "On Transcreation: Literary Invention, Translation, and Poetics," Sunday-Tuesday, Oct. 17-19, 1999.

and recessive strategies that fluctuate over time, the Anglo-American tradition is most prominently marked by a striving for what Venuti⁷ calls **invisibility**, or *fluency of the target text*.

This relationship between text and person, between act and product, is a crucial point of distinction, one that will appear throughout the portraits. In linking these two terms, **fluency** and **invisibility**, Venuti draws the connection between the translated text, which is most desired when it is most fluent, and the person of the translator, who is most desired when she is most invisible.

In other words, by subsuming earlier discussions of fluency then renaming and continuing them under the term invisibility, Venuti shifts focus, (not surprisingly, given his arguments in favor of greater translator recognition) from the impersonal text, and related discussions of *fluency*, to the actual agent of that text, the person of the translator, and discussions of *invisibility*. So, in a re-personification of the act of translation, Venuti's choice of the term invisibility (which is associated with the translator, rather than with the text) puts the translator squarely at the centre of discussions on translation.

Broadly speaking, the idea of invisibility covers two aspects: first, what I will call invisibility in the translation *process*, i.e., how much translator intervention toward fluency takes place?;

⁷ Lawrence Venuti. *The Translator's Invisibility*, Routledge, 1994. Venuti is neither the first nor the only author to discuss this central notion of (in)visibility, i.e., the relationship between translator intervention in a text and the translator's resultant (in)visibility. Indeed, this idea sits at the very core of theoretical and practical discussions in translation studies, as it has throughout the history of the field, from the earliest debates over word-for-word vs. sense-for-sense translation, and over the place of the translator in relation to the original and the original's author. Rather, I choose Venuti as the catalyst for this discussion because of his particular and continuing association with this theme, including a re-personification [re-animation] of the act of translation that places the translator in focus, and his use of the specific term "invisibility", explored for example in *The Translator's Invisibility*, 1994.

and second, what I will call invisibility in the translation *product*, i.e., how is the translator acknowledged in association with the final product? ^{8,9}

In terms of *process*, for example, a target text that reads fluently in English, as though it were not a translation but “an original”, may have undergone a great deal of change by the translator, who remains proportionately invisible to her skill in creating such a fluent read. Such invisibility is likely apparent only to those readers who are familiar with translation [text] analysis; to them, indeed, the very fact of a highly fluent target text may itself suggest translator intervention, the first details of which can be extrapolated from a knowledge of the source language, then analyzed in direct comparison with the source text.

In a simplified illustration of this *relation between intervention and fluency / invisibility*, we can speak of **four basic possibilities**, the first two of which involve *less* intervention by the translator, and the latter two of which involve *more* intervention by the translator, yet whereby the translator typically becomes obvious through *non-fluency* rather than *fluency*:

(Less intervention)		
1. non-fluent source text	----	non-fluent translation
2. fluent source text	----	fluent translation
AND		
(More intervention)		
3. non-fluent source text	----	fluent translation
4. fluent source text	----	non-fluent translation

⁸ This distinction is related to early ideas about the mapping of translation studies. The first of these aspects, invisibility in the translation *process*, is an idea discussed largely within the theoretical realm of translation studies (or what James Holmes, the first “cartographer” of the field, calls “pure” translation studies). The second aspect, invisibility in the *product*, is an issue addressed rather in the professional realm, or what Holmes calls “applied” translation studies (see entry “Translation Studies” in Baker’s *Encyclopedia of Translation Studies*, pp. 277-78). For more, see Holmes’ *Translated! Papers on Literary Translation and Translation Studies*. With an introduction by Raymond van den Broeck. Amsterdam: Rodopi, 1994 (2nd ed).

⁹ This latter aspect can also be called paratextual invisibility; I will use this term within the portraits later on.

In other words, while the average reader notices the non-fluent translation almost exclusively, the informed reader registers both fluent and non-fluent texts, and questions the relationship between original and translation¹⁰. Generally, though, whether for general or professional readers, non-fluent translations are seen to exist outside the norm, whether they arise from lack of skill or for didactic or special purposes¹¹. In other words, a fluent translation remains the predominant standard, even when it does not accurately transmit an underlying, poorly written source text.

Yet clearly, the distance from source text to translation differs, depending on the quality of the source text. In other words, and this speaks directly to the notion of invisibility, the amount of translator intervention needed to achieve a fluent translation from a non-fluent source (#3) is greater than from a fluent source to a fluent translation (#2), though any well written result relegates the translator to a position of anonymity vis-à-vis the audience during the act of reading.

¹⁰ As Newmark says, "A translator requires a knowledge of literary and non-literary textual criticism, since he has to assess the quality of a text before he decides how to interpret and then translate it" Peter Newmark, *Approaches to Translation*, Oxford: Pergamon 1981, p.5.

¹¹ For example, to deliberately disrupt the reader's experience, making him/her aware of differences between the source text culture and target text culture; though this technique dates back to a long debate between word-for-word and sense-for-sense translation, later also called foreignizing or domesticating translation, in its more pronounced forms this technique has most recently been employed by certain translators in cultural studies (for example, Tejaswini Niranjana, *Siting Translation*; Douglas Robinson, *Translation and Empire*) and gender studies (Suzanne de Lotbinière-Harwood, *Rebelle et Infidèle*) to highlight the discrepancies of experience between their source text culture and a majority culture. Thus, a non-fluent translation, as at various points in the historical debate, need - today again - not necessarily be perceived as a "bad" translation, even if this technique nonetheless remains outside the norm of fluency. Such translations for special purposes are typically prefaced by a statement from the translator (and, perhaps, author) on the explicit purpose and stylistic choices of the translation project. To be sure, every translation project has a purpose, some less explicitly stated than others. Another purpose of deliberately producing a "bad" translation might be to demonstrate the weaknesses - lexical, stylistic, structural, logical - of a source text. In mainstream translation (for fluency), such shortcomings might otherwise be smoothed over in the perceived greater service of communicating "content", whatever that may be deemed. Still, communicating the weakness of a source text is also an important, even essential, piece of information that overly zealous striving for fluency might fail to transmit. Such questions as in this footnote speak to the usefulness and popularity of purpose-oriented translation, as explored for example in Christiane Nord, *Translation as Purposeful Activity*.

Often, the anonymity of the translator may well extend to the absence of her name in publication and review, no matter how great her contribution in producing the translation. Far from being a quaint historical practice of modesty (internalized or imposed), unattributed publication and review occur even today, and are one focus of attention within professional translators' organizations ¹².

Indeed, precisely because the critical analysis of translation and original mentioned here is unlikely to be conducted or even considered by the non-specialist reader, visibility in the *product* becomes all the more compelling. This form of visibility can be asserted in a number of ways, including, for example, acknowledgement of the translator on the title page, a translator's preface, translator's footnotes, and reviews referring specifically to the translator, with critique offered by a translator in kind.

Now, whether or not we as translators agree with fluency as goal, and whether or not a given translator ultimately opts for or against a fluency-oriented translation project, from writings on fluency we see that it nonetheless remains a constant that the (implicit or explicit) goal in translating invisibly - i.e., always toward fluency in the target text - is to produce a translation that calls no attention to itself as such¹³, to produce a translation that re-creates the impression of an original; too, this model of invisibility extends to the *person* of the translator,

¹² See for example Marcella Dallatorre's paper proposing a translator-friendly legal contract for dealings with the book world. "The translator's perspective", paper presented at the International Conference on Legislation for the Book World, Warsaw, 13-15 November 1996. Available through Cultural Council of Europe on-line at [<http://culture.coe.fr/clt/eng/eculiv0.8htm>].

¹³ There is of course the tricky relationship between *calling* attention and *receiving* attention. In other words, whether a translation *calls* attention to itself at the textual level ought, ultimately, to have no impact on whether the target text and the translator *receive* attention as entities of their own. This is in part what I mean by the distinction between the invisibility of the *product* of translation and the invisibility of the *translator*, discussed in this same paragraph.

who typically remains relegated to a background or anonymous position *vis-à-vis* the source text, the source text author, and the translation itself.

Caught up with this drive for fluency are a struggle of ideas over some immutable, even inimitable primacy¹⁴ of the source text ("the original"), and a requisite secondary-ness of the translator who, paradoxically, in working to produce a translation that reads fluently, often is moved to make changes to the source text that ultimately bear permanent witness to his/her seemingly invisible yet very real presence in the target text. As Venuti¹⁵ summarizes:

"Invisibility" is the term I will use to describe the translator's situation and activity in contemporary Anglo-American culture. It refers to two mutually determining phenomena: one is an illusionistic effect of discourse, of the translator's own manipulation of English; the other is the practice of reading and evaluating translations that has long prevailed in the United Kingdom and the United States ... A translated text, whether prose or poetry, fiction or nonfiction, is judged acceptable by most publishers, reviewers, and readers when it reads fluently, when the absence of any linguistic or stylistic peculiarities makes it seem transparent, giving the appearance that it reflects the foreign writer's personality or intention or the essential meaning of the foreign text -- the appearance, in other words, that the translation is not in fact a translation, but the "original". The illusion of transparency is an effect of fluent discourse, of the translator's effort to insure easy readability by adhering to current usage, maintaining continuous syntax, fixing a precise meaning. What is so remarkable here is that this illusory effect conceals the numerous conditions under which the translation is made, starting with the translator's crucial intervention in the foreign text. The more fluent the translation, the more invisible the translator, and, presumably, the more visible the writer or meaning of the foreign text.

Driven by this posited link between fluency and invisibility, Venuti chooses, as his way of counteracting this problem, to advocate less fluency (in the form of foreignizing), in the hopes that this will result not only in more visibility of the source text culture, but also in more visibility of the translator. This strategy is not without its detractors; as Robinson¹⁶ argues:

¹⁴ This is discussed by Berman in connection with the idea of translating what he calls *oeuvres*. See Berman 1984 and 1999. Related ideas on hierarchies within translation are visited below in a discussion on the relative status of non-literary/scientific translation.

¹⁵ Venuti, *The Translator's Invisibility*, 1994, pp.1-2.

¹⁶ Douglas Robinson 1997. *Translation and Empire: Postcolonial Theories Explained*. Manchester:

... translation tends to be dualized as either (a) communicative, accessible, assimilative, and therefore part of the problem [because it supports Western imperialism toward foreign texts], or (b) noncommunicative, inaccessible, nonassimilative, foreignizing, and therefore part of the solution [because it asserts difference in the hegemonic culture]. ...

[Yet] it is not clear that foreignizing and domesticating translations are all that different in their impact on a target culture. All translations are based on interpretations, and interpretations will vary from translator to translator ...

It seems impossibly reductive to assume that all assimilative translations will have a single type of negative effect on all readers, and that all foreignizing translations will have a single type of positive effect on all readers. ...

Ostensibly “reductive” or “assimilative” or “fluent” language can be foreignized or defamiliarized by the simple act of reading it in a different tone of voice -- sarcastic, ironic, campy, fearful, bombastic, etc. -- and a good actor or speaker can “naturalize” even the strangest and most foreign-sounding phrase, so that no one notices anything out of the ordinary.

In other words, though Venuti makes great strides for the profession in drawing the connection between fluency and invisibility, and however important his explorations of invisibility are, his focus on non-fluency as a major strategy through which to achieve visibility may be too easy.

On the whole, the many approaches subsumed under modern translation studies tend toward fluency, which, as Venuti has argued, seems tightly bound up with translator invisibility, however increasingly aware and articulate these individual approaches have become over time about the person¹⁷ of the translator as opposed to a restricted focus on the text.

St.Jerome, pp. 109-111.

¹⁷ A recent dissertation by Koskinen explores the similarities between Venuti and Pym on “the vexed question of translators’ visibility and trust, as well as the deadlock of fidelity”. Kaisa Koskinen, *Beyond Ambivalence: Postmodernity and the Ethics of Translation*. Dissertation, Department of Translation Studies, U. Tampere, Finland, 2000. Meanwhile, in a critique of Venuti, Edoardo Crisafulli writes about the visible function of the translator as textual critic, “especially in light of Venuti’s failure to appreciate the potential inherent in transparent/fluent rewritings”. Abstract to “The Translator as Textual Critic and the Potential of Transparent Discourse”. In: *The Translator, Studies in Intercultural*

Yet I cannot close this section without underscoring that the link between *fluency of the text* and *invisibility of the person* is not a mandatory one; indeed it arises when the distinction between *process* and *product* is not maintained as separate. It is not, so to speak, necessary to toss the baby out with the bath water. That is, a fluent translation need not be maligned solely for the effect of invisibility it may produce, provided visibility is asserted elsewhere, as paratextually¹⁸, in the translation product. By the same token, deliberately producing a non-fluent translation is not the only way to assert visibility. The translator should not have to choose artificially between the two, but rather should have the option of a fluent translation **with** a high degree of visibility, as achieved through the strategies suggested above, in name recognition, notes, prefaces, critical literature, and the like. Certainly the deliberate use of non-fluent translations to create awareness, has had, among other effects, that of creating a *space* for translator recognition. Perhaps now that space has been created for this awareness, it can begin to be filled with visibility in association with the translation product, all the while allowing fluency a place as one major strategy.

Indeed, what is today seen as a necessary connection between fluency and invisibility was not always the case. As we shall see in the historical section next, during what T.R. Steiner¹⁹ calls the Golden Age of Translation (1650-1800), fluency did not necessarily imply invisibility.

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Invisibility and the Historical Setting (England, 1650-1850)

Communication. Vol. 5 (1) 1999.

¹⁸ Gerard Genette speaks of paratextuality (his second of five types of transtextuality) as the relationship between the text proper and that which surrounds the body of the text – such as titles, headings, prefaces, epigraphs, dedications etc. Gérard Genette, *Palimpsests: Literature in the Second Degree (Stages)*, (1982), 1998 Edition Translated by Channa Newman & Claude Doubinsky, Nebraska: University of Nebraska Press.

¹⁹ T.R. Steiner, *English Translation Theory 1650-1800*. Assen/Amsterdam: Van Gorcum, 1975.

In relation to the texts involved in this dissertation, Venuti's is a decidedly modern approach, focusing as it does on the ideas of fluency and invisibility as the predominant mode of [Anglo-American] translation *since World War II*. Yet, though the term invisibility as appropriated by Venuti is recent (1994), discussions of this central paradox are not. While there may be no unified theory of translation ²⁰, what Gaddis Rose ²¹ calls the two main taxonomies of translation i.e., literal vs. free, and text-oriented (source-oriented) vs. audience-oriented (target-oriented), have existed at least since St. Jerome in the Latin tradition and Luther in the German tradition ²², just as these traditions themselves can be traced back to "perhaps two dozen potentially usable passages ... in Cicero, Horace, Quintilian, Pliny the Younger, Terence, and Aulus Gellius" ²³.

In another point of continuity from historical to modern commentary on translation, the poles of "word-for-word" and "sense-for-sense" translation have essentially remained constant, albeit with periodic shifts towards one or the other side of this spectrum ²⁴. This is true for the entire period covered by this dissertation, which is located during what Newmark calls pre-linguistic ²⁵ thought on translation, and even after the advent of the linguistic approaches

²⁰ Newmark even objects to the use of the term theory at all. See *Approaches to Translation* 1981:19.

²¹ Marilyn Gaddis Rose, entry: "Speculative approaches" in *Routledge Encyclopedia of Translation Studies*, ed. Mona Baker, 1998:238-240.

²² Jerome (~AD 340-420) (*Letter to Pammachius*, 400 A.D.) and Luther (1483-1546) (*Sendbrief vom Dolmetschen*, 1530) are reprinted in H.J. Störig's 1963 *Das Problem des Übersetzens*.

²³ T.R. Steiner, *English Translation Theory 1650 - 1800*. Assen/Amsterdam: Van Gorcum, 1975:1.

²⁴ To be sure, other approaches do exist outside this mainstream range of acceptability (which incidentally is discussed largely in terms of [prose] literature; specialized texts are considered below under "Scientific translation and invisibility"); such fields as gender studies and cultural studies for example have had important effects on giving marginalized groups, texts, authors, and ideas a voice within more radical translation strategies that seek not fluency, but authenticity of this marginalized experience, whatever the disruption in the reader's normally fluent reception of a target text. This idea, too, is considered below, under "Women and invisibility in translation".

²⁵ Among the earliest modern discussions of translation are the linguistic approaches, which arrived (circa 1950) with the rapid progress being made in applied linguistics, of which translation was long considered a poorly differentiated subset before eventually coming into its own as translation studies. Although they encompass many authors and many variants, the *linguistic approaches* can be traced back to Fedorov, who in 1953 published the first major attempt (in Russian) at a linguistic description of translation. Well-known Western participants in the discussion on the relationship between

in the 1950s. In addition, historical²⁶ and modern discussions alike have been drawn largely in terms of two main themes: (a) the conflict between *free* and *literal* translation, and (b) the contradiction between the inherent *impossibility* of translation and its absolute *necessity*²⁷.

Ultimately, these discussions are all forms of negotiating one issue: how much change - and of what sort - a translator "should" make to a source text. In other words, just how much presence is the translator accorded - in the translation of the text, and as a person associated with the product, the translated text?

For most of the period of this dissertation, *fluency* of style (especially as domestication) and *mimesis*²⁸ of the original author/text were favoured (in England) as predominant goals; this period (1650-1800) was bookended by stronger emphasis on the creative license of the translator, as urged for example by translator-imitators Chapman, Denham, and Cowley

linguistics and translation theory include Chomsky and Catford.

²⁶ For greater detail on various aspects of the history of translation, the reader may refer to such works as referenced in Pym's *Method in Translation History*. In his section "A too-brief history of translation history" (pp. 9-15), Pym notes that "Generalist research in translation history might vaguely be dated from the 1960s, particularly the overviews of Cary (1963), Mounin (1965) and Klopfer (1967), backed up by Störig's seminal editing of some of the major theoretical texts of the past (1963). ... Discussions and surveys have been provided by George Steiner (1975), Kelly (1979), Berman (1984), Norton (1984), Van Hoof (1986, 1991), Renier (1989), Ballard (1992), and Vermeer (1992, 1996), while the editing of historical translation theory has been carried out by T.R. Steiner (1975), Lefevere (1977), Horguelin (1981), D'hulst (1990), Copeland (1991) Lefevere again (1992b), Robinson (1997), and others... Yet perhaps the most desirable change will come from certain collective undertakings, [including] Delisle and Woodsworth's *Translators through History*, the *Oxford Guide to Literature in English Translation*, the Fitzroy Dearborn *Encyclopedia of Literary Translation*, the *Routledge Encyclopedia of Translation Studies* and the *De Gruyter Handbuch zur Übersetzungsforschung*, all of which include large helpings of history".

²⁷ Peter Newmark, *Approaches to Translation*, Oxford: Pergamon, 1981:4.

²⁸ Drawing on the Neoclassical association between translation and what were called the sister arts of painting, sculpture, music, and poetry, Dryden and his fellow commentators on translation through Tytler describe translation as akin to these mimetic arts, especially painting, with similar responsibilities incumbent on the translator - also considered an artist - to make the product recall the original, whatever inevitable losses of 'spirit' may occur in transmission. This tension between replicating the 'objective experience' (T.R. Steiner) of the original, yet applying a certain necessary license with an eye to evoking its spirit remains familiar to the modern translator, and developed over the course of Dryden's experiences and writings, until he arrived at his now famous triad of mimetic strategies: metaphrase, paraphrase, and imitation.

before, and by German Romanticism²⁹ after (for the final 50 years of 1800-1850), before domestication and mimesis resumed a predominant – though not exclusive³⁰ - place around 1850.

Most importantly, during this golden age of literary translation, ideas about translation were being widely explored, and a more comprehensive and systematic codification of rules about translation began to set in. These activities took place not at the periphery of literature, but at the highest level of writer. As T.R. Steiner notes, (for the period 1650 to 1800) “writers ... did not disdain translation ... [Also,] the principles of translation were codified, and critical discourse about the art was notably expanded”³¹. This body of writing was being produced by such esteemed authors as Pope and Dryden, who effectively dominated the end of the 17th century³².

²⁹ Major writers on translation in German Romanticism included Goethe, Schleiermacher, and von Humboldt, as well as Schlegel, Novalis, and Herder.

³⁰ As all of the material offered here shows, the poles of word-for-word and sense-for-sense, and all variations thereof, have marked debates on translation for hundreds of years. Clearly, then, I mean not to imply that either domesticating or foreignizing strategies have held *exclusive* domain at any point in history whatsoever; rather, I indicate trends and predominating strategies, in particular the overall predominance of domesticating strategies in the Anglo-American sphere for the time period covered in the dissertation. For more on the case of German Romanticism and its influence on translation, for example, readers can refer to such debates as between F.W. Newman and Matthew Arnold, which record how foreignizing strategies remained in circulation in the field even after the 1850 date indicated here as a broad marker, even though Newman and Arnold, both “children of the Romantic revolution” disagreed less about ends (to be faithful, to unite with the original) than about means. As Ellis and Oakley-Brown (2000:342) stress, their “protracted and largely pointless exercise in irony and acrimony cast long shadows” yet remains important for having anticipated that important tendency of nineteenth-century translation, the ‘foreignizing’ of the original.

³¹ T.R. Steiner, *English Translation Theory 1650-1800*, p.1.

³² In brief summary thereafter, the influence of these major figures was followed by the first book-length treatise on translation, by Alexander Fraser Tytler, in the late 18th century - (*Essay on the principles of translation*. 1790); then the first half of the 19th century was distinguished by the influence of German Romanticism, as mentioned above, with its new self-understanding of the translator. Eventually, though, this period of foreignization (1800-1850) dropped back to a recessive strategy as the 19th century progressed. This is not to deny the influence of German Romanticism, nor to suggest that debate over domesticating and foreignizing strategies simply vanished after this period, as is plainly dispelled in the fact of work currently being done on post-colonialism and translation, for example; rather, I underscore simply that, for the vast majority of the time period of the dissertation the predominant overarching approach was domesticating.

Perhaps best known to students of translation in the words of Samuel Johnson, as “the lawgiver to translation”, John Dryden (1631-1700) was also the leading man of letters of his day, as well as England’s Poet Laureate. Notably, his tripartite distinction of metaphrase, paraphrase, and imitation continues to resonate in translation studies today³³. In terms of his own preferences as translator, Dryden’s personal position on free vs. literal translation did change somewhat as he aged, shifting toward *more* rather than less fluency; it seems once he had had the chance to redress the quite free approach of his predecessors, he felt more comfortable advocating a bit more freedom in translation generally.

Yet Dryden’s important contributions were not solely in response to his immediate English predecessors, as I discuss in the following; rather, he forms part of a tradition that includes the influence of French translators on their English colleagues, and extends to the later influence of the Germans, especially in the 19th century.

Because this dissertation revolves around English translators, the focus of the historical theory is, accordingly, on the Anglo-American tradition rather than, say, on the French tradition or the German tradition. Nonetheless, for the time period in question (1650 to 1850), the historical influence of French translation theory (in particular, of the *belles infidèles*) and of German translation theory (in particular of German Romanticism, which itself in part

³³ As Steiner summarizes, in metaphrase ‘the individual words, syntax, figures, form, etc. of the original’ is imitated; in paraphrase ‘a selection or abstraction of its most distinctive, analyzable features’ is imitated; in improvement or imitation, ‘the transcendent reality which underlies the original, the intellectual form, of which even the original is a shadow’ is imitated. These categories were conceived in direct response to Dryden’s predecessors in the English tradition, (Chapman, Denham and Cowley) who had worked to free translation from the constraints of the literalism used in Royalist circles. The impetus, then, for what would become the first major codification of previous (English) ideas on translation came to Dryden as a response to modulate what he perceived as his predecessors’ sometimes excessive enthusiasm in the new, more free direction toward imitation.

responded to les belles infidèles) deserves mention here³⁴.

³⁴ In accounting for the remaining source language tradition seen in the portraits, the Italian tradition, I limit discussion to the following salient points, as described more extensively by Duranti (2000:1979):

From at least the time of Virgil translator Annibal Caro (1507-66) to Romanticism, the norm for translation (i.e., poetic translation) was “the creation of a text with the same value as the original, [if] distant from it” (2000:478). In other words, as in England and France, domesticating strategies were predominant in the Italian tradition for the entire period of the dissertation up to the arrival of Romanticism. In another continuity with trends seen in the main English setting of the portraits, the Italian emphasis was on *poetic* source texts as of the highest order, and on the creative/adaptive power of the translator, though the English and French traditions saw a far earlier influence of translation on language development than did Italy, where, until the 1650s, Latin remained the official *lingua franca*, obviating the need for (scholarly) translation; this differentiates Italy from the vernacularization effects of translation seen previously in France and England, then later in Germany. This point is of course linked to the different national agendas of the four countries – Italy and Germany both were late to enter nationhood, in 1861 and 1871 respectively.

By 1750, though, a burst of French translation activity was occurring in Italy, from comedies and tragedies (with a focus on performativity, i.e., a form of domestication) to the novel (including the introduction into Italy of English content via French intermediaries – a trend that underscores the permeability of information boundaries, a permeability seen in the five portraits here as well). This French influence extended beyond letters to include “four areas which were of course inseparable from the writings of the French *philosophes*”: philosophy, science, economics, and politics (Duranti 2000:478). Translators from the French included a range of types (“Everyone translated: renowned authors and unknown dilettantes” Ferrari 2000:479), while those of the opposing camps who stayed with translations from the classics were a more homogenous group including “generally famous men of letters and academy members ... [reflecting] the ideal of the religious intellectual” Ferrari 2000:479.

As in the three other countries discussed here, Italian scholars continually grappled with the dichotomies of classics vs. modernity, of poetry vs. prose, and of word-for-word vs. sense-for-sense translation. Now, in direct contrast to such earlier translators as Annibal Caro, “respect for the source text began to become the norm” (Duranti 2000:479); as Ferrari states, “from 1725 on especially, literary translation moved closer to the original” (Ferrari 2000:479).

This shift toward foreignization as translation strategy is akin to the shift also occurring in England under the influence of French Enlightenment debates on the ancients vs. the moderns. One important voice on the issue was that of De Staël, whose 1816 modernist-slanted *Sulla maniera e l'utilità della traduzione* (in the Italian translation) stressed the usefulness of translation in the renewal of the target culture; in other words, “contact between literatures and cultures was useful above all for broadening minds and developing knowledge” (Duranti 2000:480). This eagerness to seek out the foreign foreshadows the subsequent effects of German Romanticism on translation. As well, the interest in renewal (and, coincidentally, vernaculars) links De Staël to the function of translation as repatriation and the renewal of scientific ideas, as explored in several portraits here.

By the 19th century in Italy – i.e., the final time period of the dissertation – though translations from the French continued much as before, there was an “unprecedented increase in translation from English”, with “widespread interest in the Anglophone world” (Duranti 2000:480). In addition, there was a “sudden increase in the translation of scientific texts”; this included French and English sources, as before, but also now, as the decades passed, the work of German positivist scientists (whose work is

In large terms, for the period covered by the dissertation, three major divisions can be offered here:

1. To 1650 = Precursors to codification
French: Oresme, Dolet, Amyot, Du Bellay
English: Chapman, Denham, [Cowley, Fanshawe]
2. 1650 – 1800 = Les Belles Infidèles (D'Ablancourt) and
English codification (Dryden, Roscommon, Tytler)
3. 1800 – 1850 = Romanticism and foreignization
(Novalis, Schlegel, Schleiermacher, Gottsched, Herder, von Humboldt)

Given the English (target language and culture) setting for all five translators portrayed here, my description of these broad movements is formulated from the English viewpoint, beginning with the codification of translation set into motion by such French precursors as Nicolas Oresme, Etienne Dolet, and Jacques Amyot.

Oresme's (1330-82) many contributions included the pioneering of translation into the vernacular, and the use of translator's prefaces to discuss such central issues as the "task of the translator, the need for accuracy, and the introduction of new terms into the target language"³⁵. All three themes continue to hold the interest of translation scholars to this day, nearly 700 years hence, and are seen in the portraits as well (Behn and Somerville, for example, comment on their understanding of their translation projects, and the Lovelace-Babbage translation commentary includes reference to the language of manufacture and social economy).

referenced in this instance in the Sabine portrait). Thus, the final period of the dissertation, and the Sabine portrait, are synchronous with the central presence of German scholars in the international scene, where English and French had exerted previous influences.

By 1540, Etienne Dolet would formulate the first French codification of translation. His *De la manière de bien traduire* appeared just one year after French had been decreed the official state language, and in its five rules for translation rejected word-for-word translation, in the process renewing yet again a debate that had occupied (and continues to occupy) commentators since at least Classical Rome (300 BC). Dolet's period was marked by a concern for clarity of expression, and saw expansion and amplification of source texts to this end. This is not to say the period was without nuance or opponents to such adaptive strategies, for in the other court, meanwhile, such key translators as Jacques Amyot (1513-93), though also concerned with simplicity and purity of language, found his choice of expression was judged by some to be too literal. Amyot's concern for clarity is seen less *textually*, where he observed close concordance to the source text, than *paratextually*, in the form of glosses, or other such added (and sometimes even deleted!) material. Clearly, understandings of what exactly constituted 'clarity of expression' in the target language were as varied and subjective as the practitioners who attempted to formulate, express, and codify such behaviour; such variety is no less familiar to today's practitioners.

In these three important French precursors, Oresme, Dolet, and Amyot, we see represented many of the central and ongoing concerns of translation studies, concerns that link these scholar-practitioners to the time of the dissertation portraits (1650-1850) and through to today.

In the immediate progression, though, such translators as Oresme, Dolet, and Amyot, with their concern for clarity of expression³⁵, fed the debates on the tasks of the translator, the next

³⁵ Salama-Carr 2000:417.

³⁶ Not to forget Joachim du Bellay, 1522-60, one contemporary who argued against (literary) translation altogether because he saw it as an *obstacle* to creativity in the vernacular. By contrast, it was du Bellay's opinion that *non-literary* translation was possible and acceptable – this hierarchization of text typologies, whereby non-literary texts are inferior and/but paradoxically translatable, links du Bellay to the discussion on the invisibility of scientific translators presented later in this Backdrop.

major stage of which in France was the arrival of Nicolas Pierrot D'Ablancourt (1606-64), the leading representative of one of the most recognized tropes and movements in translation studies, *les belles infidèles*. Co-existent with those who favoured a more literal approach, such predominant translators as D'Ablancourt argued for elegance of expression in the target language as among the highest criteria, for being *belles* even if it meant being *infidèles*. Clearly this approach, which extended even to include *adaptation* as translation, is located within the strongly domesticating (or target-text-and-culture-oriented) strategies.

As well as having a lasting influence on French and English traditions of translation, the trope on which the name is based has held the interest of generations of scholars, including most recently in gender studies³⁷, which has explored many facets of the central (and, they assert, misogynist) claim that translation, like woman is defective³⁸: either it is faithful or it is beautiful³⁹.

³⁷ See, for example, Lori Chamberlain's oft-cited "Gender and the Metaphorics of Translation", in *Rethinking Translation*, ed. Lawrence Venuti (1992), pp. 57-74. Or Sherry Simon's *Gender in Translation* (1996).

³⁸ This equation stems from an infamous comment by John Florio (1553-1625). Often cited as "Because they are necessarily defective, all translations are reputed females" the actual, and to my mind somewhat less scathing, comment by Florio is found in the preface to his 1603 translation of Montaigne, in which paratextual commentary Florio bows down before his "best-best Benefactors, and most-honored Ladies, Lucie, Countesse of Bedford; and hir best-most loved-loving Mother, Ladie Anne Harrington. ... So to this defective edition (since all translations are reputed femalls, delivered at second hand; and I in this serve but as Vulcan, to hatchet this Minerva from that Iupiters bigge braine) I yet at least a fondling foster-father, having transported it from France to England; put it in English clothes; taught it to talke our tongue (though many-times with a jerke of the French Iargon) wouldset it forth to the best service I might; and to better I might not, then You that deserve the best. Yet hath it this above your other servants: it may not onely serve you two, to repeate in true English what you read in fine French, but many thousands more, to tell them in their owne, what they would be taught in an other language". Available on-line through Renaissance Editions, provided by Professor Emeritus Ben R. Schneider, Lawrence University, Wisconsin. © 1999 The University of Oregon.
<http://www.uoregon.edu/~rbear/montaigne/>

³⁹ The expression, and the entire heated – and justifiable – debate which descended therefrom can be traced back to a comment by Ménage about a translation by D'Ablancourt: "Elle me rappelle une femme que j'ai beaucoup aimée àTours, et qui était belle mais infidèle". For more, see for example Amparo Hurtado Albir, *La Notion de Fidélité en Traduction* (Paris, 1990), or Edmond Cary, *Les*

Back in England, meanwhile, the question of how much intervention the translator ought to undertake, and of what kind, was being represented first by codification precursor Chapman, then largely by the Royalist translators under the exiled Stuart court of King Charles II, to which practitioners Dryden would soon, famously, respond via his classification of three translation types.

As in the French tradition of precursors to the major movement later seen in les belles infidèles, in England as early as 1598 (cf. Dolet 1540), George Chapman (?1559-1634) was increasingly using his prefaces as a forum "to negotiate a theoretical frame for the process of translation"⁴⁰. Not unlike the poles seen in other discussions of translation, Chapman's various lines of inquiry pursued translation first as straightforward linguistic mimesis (i.e., closer to word-for-word translation) and, later, more as poetic art, with an equivalent-effect approach; his understandings would "anticipate developments during the next 200 years"⁴¹.

Among these developments in translation-as-art was the arrival of the Royalist translators, including John Denham, Abraham Cowley, and Richard Fanshawe. Together this group practiced quite a free translation method for poetry (which continued to be considered the highest form of literary expression and therefore most worthy of translation). In fact, their liberal approach (especially Cowley's), though praised "for freeing translation from servility" (Dryden's 1680 Preface to *Ovid's Epistles*), was judged ultimately as far too liberal in its excesses. Between these limits sketched by Chapman (more literalism) then Cowley (imitation to the point of abandoning the source text) now entered John Dryden who, with his famous 1680 tripartite division of translation into metaphrase, paraphrase, and imitation,

grands traducteurs français (Geneva, 1963) or Georges Mounin's *Les belles infidèles*.

⁴⁰ Ellis and Oakley-Brown 2000:340.

⁴¹ Ellis and Oakley-Brown 2000:340.

became the first English codifier of translation⁴². Indeed, though Roscommon's 1684 *Essay on Translated Verse* was hardly less of an important contribution in its day, the next major English treatise on translation would not come until 1791, with Tytler's "Essay on the Principles of Translation".

In a larger sense, these two major figures (Dryden and Tytler), and the positions they favoured, echo the relationship to the source text seen in the French, German, and Italian spheres, namely a shift toward the source text as the ultimate point of reference. Between Dryden (who was very much of the aesthetic focus of the 18th-century, wherein genius, wit, and taste in the target text are prized above all) and Tytler a century later, the duty of the translator had become "to present the work exactly as ... in the original"⁴³.

These similar trends in various countries and languages suggest the interaction of translation thought and commentary across national boundaries. In particular, for example, in the actual geographic displacement of the exiled Royalist translators to France we can note the potential for the mutual influence of major contemporary figures in translation.

All of which leads us to the final phase covered in the dissertation, 1800-1850, when (in part in response to the failed economic and social hopes⁴⁴ of the French Enlightenment for the revolutionary ideals of *liberté, égalité, and fraternité*) German Romantics were having a major influence on culture and on translation, in particular on the self-understanding of the translator⁴⁵.

⁴² As Robinson notes, a number of previous writers set the stage for Dryden's three types, including St. Jerome (2000:87).

⁴³ Ashton 1980:84, 341.

⁴⁴ Professor Gerhard Rempel, Western New England College.

<http://mars.acnet.wnec.edu/~grempel/courses/germany/lectures/07reform.html>

⁴⁵ George Steiner 1975, Robinson 1991.

Now, just as the Royalists had responded to the literalism of Chapman, and Dryden had written to curb the excesses of the Royalists through codification and calls for moderation, and Tytler had further responded by advocating the primacy of the source text – in style as in content – the Germans, for their part, rallied around among the strongest reactions to *les belles infidèles*.

In response to the sequelae of the French Revolution, these Germans now advocated "against the materialism and mechanization of the spirit engendered by the new industrial and democratic age, [and] sought to escape into fantasy, sentimentality and allegory"⁴⁶. In terms of translation strategies, their creative impulses derived from "Sehnsucht--yearning for the lost, the unattainable, the irrevocable, for the disappearing, for fancy, for dreams" within which model "contradictions found deeper and richer meaning" and, as Novalis expressed his hopes, "all worlds and ages could be united by the magic of imagination"⁴⁷. Little wonder, then, that the *foreign* - with its contradictions to the familiar – should now become so prized in such fields as language and *translation* – with its own particular yearnings for the lost, the unattainable, the irrevocable, for the disappearing.

Specifically, this German contingent, which included such key figures as Goethe,

⁴⁶ Professor Gerhard Rempel, Western New England College.

<http://mars.acnet.wnec.edu/~grempe/courses/germany/lectures/07reform.html>

⁴⁷ Though this wish for unification would eventually develop more negative nationalistic tendencies, for the meantime the Romantic interest in the idea of society as an *organic* whole (within which not individual anarchism but a community of individuals was the ideal response to the difficulties seen in the French Revolution and Enlightenment) forms an interesting link to (and across) the *scientific and translation* elements of the dissertation. Specifically, the movement is characterized by the use of organic metaphors, such as in the example of Schopenhauer's 1851 description of translation as a chemical process in which the original is first melted down and then recast (cited in Hermans&Stecconi 2002).

Schleiermacher, and von Humboldt⁴⁸, as well as Schlegel, Novalis, and Herder, tended to see “the French style of nationalizing, assimilationist, ‘domesticating’ translation as degrading for the foreign writer rather than as a mark of respect” (Hermans & Stecconi 2002). Here, it is important to note that while both traditions (belles infidèles and Romanticism, with its ‘seeking out the foreign’) posited the perpetuation of the source text author’s spirit through translation, this objective was proposed to be achieved by very different strategies indeed, whether strong domestication or strong foreignization.

In fact, this last point serves the conclusion to this section well. Over the course of two hundred years of the dissertation, the struggle for clarity on issues dear to translators has led to the development of any number of schools, codifications, and movements. Whether the stated goal was ‘clarity of expression’ or ‘respect for the foreign’ or any other, translators, operating within a given milieu, found ways to justify their choices for more or less liberal approaches to the source text. Yet the fact remains that, until around 1800 –1850, i.e., just at the cusp of the final portrait (Sabine) the predominant strategy in the Anglo-American sphere was quite clearly domesticating, whatever arguments to the contrary arose. Ultimately, what remains striking to me is how, precisely when the creative spirit of Romanticism so prized the foreign, our final translator Elizabeth Sabine, in marked contrast to the four women who came before her, nearly vanished (perhaps into the foreignness of the source text?) - not an individual within a community⁴⁹, as the movement valued, nor an anarchic individual, against which they reacted, but simply absent.

⁴⁸ Of particular interest within this dissertation is the presence of **Wilhelm von Humboldt** in the Romantic movement, which embraced questions of language as at the very root of humanistic concerns. Brother to explorer-naturalist Alexander von Humboldt (whose works are referenced in the Sabine portrait) von Humboldt figured prominently in post-Enlightenment Europe as a statesman and educator, and was “firmly convinced that language is the shaping language of thought”. Cited in Miguel Vega, “Wilhelm von Humboldt, Translator and Translation Theorist”. In: *Meta* XXXV 3, 1990.

⁴⁹ See also footnote 47 above, re. Hermans&Stecconi.

All of which returns me to the point of connection between the section on modern invisibility and this historical section, namely, does fluency breed invisibility? Specifically, if fluency is today associated with invisibility, can we say the same for the period of the dissertation? In fact, this historical section shows it wasn't always necessarily so.

First, translation was being done by indisputably major - and therefore highly visible - writers of the time (e.g., Denham, Cowley, Dryden, Pope, Johnson). Many of their translations (especially of the classics) and prefatory essays (Chapman=*Iliad*, Jonson=*Ars Poetica*, Denham=*Destruction of Troy*, Cowley=*Pindarique Odes*, Dryden=*Ovid's Epistles*) on the art of translation were accorded the status of required reading by peers in letters, both within the educational system and in the literary world. Second, even while the dominant understanding of translation as mimesis over the course of the 200-year period placed great value on the primacy of the source text, and the source text author as the yardstick against which all translation is measured, considerable creativity was still demanded of (and admired in) the translator in working toward an artistic (yet domesticated) ideal.

Equally as important, considerable visibility was associated with the act and product of translation, even while the source text author continued to hold primacy. All this was occurring during a time when the overlap between author and translator was more pronounced than today. Over time, a separation of the two pursuits accentuated the pre-existing, yet still rather more neutral hierarchy of author+source text as superior to translator+translation, and began to colour the hierarchy, increasingly marking translation as clearly secondary, if not outright inferior⁵⁰. Until this distinction became thus coloured,

⁵⁰ This hierarchization and exclusion is reminiscent of the exclusion of the amateur scientist from the increasingly professionalized world of science, a trend that is discussed in the next chapter, Backdrop Two. This applies also to the status of modern translator training as a professional track, compared to the artistic creativity attributed to [other] writerly pursuits.

however, the atmosphere of vibrant intellectual discussion on translation (e.g., by such participants as Chapman, Denham, Johnson, Pope, Dryden, and Tytler) and its codification meant that translators (most often writer-*cum*-translators) could maintain a high degree of visibility through their independent status as author, and through the respect accorded by their peers in recognition of skilful translation.

Still, this historic visibility of the translator in no way contradicts my fundamental argument, that female translators of scientific materials were at a number of disadvantages, and that the 5 women portrayed here are to be given a proper place in history for their achievement. While the relative respect shown skilled translators in the day opened doors to female translators as to men, there were nonetheless limitations associated with *scientific* translation and with the fact of being a *female* translator. I consider these points in the next two sections.

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Section 2. Invisibility and Scientific Translation

The preceding section discussed modern and historical aspects of fluency and invisibility. On the general question of translator visibility in the period covered by the dissertation, the initial conclusion has been that, through their independent production and status as *authors*, some *translators* in fact also held a certain status, visibility, and influence. Thus, the simple fact of being a translator need not have predisposed an individual to obscurity, particularly if that person was well regarded as an author⁵¹. Nonetheless, this discussion has referred

⁵¹ To be sure, there were any number of less successful writers toiling in obscurity; the fact of their authorship would likely not have lent much profile to any translations they may have done. Also, it must be stated that the number of *women* who could hope to achieve the status of such author-translators as Pope, Dryden, or Tytler was quite small indeed. Without this cachet of being a known writer, a woman had less hope of generating interest in any translation output. Being a woman thus can be said to have offset many of the privileges associated with what was considered the noble calling of writing, including its positive effects on the reception of a writer's translation work. These latter points are discussed further in the final section of this chapter, on "Women and Invisibility in

exclusively to literary texts, while the translators I portray here were chosen for their work with scientific materials. What place does - and did - scientific translation hold, and what does this say about the opportunities *scientific* translators had for visibility and influence, as individuals and through their texts?

Modern context

Generally, in modern letters, a hierarchy has existed that favours first literature, then literary criticism, then (literary) translation, and finally non-literary translation. Even with the establishment of translation studies, which has worked to re-equilibrate the hierarchy by establishing translation as distinct from and not necessarily subservient to literary studies, writing on non-literary translation (also variously called specialized translation, or technical translation, or translation for special purposes) remains limited largely to handbooks or how-tos on this type of translation, with only a smattering of critical articles exploring the inherent importance and extended impact of this type of translation *per se*, whether historically or in the modern context.

Citroën for example, notes that

“Many literary translators ... consider that technical translation has very little to do with language, ... and that it is comparable to threading beads on a string. ... [Yet] it is a fact that many persons giving an opinion on classes of translation other than those they practice themselves are not ... sufficiently acquainted with these other subjects to give a well-founded judgement, and tend rather to underestimate them, or at least to over-generalize. There are, of course, simple technical texts in which the choice of correct terminology is the main [though not exclusive!] concern of the translator, ... but a paper explaining a complicated development in scientific research ... will require a mastery of the language as great as that needed for the translation of the average good book. [As Gode puts it,] ‘But woe betide the man who forgets that technical literature is literature’”⁵².

Translation”.

⁵² I.J. Citroën, “The Myth of the Two Professions: Literary and Non-Literary Translation”. In: *Babel* XII (4), 1966:181-188.

To be fair, work on text typology, including Reiss' scholarship⁵³, has been important in calling attention to a wider range of translation types and their inherent worth. Nonetheless, and despite the global economic impact of specialized translation, these forms generally remain relegated to a secondary place in translation studies, behind the translation of literary texts, or what Berman calls *oeuvres*^{54, 55}. Ortega y Gasset ponders the "reason certain scientific books are easier to translate"⁵⁶; Vinay and Darbelnet speak of the "possibility of translating scientific texts by machine" as largely based on the existence of parallel passages in SL and TL texts, with a "lack of intellectual challenge"⁵⁷; Holmes describes how "the word and the word group are still the ranks at which much terminologically-oriented thinking about scientific and technological translation takes place"⁵⁸; and Berman speaks of the "great split that divides the entire field of translation, separating so-called 'literary' translations ... from 'non-literary' translation"⁵⁹. While the shortage of material actually devoted to scientific translation speaks to a gap in translation studies that remains to be filled, it does have the advantage of simplifying this section of the chapter.

In professional translation today, non-literary translation is typically paid at a higher rate per word in compensation for the perceived additional difficulties of terminology and subject matter. The form itself is considered less difficult, a nearly automated translation of content without concern for style, and thus non-literary translation remains relegated to second place behind what is perceived to be the nobler form of literary translation⁶⁰. In terms of prestige,

⁵³ Reiss 1976, 1988.

⁵⁴ Antoine Berman, *L'épreuve de l'étranger: culture et traduction dans l'Allemagne romantique*. Paris: Gallimard, 1984. Also, *La traduction et la lettre ou l'auberge du lointain*. Le Seuil, 1999 (First appeared in: *Les Tours de Babel, essais sur la traduction*, 1985).

⁵⁵ This is true even though the UNESCO *Index Translationum* reveals the majority of translation worldwide to be of a non-literary nature. See [www.unesco.org] for the latest (8th) edition, 2002.

⁵⁶ TSR (=Translation Studies Reader) 2001:50.

⁵⁷ TSR 2001:87.

⁵⁸ TSR 2001:179.

⁵⁹ TSR 2001:285.

⁶⁰ This monetary relationship is reminiscent of the historical admonition against earning a living by writing; even such authors as Dryden (and Behn, Portrait 1) were at points in their careers chastised by

the regard held today for translators of literary works (though they may be less visible than their historical counterparts) remains associated with the status of writer and the translation of what is considered a creative form. By contrast, translators of scientific works today hold no such name recognition factor or prestige.

In fact, it is often the case that scientific translation today is a secondary task assigned to working scientists, i.e. to *content* specialists⁶¹ over *language* specialists, though certain schools do train future professionals in both fields. This practice reinforces the impression that scientific translation favours content over form (even while translation itself continues to be considered by many a derivative, not creative, activity), and that the two need not (or perhaps cannot) be achieved harmoniously; yet, as Koller has written, information and communication are not mutually exclusive⁶².

On the whole, scientific translation is understood as a non-creative form, with therefore no allotted place for translator visibility in the *process* or in the *product*. Perhaps as specialized texts, including scientific texts, come to occupy a more prominent place of discussion within the discipline of translation studies, their perceived importance as part of the dissemination of ideas will rise, as will expectations for the final product, along, perhaps, with esteem for the translators who blend scientific and linguistic skill. Next, I address whether this relative invisibility was also a factor in the historical context.

peers for sullyng their profession with financial concerns. The nobler the form, the less acceptable was remuneration considered. In the case of scientific translation, the form is considered more pedestrian, though necessary, and is paid accordingly.

⁶¹ See also footnote 62, page 210 in Somerville portrait.

⁶² Koller, W. *Grundprobleme der Übersetzungstheorie*. Bern: Franke, 1972. Cited in Newmark 1981:9.

Historical corollary

It is difficult to speak of a “historical context” here in parallel to the modern hierarchization of scientific translation, because material does not seem to exist. However, we can draw conclusions from this lack. Essentially, the major translator-commentators of the period (e.g., Dryden, Pope, Tytler) are not known to have either translated scientific content or produced commentary on this translation form. Translation from the Greek and Latin classics was considered a standard part of education, and literary translation an esteemed activity, if secondary to authorship, but, judging from the lack of extant writing on the topic, scientific translation did not figure into the picture.

In contrast to Condillac (who at least argued that the best language, the language that is well constructed, is science) a number of historic figures, including du Bellay, simply saw non-literary texts as (inferior) and/but (therefore) translatable. In one example, Salama-Carr⁶³ notes that “this aspect of translation [i.e., the translation of scientific texts, was] not being affected by the literary debates [prior to 1600]. Montaigne, as well, “draws a distinction between aesthetic and informative texts and sees the latter as being less problematic for the translation”⁶⁴. Connections to the *science* communications network of the Scientific Revolution appears in the next chapter (Backdrop Two: Science and Society), so I limit my arguments in this section to the *lack of discourse* - in historical materials - on scientific *translation*.

Even though, at the beginning of the Scientific Revolution, scientific disciplines were not as demarcated as they would later become, and an overlap of knowledge existed between the humanities and the sciences, men of letters seem not to have delved into scientific content, perhaps for simple lack of time, perhaps placing it below the status of other more esteemed

⁶³ Salama Carr 2000:411.

⁶⁴ Salama Carr 2000:411.

classical texts, even though great scientific texts certainly existed among the classics (think of Hippocrates, Galen, Euclid, and Ptolemy⁶⁵).

Rather, those who translated science⁶⁶ tended to be those who moved within the fluid and overlapping intellectual and society circles where the growth of amateur science was being fostered. As scientific training and communication gradually became more formalized, translators typically came from areas closer to the centre of scientific circles, in the form of working scientists (see footnote 66, below, for examples). While this represents a partial parallel to translation activity being conducted by scientists today, the overlap between the letters and sciences and the formative discussion taking place about translation at the time meant these historical scientists were expected to demonstrate concern for both content and form, and that they would be recognized both for their presence within the translation, as well as in paratextual reference.

I propose that, in relative terms, such scientist-translators would have had less time for translation or translation commentary (which was not a direct outgrowth of their authorial process, as for literary authors) than for their own scientific research and writing, with the exception of occasional comments on theory (such as it was) and practice gleaned from their prefaces.

⁶⁵ Jean Delisle and Judith Woodsworth (eds.), *Translators through History*. Philadelphia /Amsterdam: John Benjamins, 1995:113.

⁶⁶ For example, all the major (English, French, German, Italian) scientists in the portraits translated foreign-language texts as part of their scholarly activity, and to keep abreast not only of historical precedents, but also of the latest developments in their fields. These scientist-translators included, for example, Newton, Fontenelle, Herschel, Babbage, Peacock, Young, Arago, von Humboldt, etc. Lest the reader form the impression that this overlap between the scientific backdrop and the translation activities of scientists in a given period is not representative of a larger behaviour, I refer specifically to the 18-volume *Dictionary of Scientific Biography*, whose thousands of entries include accounting for the writings of any given scientist, including their translations. Indeed, as explained in the General Introduction, this was one major initial source I turned to to establish a list of scientific translators in history from which the 5 women portrayed here were eventually selected.

These two points - that literary translators produced no body of commentary on scientific translation, and that scientific translation was conducted largely by scientists, for whom any extensive commentary must have been a secondary activity at best- leaves the modern researcher with the impression that scientific translation ranked low in the historical hierarchy, and was therefore relatively invisible compared to the great importance attached to literary forms. Even when certain scientific works in translation became quite popular⁶⁷ among learned and popular audiences alike, they remained unconnected to any body of critical commentary on translation or literature (despite the overlap between scientific and other intellectual circles) and thus outside the realm of great works⁶⁸.

In this section, the relative status of scientific translation and translators has been discussed. Their relative exclusion from the larger theoretical and practical discourse on translation, both historically and today, leaves scientific translators a less visible subset of translators on the whole.

For the period of the dissertation, nonetheless, the fluid boundaries of scientific and intellectual circles toward the scientific amateur did help create opportunities for women to translate specialized texts, provided they had the education and social status to enter these circles at all. Thus, while their numbers were considerably restricted by such factors as education and class⁶⁹, as well as gender, the particular circumstances of the scientific milieu offered some women a chance for visibility, both in the process and the product of translation.

⁶⁷ In terms of the portraits, examples include Fontenelle/Behn and Algarotti/Carter (for popular audiences), and Laplace/Somerville (for the academic audience; Somerville's work was chosen as a standard university textbook). For more, see the individual portraits.

⁶⁸ This connection to critical commentary is another of Berman's criteria for *oeuvres*.

⁶⁹ Of note, though the fact of being a woman may have worked to offset the status associated with authorship, women of a high enough class could find this position offset the disadvantage of gender. So, a woman of the middle or upper classes could hope for some authorial and/or translator status, particularly if she observed the mores regarding other womanly duties. Note also that public education in England was not granted women until the founding of Queen's College in 1848, at the very end of the timespan covered by this dissertation.

In fact, this contribution to the scientific literature was welcomed by a number of prominent scientists in part as a timesaver from their own research. This perception of woman as potential helpmeet⁷⁰ existed within the scientific world as elsewhere, and is one permutation, as we shall see, of the notion of translation as an acceptable activity for women. As Albertine Necker de Saussure herself put it⁷¹,

yet as we hear constant complaints from scientific men of the want of observations with regard to a great variety of facts, would it not be possible for them to have recourse to the active, assiduous, and willing assistants they might have in intelligent women.

In the next and final section of this chapter on translation and invisibility, I discuss how the general prestige of author-translators along with opportunities for scientific amateurs is connected with the status of women in both these fields.

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Section 3. Women and Invisibility in Translation

- Prelude

In the preceding two sections, I have questioned whether historical translators experienced an invisibility similar to that of modern translators, and to what extent scientific translators, as

⁷⁰ References include Abir-Am, Pnina G. and Dorinda Outram. *Uneasy Careers and Intimate Lives: Women in Science, 1789-1979*. Douglass series in women's lives and the meaning of gender. Rutgers U. Press, 1987. Marianne Gosztanyi Ainley. *Despite the Odds: Essays on Canadian women and Science*. Montréal : Véhicule Press, 1990. M. Alic, *Hypatia's Heritage: A History of Women in Science from Antiquity to the Late Nineteenth Century*. Boston: Beacon, 1986). "Female Doctors in Medicine," *British Medical Journal* 2 (July 5, 1862): 11-12. Paula Gould. "Two Good Women, or Too Good to Be True?". In: *Science Magazine* (AAAS) Volume 296, Number 5574, (7 Jun 2002), pp. 1805-1806. On-line. Roald Hoffmann. "Mme. Lavoisier". In: *American Scientist* (Marginalia). January-February 2002. On-line. Marilyn B. Ogilvie. *Women in Science*. Cambridge: MIT Press, 1986. Londa Schiebinger. *The Mind Has No Sex?: Women in the Origins of Modern Science*. Cambridge: Harvard U. Press, 1989. Ann B. Shteir. *Cultivating Women, Cultivating Science: Flora's Daughters and Botany in England 1760 to 1860*. Johns Hopkins U.Press, 1986.

⁷¹ *Progressive Education, Commencing with the Infant*, by Madame Necker de Saussure (Boston: William D. Ticknor, 1835). Volume 3, pp.353-4.

a subset, experienced added invisibility based on the subject matter in which they worked. From these sections, I draw a conclusion that forms a central point of connection to this third section, on women and invisibility in translation: translators *could be* visible, provided they were also, and primarily, authors (whether literary or scientific).

In other words, it was the *connection* of authorial and translation activities that seems to have conferred status - and visibility, and influence - on the act of translating, and on the person of the translator, and on the translated text. Thus, while authors such as Dryden and Pope were - and remain - known for their translations of the classics, as for their commentary on the act of translating, they were - and are - considered nonetheless primarily authors; translation was a secondary, if esteemed, activity ⁷².

This ranking was also true in scientific translation; one part of the creative process of scientific research was to seek out new ideas from a broad range of sources, including historical and contemporary works by fellow scientists in other countries. Any number of prominent [male] scientists therefore included translation among their activities⁷³. Again, nonetheless, these were secondary activities to their primary goals of scientific research and authorship.

This connection between the status of author and the prestige it conferred on translation activities also relates to the earlier discussion in Section 1 on the distinction (and link) between the translated text (more or less *fluency*) and the person of translator (more or less *invisibility*). The chain of visibility ran: from the primary visibility of the individual as author; to the visibility of the secondary activity, translation; and then to the visibility of the translated

⁷² For comments on how the overlap between author and translator was also reflected in a more fluid understanding of what exactly constituted translation, as opposed to, say, imitation, see Mary Helen McMurrin, "The Eighteenth-Century Novel: National or Transnational?". Unpublished manuscript, p.2. PDF available on-line at [<http://novel.stanford.edu/pdf/mcmurrin.pdf>].

⁷³ See footnote 51 ("To be sure..."), above.

text. Since the chain derived from the strength of the connection between an individual's primary and secondary activities (author, then translator), if the two activities became detached, the strength of the authorial presence could be lost, and the translator could become less visible⁷⁴.

In fact, over time, the two activities *have* become more distinct, with translator training eventually evolving today into a professional track of its own. In two parallels to the historical period in question, there came to be an increasing separation between letters and the sciences, where once these intellectual circles had shared greater overlap; and within the sciences, there came to be, as we shall see in Backdrop Two, an increasing professionalization of science, with a more rigid distinction between professional and amateur scientist⁷⁵. Together these distinctions had the effect of isolating the scientific translator from the original source of strength found in the status of the [literary] author, with less visibility for the independent scientific translator as a result. Until these changes gathered momentum, however, it was still possible for such translators to have some personal visibility and text-based influence; this will be seen in the portraits that follow.

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Yet the majority of the ideas proposed up to this point applies to *male* authors and translators, who were predominant for the period 1650-1850. Which brings us to the question: How does

⁷⁴ This assumes that the strength of the authorial presence is retained in that position, and relinquished by, rather than displaced to, the translator. Indeed, this idea of translator as *target text author* is one major feature of discussions in modern translation studies. Consider, for example, Reiss (Skopostheorie) in Baker's *Encyclopedia of Translation Studies*.

⁷⁵ Another modern offshoot of these separations is the distinction between what Orland calls the 'central core of scientific research' and popular science writing, a 'subsidiary scholar's activity'. Barbara Orland, 'The Chemistry of Everyday Life, Popular Chemical Writing in Germany 1780-1939' In: *Communicating Chemistry: A History of Textbooks in Europe between 1789 and 1930*. Bernadette Bensaude-Vincent, Anders Lundgren (eds.). Cambridge, 1999. PDF version available on-line.

all this relate to the presence of women in translation? If, historically, women were simply less present as *authors*⁷⁶, how could their activities as translators be visible?

Therein lies a distinction associated particularly with women and translation: in fact, because of the perception of this task as secondary, and, later, partly also in order to occupy a growing number of learned women in ways that would tend not to compete with men on the job market or in academia, translation was offered to women as a consolation prize of sorts. This secondary activity then came to be associated with women, and was labelled a feminine pursuit, and therefore less desirable than primary (or “creative” activities, which were considered male). As many authors in historical⁷⁷ and modern⁷⁸ translation studies have pointed out, the tropes of translation as female, weak, inferior, and unfaithful are common, if objectionable.

Still, women made of their opportunities what they could. Though social mores and educational as well as class restrictions meant that their numbers and body of work were smaller than that of men, women *did* hold a place in history as authors and translators.

As Agorni summarizes,

Eighteenth-century women’s writing activities have recently attracted a certain degree of critical interest, but attention has generally been focused on specific literary genres, such as autobiography, the novel, drama, and, more recently, poetry. Other genres, such as historical writing, reviewing, and above all translation have often been

⁷⁶ Through the influence of such fields as gender studies, a growing body of scholarship is also being produced on the existence and importance of female *authors* in history.

⁷⁷ In one well-known historical example, John Florio wrote in 1603 that, because translations are always defective, they must be female. Cited in Delisle/Woodworth 1995:149, and in Margaret Hannay, *Silent but for the Word: Tudor Women as Patrons, Translators, and Writers of Religious Works*. Kent, Ohio: Kent State U. Press 1985.

⁷⁸ Modern scholarship includes, for example, work by Suzanne de Lotbiniere-Harwood, Barbara Godard, Tina Krontiris, Suzanne Jill Levine, Sherry Simon, and Luise von Flotow.

neglected or given only marginal consideration. Yet translation represented one of the very few cultural activities open to women in the early modern period”⁷⁹.

Further, Robinson notes the ‘feminization’ of translation in sixteenth-century England⁸⁰, and Simon asks whether “translation condemned women to the margins of discourse or, on the contrary, rescued them from imposed silence”⁸¹.

Women who were determined to pursue a life of the mind had a number of possible routes; in the case of the five women portrayed here, I note the following possibilities: First, they could persevere - despite objections - to become writers anyway, then confer status on their translations through the same conventional route as men did. This could be done with disregard for the perception of women in anything other than religious writing as somehow indicative of sexual libertinism (see, for example, Aphra Behn, Portrait 1), or, by contrast, in respect of a chaste lifestyle expected of female writers in return for the “privilege” of condoned authorship (Elizabeth Carter, Portrait 2).

Second, they could pursue status as learned women directly within the more fluid scientific-intellectual circles before the professionalization of science excluded amateurs. Though this status within a scientific subset may have been considered less noble than a pursuit of letters, it had the advantage of not competing with the creative authorial presence in literature, and so was less of a threat. Through personal determination and liberal mentoring, women could rise to considerable visibility in these circles, even without being primarily

⁷⁹ Mirella Agorni, “The Voice of the ‘Translatress’: From Aphra Behn to Elizabeth Carter. In: Yearbook of English Studies (28) 1998, 181-195. Both Behn and Carter are portrayed in this dissertation, but as *scientific* translators. More recently, Agorni has published on British Women, Translation and Travel Writing (1739-1737), including a section on Carter’s translation of Algarotti. *Translating Italy for the Eighteenth Century*. St. Jerome, 2002.

⁸⁰ Douglas Robinson, ‘Theorizing Translation in a Woman’s Voice: Subverting the Rhetoric of Patronage, Courtly Love and Morality’. In: *The Translator* (1) 1995, 153-175, p.153.

⁸¹ Sherry Simon, *Gender in Translation: Cultural Identity and the Politics of Transmission*. London: Routledge, 1996, p.46.

authors, not to mention literary authors. This status, too, could then be conferred on their translations. Such is the case of Mary Somerville (Portrait 3), who rose to great fame as the “Queen of 19th Century Science” largely in connection with her translation and exposition of a French scientific text. Ada Lovelace (Portrait 4) is another example of visibility and influence attained through interaction in scientific circles, then translation and exposition.

Third, and finally, a woman could find ways to exert influence even without authorship and while her person remained nearly invisible. Such is the case of the final translator, Elizabeth Sabine (#5) whose numerous translations of major German and French scientific texts were a widely read and respected contribution to scientific writing in England, even though she herself today remains absent nearly entirely from the historical record. Rather, the translations, and her lifetime of work as scientific partner to her husband, are made visible through her husband’s high standing in English science of the day. In this type of shift, the translator and her translations derive strength not from the woman’s own position as author first, translator second, but rather from a combination of the *source text* author and from a visible male relative or mentor – a surrogate translator, if you will - in the scientific milieu.

To conclude, I return to the following questions: considering the hierarchy of writer over translator; literary translator over scientific translator, and man over woman, were female translators of scientific materials at a particular disadvantage? And, if so, then what can we make of the achievements of the five women portrayed in the dissertation?

Simply put, although - taken alone - scientific translation was a less present form than literary translation or translation commentary, and although - taken alone - women were less visible than men, the combination of these two potential disadvantages seems to have been greater than the sum of the parts. In other words, within the vibrant and fluid circles of the new science that developed in the long wake of the Scientific Revolution, a woman’s personal

determination to challenge expectations by engaging in scientific and intellectual discourse could find hold. As the portraits will demonstrate, translation was one form this positive interaction could take.

In the next chapter, Backdrop Two, I take a closer look at some of the specific features of the changing scientific world that converged to offer women potential opportunities to make a name as translators.

Backdrop Two: Science and Society

Introduction

This is the second of two preliminary chapters in the dissertation. In the preceding chapter I offered a tripartite explanation for the relative paucity and invisibility of female translators of scientific materials (in Europe, for the period 1650-1850). Despite this initial argument, I was nonetheless able to recover nearly twenty such translators (see Portraits and Appendix), many of whom translated works of considerable scientific importance.

This discrepancy between the anticipated and the actual findings suggested to me that certain factors were at work in the period that enabled these translators increasingly to make a mark, both in their day, and again today through modern scholarship in the history of science and in the history of translation. In this second chapter I propose a number of scientific and societal factors that were favourable to visibility and influence, both of the *person* of the translator and the translated *text* - a distinction made in Backdrop One.

This chapter is organized into two main sections (*The Science behind the Portraits* and *The Society behind the Portraits*) and runs generally along the chronological order of the subsequent five portraits. The purpose of the chapter is to address an anticipated need among translation readers for information on the scientific backdrop to the period covered in the portraits (1650 – 1850). To do so, I offer a sense of the change in scientific topics, and in outlets for the communication of scientific information. Clearly, both issues – content and dissemination, hold importance in linking the portraits to one another as to their times.

It is not my intent to explain the underlying science (nor the societal frameworks) in fundamentally new ways; any number of illustrious historians already exist as authorities on

such matters. Rather, it is my purpose to point out how the **convergence** of certain fortunate factors seems to have offered openings to female translators of science when many other odds were simultaneously stacked against them. In the main, examples of these 'fortunate factors' include the rather open atmosphere of English amateur science to enthusiasts (including women) and the need for more formal, public communications networks to communicate new science in any number of fields in the wake of the Scientific Revolution; additional factors include the growth of the periodicals industry in London, an increased use of vernaculars in scientific communication, the growth of a middle-class readership, salon culture, and the market for scientific fads. First, though, I turn to an overview of the fundamental scientific change that underlies the time period of the dissertation: the Scientific Revolution.

Throughout the chapter I ask the reader to bear in mind a number of important structural points on revolution in science raised by historiographer I. Bernard Cohen¹; I begin immediately with these points, which locate the events of this chapter as well as the events of each portrait within a timeline of scientific thought and policy.

First, Cohen notes that any scientific revolution is marked by **intellectual** and by **institutional** change; the institutional points are considered later below. On an **intellectual** level, these changes can be seen to progress in four phases, as here²:

¹ The reader will note that I refer almost exclusively to Cohen's interpretations of the history of science. This is not to suggest that his ideas either stand alone or without opposition; rather, Cohen is widely recognized as "one of the most influential figures in the rise of the history of science as a scholarly discipline" (Everett Mendelsohn, ed., *Transformation and Tradition in the Sciences: Essays in Honour of I. Bernard Cohen*. Cambridge U. Press 1985). His structuring of scientific history, as I summarize it here, offers the non-scientist reader a necessary overview of the defining events of the period of the dissertation (1650-1850), with an eye to one purpose of the dissertation: to assert the importance of the translators portrayed, with reference to the importance of the source texts and the revolutionary ideas they contained for eventual dissemination through translation.

² As Cohen explains it, "In the course of studying a large number of revolutions, I have found four major and clearly distinguishable and successive stages in all revolutions in science" (*Revolution in Science* 1985:28-31).

Cohen's Four Stages of any Revolution in Science

- Stage 1** Intellectual Revolution/Revolution-in-Itself = when a scientist first devises a radical solution to some major problem; this is a "private" intellectual event, generated from the mind of the scientist.
- Stage 2** Revolution of Commitment = when the new findings are recorded or written up, as a show of the originating scientist's commitment to the new method, concept, or theory; this, too, is a "private" event.
- Stage 3** Revolution on Paper = when the idea is entered into general circulation among scientific colleagues for scrutiny. This marks the shift from "private" to "public" event. Without this phase, no revolution can be said to have occurred, since a successful revolution "influences other scientists and affects the future course of science".
- Stage 4** Revolution in Science = when a sufficient number of other scientists become convinced of the theories and findings, and themselves begin to do the science in the revolutionary new way.

Second, Cohen asserts that there has been not one ("the" Scientific Revolution) but rather a number of (generally agreed) scientific revolutions ³:

General Chronology of Major Scientific Revolutions

16th/17th centuries: Math/Physics = Copernicus/Newton

Known as **The** Scientific Revolution, this first revolution encompassed a range of revolutionary achievements in pure mathematics and rational mechanics (physics) sparked by Copernicus in 1543 (*De Revolutionibus*) and is represented at its high point by Newton's *Principia* in 1687. **The** Scientific Revolution established experiment and observation as the basis of our knowledge of nature and set forth the goal of mathematics as the key to science and the highest form of its expression.

18th century: Chemistry = Lavoisier

Lavoisier is considered the father of the chemical revolution of 1789 (*Traité élémentaire de chimie*), which includes a theory of oxygen, the modern concepts of element, compound, and mixture, a table of elements, and an entirely new nomenclature.

³ For this general chronology, Cohen cites (Revolution in Science 1985:403) as his inspiration another seminal figure in the historiography of science, Thomas Kuhn; the chronology is further supported by other major writers in the field, including Roger Hahn and Steven G. Brush.

19th century: Biology = Darwin

The Origin of the Species appeared in 1859, transforming the way we understand human development, namely as a result of natural selection, and counter to a literal interpretation of Scripture. The very idea of evolution, of dynamic systems, would come to permeate many other areas of human understanding. Darwin's is the biological revolution.

20th century:⁴ Physics = Einstein

In the very simplest of terms, Einstein's 1905/1907 works (*Special theory of relativity*; *General theory of relativity*) proposed a radically new theory of light (and, therefore, all forms of electromagnetic radiation), ushering in a modern revolution in physics (relativity and quantum mechanics) that proposed new concepts of mass, space, and time, and leading to the famous equation $E = mc^2$.

In a third and final point, Cohen notes a sequence of change at the **institutional** level during and resulting from "the" Scientific Revolution; taken together with points one and two this sequence helps define the environment within which the five female translators received and produced their texts:

General Chronology of Institutional Changes

Institutional Change 1 (1650s)

- The emergence of a scientific community and a formal information network to advance, record, and disseminate knowledge.

This was embodied in the creation of the first-generation academies (The Royal Society, and the Académie des Sciences, as well as the Berlin, Stockholm, and St. Petersburg societies).

Institutional Change 2 (by early 1800s)

- An explosion in the number of scientists and science supporters. To accommodate them, a marked increase in provincial academies and journals. The beginning of specialized groups and publications, such as for geology. Talks and debates for the general public as well.

Institutional Change 3 (late 1800s/early 1900s)

- Universities become centres for research and graduate training on large scale. Self-trained amateurs replaced by trained academics. Flowering of specialized groups and publications.

⁴ Though it falls after the end of the dissertation texts, this last development is included for the sake of continuity.

Enlarged government presence in science as bureaus and institutes.
Rise of industrial labs (and multi-institutional cooperation) for applied science; especially the dye industry in Germany, late 1800s.

[Institutional Change 4 (post WWII)]⁵

- Large government expenditures for research; “big science”.
Therefore, new gov’t agencies to organize, evaluate, distribute funds.
Research in groups.
An increasingly sophisticated - and rapid - communications network⁶.

With these general trends for the period of the dissertation (1650-1850), the reader is now better prepared to contextualize the two main sections of this chapter, *The Science behind the Portraits* and *The Society behind the Portraits*. In a parallel to Cohen’s divisions, the first section explains the central scientific-intellectual changes relevant to the portraits, while the second section looks at the broader, socially-mediated factors.

Section 1. The Science behind the Portraits

**Portraits 1, 2, and 3: Setting the Stage for Newtonism -
 Scientific Method and Heliocentric cosmology**

Ultimately, all of the source texts treated in the dissertation arise from the impetus of the Scientific Revolution. While Portraits 4 and 5 (Lovelace and Sabine) reflect later effects of the Scientific Revolution (such as England’s shift into an Industrial Revolution and Germany’s growing influence in the sciences), the first three portraits (Behn, Carter, and Somerville) deal directly with the influence of Isaac Newton, as repatriated into England through the filter of other (in this case, French and Italian) scientists. In thus helping the progress of Newtonism, the texts in these portraits result from the combined effects of two earlier, fundamental

⁵ Again, though it falls after the end of the dissertation texts, this last development is included for the sake of continuity.

⁶ Notice how the importance of a communications network comes full circle, if you will, from the impetus seen in Institutional Change 1; dissemination, and therefore translation, remains an essential feature of the scientific process.

intellectual changes: the epistemological change toward a “scientific method”; and the cosmological change toward a heliocentric universe ⁷. Let’s look briefly at these major changes.

Change 1: The Scientific Method - Descartes and Bacon

In Cohen’s description of the stages of scientific revolution, the beginning is set with a new way of thinking, a challenge to established notions. In the time leading up to the Scientific Revolution and the first portrait text, Fontenelle’s *Entretiens*, came a major shift in thinking toward the importance of reason and, soon, experiment, in science. The major intellectual impulses behind the development of this new, scientific method were, in France, René Descartes (1596-1650) and in England, Francis Bacon ⁸ (1561-1626).

Descartes set this new process in motion by drawing attention to the problem of *how* we know, i.e., to epistemology. Dissatisfied with the unsystematic methods utilized by the previous authorities in science, and noted for his great accomplishments in the areas of algebra and geometry, he decided to conduct a personal plan of investigation, placing even himself under suspicion of “deception of the senses”. Departing from the famous dictum “*cogito, ergo sum*,” Descartes formulated a *deductive* (or *top-down*) method based on the following rules: (1) accept as “truth” only clear, distinct ideas that can not be doubted, (2) break a problem down into parts, (3) deduce one conclusion from another, and (4) conduct a systematic synthesis of all things. This first, important, step enabled scientists to take known or observed phenomena and explain them in a more objective and systematic way.

⁷ In terms of Cohen’s stages, these two changes relate directly to the intellectual act of generating radical scientific content, i.e., the “Revolution-in-Itself”, Stage 1.

⁸ As Bredvold and Whitehead explain, it would be false to describe the intellectual impulse of the new science as mainly Baconian in nature, for Bacon had entirely ignored *mathematics*, and thereby completely missed the tonality which lay behind the success of seventeenth-century science. See Bredvold 1966:50.

Meanwhile, in England, Bacon⁹ was working on a further refinement of this idea. If today the true measure of scientific validity is not only to *explain* previous work in a field, but also to *expand* upon it, and, most importantly, to correctly *predict* future events, a shift was needed from Descartes' deductive approach, which provided the essential mathematical beginnings, to Bacon's *inductive* (or *bottom-up*) method of analysis, as expressed in his *Organum novum*, or *New Organon*, of 1620. It was Bacon's passionate insistence that true science progresses through awareness and observation "in a just scale of ascent, and by successive steps ***not interrupted or broken***, from particulars to lesser axioms; and then to middle axioms, one above the other; and last of all to the most general". The standards set by these men remain today our scientific method of reasoning. The climate produced by these changing demands on science would feature in Fontenelle's 1686 *Entretiens* as an insistence on a logical progression of ideas, as the narrator explains the new heliocentric cosmology to his pupil, the Marquise.

Change 2: Heliocentric Cosmology - Copernicus to Newton

In the time leading up to the first portrait text (Behn's 1688 translation of Fontenelle - *Conversations*), much interest in cosmology characterized Europe in the 1680s. On a concrete level, this interest was fed by a number of unusual events in astronomy, including the appearance of comets in 1665 and 1680 (Halley's); unusual sunspot activity in 1676, 1684, and 1686; an eclipse of the sun in 1684, and the discovery of two new satellites of Saturn. The nature of comets would continue to be widely discussed, and Fontenelle himself

⁹ Though Bacon spoke little of mathematics, as his area of expertise was law, Nordgren speculates that the empirical observations Bacon emphasized for science may parallel the kind of "eye witness" evidence he required when building a case in a court of law. Tim Nordgren (17 May 1998) [<http://www.jps.net/tnordg/dscrtbacn.htm>]

published a 1681 comedy *La Comète*, traces of which - according to Shackleton ¹⁰ - can be seen in the *Entretiens*.

Yet underlying these visible phenomena was the true spark: the “new”, heliocentric cosmology, which has been suggested in the preceding but not yet specifically touched upon. In order to help the reader appreciate the importance of the source texts in Portraits 1,2, and 3, and their translations as a dissemination of the scientific knowledge therein, I offer here a brief overview of this major scientific change, which occurred not overnight, but ultimately over the span of an extended transition period¹¹ as scientists and opposing authorities grappled with the mathematical difficulties involved and their larger implications. The major figures, in order of birth, run from **Copernicus** (1473-1543) to **Brahe** (1546-1601) to **Galileo** (1564-1642) to **Kepler** (1571-1630), and, finally, to **Newton** (1642-1727) ¹².

Though certain ancients, notably the Pythagoreans, rightly suspected that our universe did not center around the Earth, it was nonetheless the geocentric model that clearly dominated, from namesakes Aristotle and Ptolemy through the 1600s. Adding considerable weight to this

¹⁰ Shackleton 1955:7.

¹¹ As Cohen explains, “...the real impact of Copernican astronomy did not even begin to occur until some half to three-quarters of a century after the publication of Copernicus’ treatise, when in the early seventeenth century considerations of the physics of a moving earth posed problems in the science of motion. These problems were not solved until a radical new inertial physics arose that was in no way Copernican but rather was associated with Galileo, Descartes, Kepler, Gassendi, and Newton. During the seventeenth century, furthermore, the Copernican astronomical system became completely outmoded and was replaced by the Keplerian system. In short, the idea that a *Copernican* revolution in science occurred ... is an invention of later historians” Cohen, *Revolution In Science* 1985:106, emphasis mine.

¹² This progressive, cumulative effect is stressed by Herbert Butterfield, another seminal figure in the history of science. Butterfield (*The Origins of Modern Science*, 1949) saw the Scientific Revolution as equated with “the whole development of modern science from the days of Copernicus, or of Galileo and Kepler;...he implie[d] that the Scientific Revolution was not merely a single series of historical events at the time of Galileo, [but rather] a continuing historical or history-making force acting right up to the present time” (in Cohen *Revolution In Science* 1985:398).

view was the Church, which found that this highly structured, stylized, and hierarchical representation fit conveniently with the Old Testament story of the creation ¹³.

The first serious challenge to this view was posited by Copernicus in 1543, but was very slow to catch on, hardly surprising in light of the extreme punishments meted out by authorities for such deviance. Even with support from Galileo and his telescopic observations 70 years later in 1610, adherence to the Copernican model was punished severely; in a notorious example, Galileo was censured by the Holy Office, imprisoned, and forced into retraction upon threat of death ¹⁴.

It would take the definitive blow dealt by Sir Isaac Newton's influence to break free of the geocentric clutch. Until that time, however, geocentric and heliocentric proponents tended to exist side-by-side in a changing situation that gave rise to various "compromise theories" between old and new, such as that of Tycho Brahe ¹⁵.

¹³ For implications, see Cohen *Revolution In Science* 1985:79.

¹⁴ It was not until 1822 that the Holy Office permitted the publication of works that explained the Earth's motion, and until 1835 that Copernicus was removed from the Index of prohibited texts (*Index Librorum Prohibitorum*)! As for the Index itself, in 1559, the first Index Auctorem Et Librorum Prohibitorum (or Pauline Index) was published under the direction of Pope Paul IV as a guide to censors in their decisions of what texts to authorize for printing. Without this authorization, printers were not allowed to publish a book. Copernicus and Galileo were among the first listed. Various incarnations of the Index were published until 1948, with various authors and artists tortured, burned, hanged, beheaded, etc. for their ideas. In 1966 the Index was completely discontinued as a list of works forbidden to Catholics. In another instance of how censorship affects texts, Agorni has proposed that "The extraordinary success of *Il Newtonianismo* [see Carter – Portrait 2] in Italy as well as in several other European countries may be partly due to its inclusion in the *Index*" (Agorni 2000:74).

¹⁵ Tycho Brahe (1546-1601, Danish nobleman-astronomer). With the financial might of King Frederick II, Brahe constructed an observatory on the island of Hveen, about 32 km northeast of Copenhagen, in 1582. Brahe never fully accepted the Copernican theory of the universe - most important to him, a moving Earth was contrary to scriptural belief. Thus, he sought a (complex) compromise by combining it with the old Ptolemaic system: The planets orbited the Sun; the Sun and Moon, in turn, orbited a fixed Earth. It was a mathematical nightmare. Although Brahe's theory of planetary motion was flawed, his great contribution in science came not from his ideas but from the persistence, consistency, and accuracy with which he recorded the position of the planet Mars. [<http://www.connect.net/ron/brahe.html>] (Dr. Neb Duric). [http://129.24.193.206/Kepler/tycho_brahe.htm] (William L. Drennon).

Despite protracted resistance, the Copernican system continued to gain momentum, acquiring additional support from Kepler. While **Copernicus** had put forth the new heliocentric idea, and **Brahe** next had sought to reconcile it with the old system, and **Galileo** then forged ahead to provide telescopic confirmation of the new system, **Kepler** (who was Brahe's assistant from 1600 until Brahe's death in 1601) now used Brahe's data to help lend additional mathematical support, especially through his famous three laws of planetary motion.

Finally, in France, Descartes (who had already contributed the deductive approach to the scientific method) also was working to extend his philosophical ideas to the cosmological debate. Among the major conundra of the new system was how to explain the influence of celestial bodies on one another over great distances. Descartes lent his contribution to the astrophysical, or applied mathematical, component of the puzzle, arguing the inefficiency of the Ptolemaic system, and proposing a new theory of astrophysics that explained the heavens not as vacua, but as liquids, liquids forever rotating, carrying with them as they do all celestial matter. This is his theory¹⁶ of vortices, or *tourbillons*, which is a fundamental feature in the *Entretiens* (the source text in Portrait One –Behn). As Shackleton explains (1955:5):

Descartes' theory of vortices was "free from the occult if not free from hypothesis, and eminently compatible with the theory of extension in Descartes' metaphysics [...] It was widely spread [...] and, until the acceptance of the theories of Newton, it constituted the generally accredited basis in physics for the Copernican system of astronomy".

The essential work of all these scientists culminated in Newton's mathematical synthesis and proof. Though Newton (1642-1727) had long studied these problems and written on them, it

¹⁶ Oddly enough, even in the undeniable presence of Newton's discoveries, Fontenelle reverted to a defence of Cartesian vortices toward the end of his life. This is just one measure of how long the process was, even in well-educated circles, to finally make the shift to Newtonism, however compelling his mathematics were, and remain.

was not until after several years that he actually *published* and *disseminated* his solutions, including the masterpiece *Principia*, which left no scientific doubt as to the truth of a heliocentric universe. Today it remains considered by many the single most important scientific work ever published¹⁷.

Still, Newton's accomplishments were not limited to the *Principia*; his legacy also includes studies on the nature of light and colour, and the co-founding of the calculus. These discoveries feature in Portrait 2 (Carter's translation of Algarotti) and Portrait 3 (Somerville's translation of Laplace) and are treated here next.

Newton Continued: Optics

The second portrait, on Elizabeth Carter, relates to her translation of Algarotti's // *Newtonianismo per le Dame*. In its plot and dialogue form it acknowledges a direct debt to Fontenelle's previous *Conversations*; in register, too, it discusses Newton in lay terms. In this text, though, the content focus is on Newton's *Opticks* [sic], which was published in 1704¹⁸.

To be sure, Newton was neither the first nor the last to propose a theory of light and colour. Newton himself acknowledged a great debt in the development of his ideas to Descartes, for example, and his own successors - scientists and artists as well - would go on to disprove certain of his fundamental claims, especially with the introduction of a trichromatic theory of

¹⁷ A massive and complex work, Newton's *Principia* itself required continued explication by mathematicians well into the next century; it is hardly surprising that the first three of five portraits (Behn, Carter, Somerville), which span 150 years, are directly related to Newtonism.

¹⁸ At Newton's personal request, a translation from English into Latin was then made in 1706. Note that the *vernacular* was being used at this date (and earlier still), and by such major scientists as Newton for major works, with undoubted influence on the writing choices made by fellow scientists, as well as with undoubted influence on availability of scientific ideas to the general audience. It has been suggested that one factor in this switch from Latin to English as a scientific *lingua franca* was a gesture, whether deliberate or initially rather more subconscious, to assert the distinction between science and the Church, where Latin continued to reign as official language well into the 20th century.

colour in the mid-nineteenth century, which development went hand in hand with Impressionist practice¹⁹.

Nonetheless, Newton's research was groundbreaking and influential on three major points. First, many before him had struggled to explain the relationship between light and colour, and between light and solid bodies. Where previous explanations had been more philosophical in nature, by the 1600s, the growing use of mathematic explanations led scientists to propose a direct relationship between light and colour, and to propose theories on what exactly constitutes light. Based on experiments he conducted at Cambridge in 1666, Newton came to propose that light is itself a heterogeneous mixture of rays, and that the degree of refrangibility corresponds directly to its colour. In other words, Newton's 1666 experiments²⁰ now suggested both that light could be decomposed into several colours, and - in a subtly different and much bolder argument - that different colours of light, when combined, could create another colour of light. Thus, white light was to be viewed as a *compound*, or mixed colour, however counterintuitive²¹.

Second, in applied science, Newton's optical experiments led him away from a focus on lenses to a focus on reflectors as a means to perfect telescopes, a realization that was to influence optical instrumentation and the many future discoveries made through it.

¹⁹ Douglas Allchin, "Newton's Colours". Ships Resource Center for Sociology, History, and Philosophy in Science Teaching. Available on-line at [\[http://www1.umn.edu/ships/updates/newton1.htm\]](http://www1.umn.edu/ships/updates/newton1.htm).

²⁰ As Allchin explains, Newton pinned much of his light and colour arguments on one particular experiment - his 44th - that he selected from a series of trials he made in 1666 while still a student at Cambridge. There is no evidence from his notebooks, however, that Newton saw this trial as crucial when he first performed it.

²¹ This notion, together with the separation of the chromatic scale from the black and white, was further pursued in such works as (German) Helmholtz's 1852 work on the additive and subtractive mixing of colours ("On the theory of compound colours". In: *Philosophical Magazine*, Serial 4, 4, 519-535). Note the long-term effects of Newton's 17th-century experiments, and the German authorship characteristic of this country's growing dominance in 19th century, as signalled also in the Sabine portrait.

The third major point made in *Opticks* was to provide mathematical support for the “corporeal hypothesis” of light. Until Heisenberg and Einstein reached a unified theory of light in the 20th century, arguments had long existed for either a wave theory or a corporeal (or particulate) theory of light. Though ultimately both camps can be said to have been right - in part, at least - it was in the end Newton’s arguments that became persuasive because they were able to explain certain additional, related problems, such as periodicity, and how wavelength relates to colour. Thus, while his detractors were such respected men as Hooke and Huygens, who argued for a wave theory of light, Newton’s *corporeal* theory held great influence in optics, both in scientific and in popular circles.

In scientific circles, the most important feature of the *Opticks* was seen to be the concluding set of 16 queries “in order to [*sic*] a further search be made by others”. In popular circles, his work was welcomed both for its scientific novelty and its affinity with music and painting, sister arts that were used to understand colour²². This mimesis is reminiscent of the historic association between translation and such sister arts as painting (as explored, for example, in Steiner).

Finally, the *Opticks* was written in a more engaging style than Newton’s masterpiece, the *Principia*, making it one of the most widely read works for scientists in the eighteenth century, and certainly the most influential in the field of optics²³. Amid the general public, this more accessible style was then easily adapted in popularizations such as Algarotti’s //

²² By the time of the *Opticks* in 1704, these thoughts had led Newton to the now-familiar ROYGBIV (red-orange-yellow-blue-green-violet) chromatic scale of colours, which he adjusted during development from five principal colours to seven (adding the “half-steps” orange and indigo) in imitation of the seven steps of the musical scale, thus arriving at a depiction of light and colour as both expressing harmonies. In painting, Renaissance artists searched for the primary colours, from which all others could be made; they would not be discovered until the early 17th century (see Pierre Paul Rubens’ 1611 *Juno and Argus*). After Newton, work would continue on the composition of white light and on the separation of the chromatic scale from black and white (Helmholtz, 1852; see also preceding footnote 21 above).

²³ Modern reprints and editions also remain in circulation.

*Newtonianismo per le Dame*²⁴, and Carter's translation thereof (*Newtonism explain'd for the use of ladies...*). Combining an appealing subject matter (light and colour, with their affinity with art and music, were all topics for polite conversation) with a growing middle class audience for popular science²⁵, and steering clear of the controversies of religion and science that arose from celestial mechanics, *Opticks* and its translations were sure to be successful.

Newton Continued: The Calculus Controversy of Newton and Leibniz

The third of the portraits to stem from Newton's work is on Somerville and her translation of Laplace's *Mécanique céleste*. As the title suggests, the source text draws on Newton's celestial mechanics (or physics of motion in the universe), also a feature of the first portrait. It is one measure of Newton's influence that in the intervening 150 years, the vast implications of his work had continued to be explored; this exploration included not only Newton's contributions to mechanics, but also his role as the co-founder (with German Leibniz) of the calculus, which sparked a great international controversy.

²⁴ *Il Newtonianismo per le dame ovvero dialoghi sopra la luce e i colori*. Naples: s.n., 1737.

²⁵ The growth of a middle-class readership is also treated later in this Backdrop, under The Society behind the Portraits. That this growing readership included a considerable number of periodicals for and by women, and that their translations were perhaps thus particularly suited to a female readership need in no way temper our sense of the achievement of such (female) translators as Aphra Behn and Elizabeth Carter. For the facts remain that they were translating source texts that held importance, and they formed part of a communications network for scientific information that responded to these source texts by welcoming any number of translations. In the example of Carter (and her source text author Algarotti) for instance, Wechsler et al. recall that "The young Venetian's immediate acceptance into the best circles of the capitals of Europe assured him the acquaintance of the most brilliant men of the day and the most advanced ideas. Algarotti was already planning a popularization of Newton in a series of dialogues similar to Fontenelle's *Entretiens sur la pluralité des mondes*, when he was invited to Cirey by Voltaire, who was himself planning a like work (394). He returned to Venice in 1736 after nearly two years in Paris and London, where the general approbation of his dialogues induced him to ready the manuscript for publication. ... *Il Newtonianismo* became the first successful popularization of Newtonian optics, and its influence is attested by the publication of ten Italian, five English, four French, three Dutch, and individual German and Swedish editions between 1738 and 1832". Lilla Wechsler, Christopher Hoolihan, Mark F. Weimer. *The Bernard Becker Collection in Ophthalmology: An Annotated Catalog* (Third Edition).

Web version: Simon Igielnik. On-line at <http://becker.wustl.edu/ARB/Becker/>

Specifically, English and Continental mathematicians argued over which man, Newton or Leibniz, had actually discovered the calculus. Though Newton (1642-1727) did compose several accounts of his infinitesimal²⁶ calculus from 1666 onward, these writings, like his writings on gravity and colours, were long held back from publication by the deeply suspicious Newton, with certain key pieces even first appearing only posthumously. In addition, when, in 1687, his *Principia* “brought for the first time to the general public indications of his methods in infinitesimal calculus, ... these were not enough to show the scope and power of his mathematical discoveries”²⁷.

Leibniz (1646-1716), meanwhile, had discovered the calculus in 1675 (so, later than Newton), elaborated his ideas over the next few years, and published in 1684-1686 (so, earlier than Newton). As Grattan and Guinness summarize²⁸:

...[All] this caused a nasty quarrel over priority, in which feelings of personal pride combined with insufficient insight in the mathematics involved (at least in the case of the lesser participants in the debate). ... The net result of [patient historical research in the present century] is that Leibniz **found** his calculus later than Newton and independently of him, [but] that he **published** it earlier.

The English, wounded because they believed that Continental mathematicians were rejecting Newton's primacy, turned away from Continental developments in mathematics and thus fell behind in several areas, including mathematical notation. Of fundamental importance in communicating mathematical thought across boundaries of *conception* more than of language, the elegant mathematical notation of Leibniz for the calculus, deemed superior to Newton's and still used today, spread outside England and placed the country at a distinct

²⁶ The very essence of the calculus is its examination of infinitely small quantities; hence 'infinitesimal' calculus.

²⁷ Grattan-Guinness 2000:50.

²⁸ Grattan-Guinness 2000:50-51, emphasis mine.

disadvantage until at least the early 1700s when the controversy began to fade, and English mathematics could begin to come abreast of progress made in the interim on the Continent. Ultimately, this separation of the two camps meant that most English maths would follow a rather different, applied, path until as late as the 1840s.

Still, Newton's ideas were not without support on the Continent, which received his calculus disseminated in two waves. The first wave²⁹ undertook an initial approach to understanding the radical new calculations contained in Newton's and Leibniz's work, stimulating their own independent work as well. By the second wave, beginning in the early 1700s, calls were heard to explore the actual foundations of calculus, rather than consider it just a tool. This second wave included the "great three" explicators of Newton from France, Lagrange, Laplace, and Legendre³⁰. It is Laplace's massive interpretation of and expansion on Newton, the *Mécanique céleste*, and its translation by Somerville (the "Queen of 19th-century Science") that feature in Portrait 4.

By way of transition to the final two portraits, away from a direct reading of Newton and into the later effects of the Scientific Revolution, I introduce here Charles Babbage. Among the most vocal English proponents for keeping pace with French - and Continental - developments in math, English scientist Babbage worked to counter a seemingly imminent decline of British science in the face of French advances. Babbage's 1830 essay "Reflections on the Decline of Science in England and on Some of its Causes" urged adoption of new French methods in mathematical analysis, as well as the

innovative use of scientific theory and findings (as in [Babbage's] calculating engine), increased state support and recognition of the scientific enterprise, reforms in the

²⁹ Including such renowned mathematicians as the Bernouilli brothers, l'Hôpital, and Euler.

³⁰ Simons 1939:45.

functions and management of scientific bodies, and, above all, professionalization of science”³¹.

As explained in Patterson’s Somerville biography, “in some quarters, [Babbage] succeeded in gaining at least limited support, in others he met with indifference”³². Ultimately, though, he was the “scientific gadfly” who “successfully needled his contemporaries into general agreement”³³.

With like-minded scientists such as Herschel and Peacock in the Analytical Society, Babbage fought, against considerable opposition, “ ‘to put English mathematicians on an equal basis with their Continental rivals and actually had a profound effect on the future development of English mathematics”³⁴. Indeed, Babbage is the link between Portraits 3 (Babbage-Lovelace) and 4 (Laplace-Somerville), as we see next.

Portrait 4: The Industrial Revolution and Babbage’s Engines

By the time of Portrait 4, on Ada Lovelace (1815-1852), the initial effects of the Scientific Revolution were being felt in England as the Industrial Revolution, as part of which the pure sciences of math and physics were leading to applied advances in industry and commerce. Though scholars resist the use of the word “revolution”, because it is inconsistent with the “slow gradual process of economic evolution”³⁵, the term Industrial Revolution “has long been used to identify the period roughly from 1750 to 1825” during which “mechanical principles, including steam power” were applied “to manufacturing in Great Britain”³⁶.

³¹ Elizabeth Chambers Patterson, *Mary Somerville and the cultivation of science, 1815-1840*. The Hague/Boston: Nijhoff, 1983, p.55.

³² Patterson 1983.

³³ Morrison and Morrison, *Charles Babbage and his Calculating Engines*. 1961: xxxi.

³⁴ Morrison and Morrison 1961: xii.

³⁵ Birnie in *Encyclopedia of Social Sciences* 1932. Entry “Industrialization” (in Cohen 1985:263).

³⁶ Encyclopedia of the Social Sciences, 1943/1968. Entry “Industrialization” (in Cohen 1985:263).

These advances include (strictly speaking) the introduction of the steam engine and the weaving machine, but it must be understood that these changes also brought permanent demographic, agricultural, and economic effects ³⁷. As Landes summarizes, this Industrial Revolution denotes “the first historical instance of the breakthrough from an agrarian, handicraft economy to one dominated by industry and machine manufacture” ³⁸.

At least as controversial as his calls in support of revamping English science (see more in *The Society behind the Portraits*, next section) were the curious *machines* being invented by Charles Babbage; arriving as they did around 1830, Babbage’s inventions fit firmly within this scene of mechanization.

Though it is essential to bear in mind that Babbage was to have a profound and lasting effect on many other areas of applied mathematics, it was *this* idea, of designing and constructing a calculating machine, that would preoccupy his energies for the last 40 years of his life.

The desire for such a machine was not new ³⁹, but Babbage’s remarkable creative efforts can be seen as a reformer’s response to two of various weaknesses within English science ⁴⁰. First, astronomers had long struggled to produce accurate tables of planetary motion, to bring it and human observation and prediction into convergence. The work was tedious and prone to human errors of perception, calculation and transmission⁴¹. Second, as hinted at in the discussion of the calculus, above, English mathematicians seemed to require some

³⁷ T.S. Ashton (in *Cohen* 1985:266).

³⁸ David Landes (in *Cohen* 1985:269).

³⁹ Blaise Pascal (1623-1662) is credited with the first automated calculating machine, called *Pascaline*.

⁴⁰ Babbage was, after all, the author of two “stinging tracts” against the Government’s mismanagement of science, *Reflections on the Decline of Science in England, and on some of its Causes* (1830), and *The Exposition of 1851; or Views of the Industry, the Science and the Government of England* (1851) (see Morrison and Morrison 1961).

⁴¹ This potential for human error in the transmission of information is reminiscent, in its own way, of the distrust of the translator in the perception, calculation, and transmission of the source text message.

persuasive argument in favor of the usefulness, even superiority, of Continental interest in mathematical analysis, including the (infinitesimal) calculus, with its focus on very small differences between mathematical quantities ⁴². In 1822, fellow reform scientist John Herschel made a chance remark to Babbage that the mass calculation of small increments could be done by steam, rather than by human 'computers' (as such workers were then called), thus setting into motion Babbage's years of research and development. The plans for Babbage's machines would come to demonstrate the power in calculating, carrying, storing, and printing differences - hence "Difference Engine" - which lay at the heart of calculus in its differential and integral functions.

The common depiction of Babbage as a gregarious man turned bitter by his government's utter failure to support his engine endeavours is simplistic and flawed. In fact, from 1823-1833, England's Treasury wholeheartedly supported Babbage's plans, so important were the anticipated tables for astronomy and navigation to a sea-going nation. Yet work toward the actual construction of the first engine, the **Difference Engine**, involved many truly extraordinary refinements in tool and die-making, mechanical drawing, and manufacturing processes, and constantly stimulated Babbage to ideas for improvement.

By 1834, these many digressions even led Babbage to abandon the project in favor of what he perceived would be a far more powerful and rapid machine - the **Analytical Engine** - with a simpler mode of construction than his original design. The Government, which had thus far granted a total of £17, 000, and this in addition to Babbage's considerable infusion from his personal fortune, now tired of Babbage's requests and left him waiting eight years for a final refusal of the projects in 1842.

⁴² Perhaps this masterful demonstration of *Continental* advances in mathematics was yet another reason Babbage came to be rejected by his government; science involves personal and political allegiances as much as the pursuit of knowledge.

That Babbage originally approached the Government too soon for funding, then succumbed to a personal drive for excellence in design and execution did little to invalidate his immediate influence on such fields as life assurance, machinery, manufacturing, and the debate over science, and science and religion, in England. Ironically, shortly before Babbage died in 1872, his life assurance tables were updated by a new set of tables, which were compiled by the Government on a **Difference Engine** built especially for the purpose, after all.

In Portrait 4 we will see how Babbage's ideas, resisted in part in England, were, like those of Newton, repatriated into England through translation, this time via an enthusiastic Italian account of Babbage's work written by Luigi Menabrea, who would eventually become Prime Minister of Italy. Next, in the final part of *The Science behind the Portraits*, I shift to the influence of German scientists.

Portrait 5: Germany's Growing Influence

In a departure from Portraits 1 through 4, which mark the predominance of England and France in European science (1650-1850, with links to Italy), Portrait 5 is striking for the number, content, and importance of source texts from *German* scientists (Dove, Gauss, and von Humboldt). Let's look briefly at this development, and at the connections between English and German⁴³ science.

In the previous sections we saw some of the many contributions of Charles Babbage, who was a major figure in a full range of applied mathematics as well as in his push for scientific reform, especially for the support of pure science through government subsidy. In both areas,

⁴³ Throughout I use the term "German", though of course the country was not unified as such until 1871, as a result of the Franco-Prussian war. William I of Prussia was proclaimed emperor.

pure and applied science, Germany would now increasingly come to the fore.

In applied science, German researchers would multiply the effects of the Industrial Revolution through revolutionary⁴⁴ advances in dye chemistry. Much as the introduction of industrial weaving equipment had enabled large-scale, more profitable production of textiles, the artificial dye industry (as of ~1850) enabled a shift away from costly natural, largely plant-based dyes to more consistent and more affordable textile results, spawning as it went other discoveries in chemical synthesis.

Interestingly, this development occurred in Germany around the time of Cohen's third Institutional Change (see page 59), when universities, industry, and government were beginning to band together in a large-scale effort to couple pure science with applied technology for major economic effect. Thus, just as German strength in the dye industry multiplied the effects of the Industrial Revolution, this combination was enhanced even further by government interaction with scientists in Germany, a development Babbage himself was vociferously arguing for in his own country, and which he much admired on personal visits to the homes and labs of prominent German scientists, including the father of Berlin science, Alexander von Humboldt⁴⁵. This coordinated effort meant German discoveries in the pure and applied sciences would have wide-reaching influence. As Cohen notes, "[s]cience-based technological advance involving the cooperation of several institutions has been a feature of our world ever since"⁴⁶.

⁴⁴ The complex matter of what exactly constitutes a true *revolution* in science is discussed at length by Cohen (*Revolution in Science*) and numerous other historiographers of science. Cohen attributes revolutionary characteristics to the dye industry in Germany around 1850+.

⁴⁵ For his part, meanwhile, von Humboldt deplored what he perceived as petty infighting and status-mongering in the *German* academies; it seems, then, that the very *existence* of an outside reference point to look to for alternatives (England looks to German, Germany looks outside its own institutions...) was the more important part of this aspect of a scientific communications network.

⁴⁶ Cohen, 1985, p.93.

Another link between English and German scientists is seen in the *topic focus* of the source texts in Portrait 5. Begun in Portrait Four, Babbage's research on calculating engines was part of a larger desire for the mass accumulation of scientific data for eventual interpretation; this trend continues in Portrait Five. As Yost⁴⁷ describes it, this was a time when the mathematization of science found a particular outlet in data collection:

During the second half of the eighteenth century a broad-based "quantifying spirit" took root in Europe. Investigators in Britain and elsewhere enthusiastically assigned numbers to all types of natural phenomena and human activities. At the turn of the century, quantification and measurement affected such diverse areas as experimental physics, meteorology, geodesy, chemistry, forestry, and political economy.

One discipline that grew simultaneously with this quantifying trend was earth science, which includes such fields as geology⁴⁸, physical geography, and climatology. Drawing on both the drive for *data collection* (which fit in well with national geopolitical interests to explore - especially by sea - then claim vast parts of the globe), and the great interest in *electromagnetism* (which itself grew out of an earlier interest in optics, for light is one form of electromagnetic radiation), scientists now embarked on a quest for global electromagnetic data. Yost continues:

...world exploration allowed increased opportunities for enhancing ... national prestige, for expanding geographic knowledge, and for collecting a wide range of scientific information. Exemplifying the desire to quantify, ... naval explorations of the late eighteenth century gathered, measured, and classified data of all kinds—astronomical, ethnological, meteorological, geographical, and natural historical.

⁴⁷ Robinson M. Yost, "Global Magnetic Collecting," 1997. Chapter Two of dissertation on-line at [<http://www.kirkwood.cc.ia.us/faculty/ryost/chapter2.htm>].

⁴⁸ Meanwhile, in an interesting connection to the biological sciences of this time, it was Lyell, a contemporary of Charles Darwin, who brought his interpretations of Darwin's evolutionary and competitive ideas to bear on the science of the earth, geology, of which he is now considered the father.

This quest for electromagnetic data became especially associated with England, where such men as Herschel and Sabine⁴⁹ pledged to undertake a "Magnetic Crusade" for the purposes of accumulating the most, and most accurate, data. As Stern⁵⁰ describes their contribution,

The greatest help ... came from the British empire, whose "Magnetic Crusade" led by Sir Edward Sabine set up stations from Canada to Tasmania (then known as "Van Diemen's Land"). The vast network not only made possible the first global models of the field, but also demonstrated the world-wide character of magnetic storm.

Yet, however fervent the English, it was in fact the impetus of German scientists Gauss, Weber, and von Humboldt that set this global collecting network in place. Stern continues, "Gauss and Weber organized a "Magnetic Union" [1836] for setting up observatories, and von Humboldt enlisted Russia's Czar to create a chain of them across Siberia". On a personal level, scientists from both countries worked willingly and well together in support of this common goal, though national prestige was of course involved in the healthy spirit of competition. Ultimately, the Germans, who were also working with US scientists, were to outdo the English and French with highly accurate mathematical predictions of the North and South poles. As Hecht⁵¹ explains,

By 1840, on the basis of data obtained [at the stations], Gauss was able to calculate the probable location of the North and South magnetic Poles of the Earth. ... It was a great triumph for Gauss's theory, and for the U.S.-German republican collaboration, when, in 1841, Captain Charles Wilkes, USN, located the magnetic South Pole at a point in the Antarctic Ocean, within a few degrees of the latitude and longitude Gauss had predicted. The six-ship Wilkes Expedition (1838-42), funded by the U.S. Congress, and directed by the American Philosophical Society under Alexander Dallas Bache, outdid the rival British and French expeditions in other ways as well, and the whole affair surprised and stunned the imperial powers, probably in somewhat the same way as the Soviet Sputnik achievement of the late 1950's shocked the U.S.A.

⁴⁹ Sabine's wife, translator Elizabeth [Juliana Leeves] is the subject of Portrait 5.

⁵⁰ David P. Stern, "Gauss and the Global Magnetic Field". On-line article dated 25 November 2001, at [<http://www.phy6.org/earthmag/gauss.htm>].

⁵¹ Larry Hecht, "Demonstrate the Principle that Measurement is Hypothesis". On-line article at [<http://www.geocities.com/antidummy/sub/demonstrate.html>].

As in the earlier example of government support of science in Germany, and Babbage's interest in such possibilities at home in England, the interplay from country to country is well demonstrated in this example, too, with English scientists inspiring the magnetic crusade, then finding great impetus and practical growth for the movement through the defining contributions of German scientists. The desire for the latest materials on this research and for close contact with fellow scientists meant that translators, such as Elizabeth Sabine of Portrait 5, continued to hold a very necessary place in the communications network.

Overall, the topic changes over the course of the portraits can be seen to flow in a direct line from the early days of the Scientific Revolution. The electromagnetic passions aroused in the 1830s and 40s stemmed from earlier work on optics, combined with the mechanized possibilities for data collection being championed by Babbage, and combined with the general mathematization and rigor being required of science in the wake of such earlier thinkers as Bacon and Descartes. The interest in optics, in turn, harkens back to a major, if secondary, interest throughout Newton's own work, which interest is explored in Portrait 2 (Carter) even while the far-reaching significance of his work in heliocentric cosmology continued to occupy scientists for nearly the entire timespan covered by this dissertation.

I contend that, in this procession of scientific thought through successive generations, there came windows of opportunity for various scientist-authors to influence colleagues and the general public alike, whether through original research, popularizations, or translations. The waves of research interests coming from one country or another, the growing communication network between scientists (as recorded by such historians as Hatch, see footnote 62, p.86), the value of outside commentary on one's own research, and the still largely accessible nature of scientific society to the amateur enthusiast all worked together to fuel a demand for

dissemination of scientific knowledge across whatever differences of country, language, or scientific affiliation. Into this mix came the contributions of the five translators portrayed in this dissertation. With this in mind, and continuing in this vein, I now proceed to the second section of this chapter - *The Society behind the Portraits* - in which I investigate some broader social factors that offered opportunities of their own to our group of five female translators.

Section 2. The Society behind the Portraits

In section one of this chapter, we saw how the changing science of the times, from Newtonism, to the Industrial Revolution, to the rise of German science, is reflected in the source texts of the portraits. In terms of Cohen's revolution-on-paper, it stands to reason that topics of major scientific importance would appear in source texts and that certain of these source texts, particularly those by or on prominent authors, would be singled out for translation⁵². In this way, the very topicality of the source texts, together with the power of the source text authors, stimulated a continuing demand for the dissemination of new ideas, whether in the form of multiple editions, or explications, or popularizations, or translations - or any combination thereof.

Above and beyond the translation opportunities generated by the sheer force and number of changes in scientific content itself, there also came into play a number of fluctuating environmental factors that offered female translators opportunities in science. I now turn to these factors.

⁵² This holds true whether or not the source texts were originally by English scientists, or by interpreters of English science in other countries, such as France (see Portraits 1 and 3 on Behn and Somerville) or Italy (see Portraits 2 and 4 on Carter and Lovelace). In other words, this holds true whether or not the scientific ideas in question had to be repatriated into England through the intermediary of translation or not.

Set I: Change Motivated by Scientists

The environmental factors I speak of can be grouped in two general sets, with an overlap between them. One set involves changes set in motion by “scientists”; the other, changes motivated by what I will call “the general public”, with certain synergistic effects between the two groups. Again I point out that my purpose is not to provide a detailed account of each of these factors, but rather to provide a larger sense of the *convergence* of factors in the environment in which the women portrayed here translated.

Amateur to Professionalized Science, and the Royal Society Debates

The most general trend that marks the period of the portraits is an increasing professionalization of science. This is a recognized phenomenon that has been discussed by any number of major figures in the history of science, including Cohen (see Cohen’s stages 3 and 4, earlier in this Backdrop), Kuhn, Hahn, and Brush. Around the time of the first portrait (Behn, 1689), a scientific community and a formal information network began to form, including the academies in London (Royal Society 1660) and Paris (Académie des Sciences 1666). By the time of Portrait Three (Somerville, 1831), there were growing calls in England for the reform⁵³ of science, including the *modernization of content* and the *professionalization of membership*.

This drive toward professionalization was one of the root causes of the heated Royal Society debates around 1830, during which members argued at length over whether to restrict society membership to a majority of actual scientists rather than enthusiasts and patrons. Despite considerable objection by the more conservative elements within the Society, by the last of the portraits - just 20 years later (Sabine, ~1850) - professionalization was well underway, bringing with it a shift to universities as formal training centres for scientists, as opposed to the

⁵³ Among the most vocal proponents of modern content and restricted membership was Royal Society member Charles Babbage. For more on Babbage, see also Portrait 4, on Lovelace’s translation of Babbage/Menabrea.

largely autodidactic and mentor-apprentice methods used in personal laboratories until this time. Ironically, it was thus the more liberal-minded Society members who (in striving always to keep science up-to-date and subject to rigorous examination by peers) set underway a growing separation of science from the general public, where before it had been quite decidedly accessible to anyone of the means, mind, and enthusiasm to pursue a scientific life. The amateur⁵⁴ scientist was slowly being excluded from the corridors of science. Until such time, however, the vibrant interaction between intellectual and social circles in such major centres as London and Edinburgh, for example, continued to ensure a welcoming forum for all manner of scientist and science enthusiast, whatever their formal training and whatever their specific field of interest; women were also represented in these settings.

Professionalization as part of Modernization

Though, in terms of the shift to universities as formal training centres for scientists, this professionalization began to set in rather soon after the Royal Society debates (~1830), it can be seen as part of an ongoing and larger discussion on the modernization of knowledge, whether in sciences *or* in letters. There was, for example, the earlier *Quarrel of the Ancients and the Moderns* around the time of Behn (1689) and her source text author, Fontenelle, himself a major Enlightenment figure who contributed his own essay to this heated discussion of how far to imitate the classics and how far to risk the freedom to innovate⁵⁵. As Levine⁵⁶ explains, this was already an old debate when it was resumed with particular ferocity in the late 1600s; the outcome of this particular round was mixed, with a preference for

⁵⁴ Note that the term “amateur” scientist holds no derogatory connotation for the time, no suggestion of dilletantism, though such people did - and do - of course exist. Rather, amateur underscores the true Latin root, for one who *loved* science.

⁵⁵ See Fontenelle’s 1688 *Digression sur les Anciens et les Modernes*, in which he argues that the best contemporary works are inevitably superior, because of the greater maturity of the human mind. For more on Fontenelle, see also Portrait 1, on Behn’s translation of Fontenelle.

⁵⁶ Of note, Levine’s article also includes a number of references to the intellectual milieu of translator John Dryden. See Joseph M. Levine, *Between the Ancients and the Moderns: Baroque Culture in Restoration England*. Yale University Press, 1999.

conservativism in letters ⁵⁷ yet modernization in science. Within science itself, recall that thinkers such as Descartes and Bacon were an essential force behind the modernization of *methodologies*, while scientists such as Babbage continued this process with calls for modern *content* (as in the adoption of Continental/Leibnizian methods of the calculus in English maths) and, also, for modern (professional) *status*, as has just been discussed.

Professionalization and Modernization: Consequences for women

The evolution of science toward a more modern and professional form meant more fluid boundaries for portraits 1 through 4, before these changes had begun to exclude amateur scientists, including women and female translators. There remained a continuity between the more intellectual and the more social types of circles within which science enthusiasts moved⁵⁸. Here, anyone who demonstrated a sincere interest in the pursuit of scientific knowledge could expect to be well-received by fellow enthusiasts. This included an openness to women who, such as our translators, had been encouraged in maths and science in the home, then went on to seek out a lifetime of instruction and mentoring. This educational base and subsequent interaction with like-minded amateurs, taken together with the acceptability of translation as a task for women, gave motivated women (above the lower classes) access to disseminate scientific texts in translation ⁵⁹.

⁵⁷ One instalment in this ongoing discussion can be found, for example, in Swift's 1704 satirical essay "The Battle of the Books".

⁵⁸ Consider in the portraits, for example, how Aphra Behn moved in court theatre circles, and by extension within intellectual circles, which led her to a commission for the Fontenelle translation; or how Carter moved within the Bluestocking circle, which contacts led her to such new scientific texts as Algarotti's; or how the Somervilles belonged to any number of social and scientific groups in England and Scotland, leading to Mary's commission as translator of Laplace; or how Lovelace was duly presented at court, through which circle she came to meet Babbage, who in turn introduced her to his many scientific associates.

⁵⁹ To be sure, certain women also conducted their own scientific research and published original works, among whom Mary Somerville, Caroline Herschel, Sophie German, and Sofia Kovalevskaja, to name some better-known examples. Refer also to the Appendix for more women as authors of scientific (and mathematical) materials.

Over time, though, the shift toward professionalization tended to exclude any group that could not enrol for formalized training. This included some young men with financial or social hindrances, and women, who, in England, were denied access to university education until the founding of Queen's College in 1848⁶⁰. And while thoughts on science as a profession had surely been percolating for some time, with the heated Royal Society debates the change was now set rather briskly into effect - with just twenty years between a peak of women's prominence in science held by Mary Somerville (~1830) and the near invisibility of the last translator, Elizabeth Sabine (~1850).

Thus, we see over the course of the five portraits a shifting relationship between a woman's scientific credentials, her independent prominence in society, and her influence as a translator. Though Behn had little, if any, training in maths or science, she was a highly prominent author, and therefore also a highly visible translator; next, Carter was educated in maths and science as well as being a prominent intellectual and literary role model through her association with the Bluestockings; the third translator, Somerville, was well trained in science and maths and conducted her own research. This training, combined with the fact that she was the wife of an eminent and highly social Scottish physician, meant she would attain the very peak of combined strength of scientific education and prominence, both as an intellectual figure and as a translator of science; this is clear in her title, "The Queen of 19th-Century Science", and in her translation of the *Mécanique céleste*, Laplace's explication of Newton's notoriously difficult work. Notably, Somerville's reign also marks a peak of Newtonism, or pure maths/physics, in the *content* of the portraits, which thereafter shift to

⁶⁰ Even then, women were restricted to certain courses of study, which did not mirror the content taught to male students, and their degrees were granted by an external college until well into the 1900s, when women were finally conferred degrees directly from Cambridge. Ironically, the availability of formal education, for which many women had fought so ardently, in some ways meant much greater exclusion from intellectual dialogue. Where once women - of a certain class at least - had had access to the latest ideas in salon settings for example, the advent of college education, however indisputably beneficial in many aspects - engendered a harsh, exclusionary reaction in many quarters where, it was feared, women might abandon their home duties and compete with men on the job market.

applied science, as in the case of the next translator, Lovelace, who was well educated in maths and science (in part by Somerville herself, one of her mentors) but was less prominent, in part because of a topic focus in applied rather than pure science, and in part because of the professionalization of science ⁶¹. The final translator, Sabine, published just 20 years after Somerville, remains today nearly invisible. Though she, like Somerville, was married to an eminent scientist, to whom she was a full partner in scientific research, the changing institution of science, combined with the now Victorian codes for women and learning leave Sabine a nearly invisible translator today, though her translations (many of which are attributed to her husband...) remain visibly influential as part of the dissemination of German contributions in physical geography and electromagnetism.

In other words, first it was the very prominence of a particular woman in society that allowed her to have such an influence on the dissemination of scientific ideas, whether she herself had strong training in science or not (Behn). Here, the *woman* was making the *text* visible. Next, it quickly became important to also have a solid knowledge of maths and science, even if this occurred in isolation from standard education such as that offered boys of a comparable class standing (Carter, Somerville, Lovelace). Later, it was a sound basis in scientific knowledge, rather than personal prominence independent of such training, that enabled a woman to remain influential in the dissemination of scientific ideas even if she herself was relegated to invisibility (Sabine). This is the *text* (as a vestige of her work) making the *woman* visible.

⁶¹ As the Lovelace portrait (#4) will explain, there were additional reasons that Lovelace was less prominent, including her championing of an eccentric source text, her short lifespan, and her own colourful history as the daughter of Lord Byron, which led her to shun public life.

Set II: Changes Motivated by the General Public

As Cohen has argued, Institutional Change 3 involved not only the growing importance of university training, but also an increasingly sophisticated science information network⁶². It is in this latter point that there are a number of interesting overlaps with the changes being motivated by the public, as first mentioned in the introduction. These overlaps converge through such factors as the growth of periodicals, salon culture, a preference for vernaculars, and scientific fads, all of which generated interest in new scientific content, and in its dissemination to the public. I treat these factors briefly here, in line with the purpose of Backdrop Two, namely to suggest links to the translators' working environments.

Science Spreads through Periodicals

While scientists themselves were continuously redefining their place in society (as individuals and, increasingly, as groups), society itself was changing, too. In England, around the time of the second portrait (Carter, 1717-1806) there was a rise in a prosperous middle class, which now developed a taste for various leisure-time activities, including reading. As Adburgham⁶³ explains,

[Aphra Behn, Portrait #1] died [in 1689,] before women of her own class had acquired a taste for reading, and before the appearance of periodical publications aimed at a middle-brow feminine readership....[Thereafter, with] increasing prosperity, [the growing middle class] were beginning to employ more servants; and in any case many of the traditional domestic tasks such as baking, spinning, and weaving were no longer done in middle-class homes. There was more leisure for the womenfolk...

Among the materials that moved in to fill this demand were periodicals, including periodicals for women. These publications were written in an upstanding style, and many included

⁶² Hatch (U. Florida) has also written extensively on the correspondence networks of the Scientific Revolution. As he explains, "Throughout the Scientific Revolution, the size and number of 'correspondence networks' continued to expand, and in the course of the century, 'intelligencers' adapted the Renaissance ideal of a Republic of Letters to the realities of the New Science - a learned world divided by time, distance, and censorship". Robert A. Hatch, on-line under Correspondence Networks at [<http://web.clas.ufl.edu/users/rhatch/pages/03-Sci-Rev/SCI-REV-Home/...>].

⁶³ Alison Adburgham, *Women in Print*. 1972:22.

regular features on maths and science, which were quite popular with readers. Thus, knowledge and respectability could appear united in periodicals destined for a mixed or even women-only readership ⁶⁴. These publications were quite successful, with long runs, and sales often reaching well beyond London. They nourished public demand and showed scientists there was widespread support for their own interests and efforts amid the larger public.

As suggested by the long lists of periodicals compiled by Adburgham and by Beetham and Broadham⁶⁵, the public appetite for scientific content was no passing fancy, no minor event, and the fortunate overlap of intellectual and society circles in a vibrant city such as London meant that it was often scientists and mathematicians themselves who were invited to have a direct hand in the publication process. In addition to such materials, scientists, in turn, now also came to offer a variety of lectures for the public, as well as general admission to scientific debates, typically sponsored by a society, such as the Royal⁶⁶. Thus, the general change in the information network to a more formal and farther-reaching written format enabled a symbiotic exchange among scientists, within the general public, and at the interface of these two sets, all the while fostering a continued oral culture of interaction as well, at least for some time.

Another Link in the Information Network: Salon Culture

The immediate roots of this interaction can be seen in the oral format of the salon culture, which began in France and spread to England. Here, where a mix of intellectual and civil society could meet regularly to exchange ideas on the arts and sciences, women could hold

⁶⁴ For more on the boom in London periodicals, see Portrait 2, Carter.

⁶⁵ Margaret Beetham and Kay Boardman (eds.). *Victorian Women's Magazines: An Anthology*. Manchester / New York: Manchester U. Press, 2001.

⁶⁶ There was also Brougham's aptly named "Society for the Diffusion of Useful Knowledge" - see Somerville portrait.

positions of considerable influence ⁶⁷. They could serve as organizers and patrons to thinkers whose funding still came largely from private sources or independent wealth, and they could also participate actively in discussions. A young woman could find tutoring and mentoring in her scientific interests ⁶⁸, as well as cultivate a network through which to disseminate her ideas, original writing, and translations. Here, the emphasis was on passion for science, and the more liberal-minded participants could see beyond any formal educational or gender restrictions to welcome women as enthusiastic supporters of the scientific cause. So, we know that an oral and written information network was available to women interested in science, and that women did participate in this forum. But what about the language used?

Vernaculars and the Dialogue Format

By extension, such circles as salons and societies raised questions on the language and format in which to communicate scientific knowledge. For the written word, scientists were increasingly communicating in the vernacular, with French and English the predominant vernaculars in the 17th and 18th centuries, and German coming into play by the late 18th century. As Cohen points out, "A surprising number of the great works of science in the seventeenth century were not published in Latin, as is often supposed, but in the vernacular languages" ⁶⁹. Precursors to this development can be seen as early as Oresme (1330-82, see Backdrop One), who worked for translation into the (Old French) vernacular, against such objections as by Montaigne and Condillac (see Backdrop One).

⁶⁷ One pertinent example is that of Madame du Châtelet (1706-1749), a popular figure in recent translation studies for the vibrant and influential salon she founded (together with Voltaire) at her husband's Cirey estate. Above and beyond sponsoring this forum for Newtonian science, du Châtelet is highly regarded for her translation of Newton's *Principia* into French. Read more in the portrait of du Châtelet in Delisle (ed), *Portraits des Traductrices*, U. Ottawa Press, 2002. See also Elizabeth Carter (Portrait #2) and Mary Somerville (Portrait #3), who were key salon figures - Carter in the Bluestocking Circle, and Somerville in various London, Edinburgh, and European circles.

⁶⁸ See examples in the Carter, Somerville, and Lovelace portraits.

⁶⁹ Cohen, *Revolution In Science* 1985:82.

It may seem odd that, just as the information network was making possible more extensive communication between scientists, and between scientists and the public, there should come a turning away from a *lingua franca*, in this case Latin. Yet it is important to note that, in fact, the shift away from Latin (~1630) preceded the beginnings of the information network (~1660) by at least 30 years. Scholars have interpreted this shift as a turning away from the Church associations with Latin, in favor of the rationalism at the core of the new science.

Then, with the exchange of information in salons, there seems to have been a preference for the vernacular in spoken communication, at least in these informal settings, where Latin would have represented a true *lingua franca*, and not just a schoolday memory, for only a portion of the group. Given the political power of England and France, and the major scientific research taking place in both countries, it hardly seems surprising that these vernaculars would take some precedence⁷⁰. This meant both that more people outside the Latin tradition (including many women) could greatly contribute to the spread of scientific ideas, and that scientists could communicate their ideas to an increasingly wider audience.

Yet this change was not linear. Indeed, once the boundary previously set by Latin as scientific *lingua franca* had begun to dissolve, it did not simply vanish, but reappeared in such distinctions as between professional and amateur scientist, between university graduate and autodidact. Later still, the language of science itself, though now in the vernacular, became increasingly specialized, even rarefied, so that a boundary of language developed, and remains today, as terminology⁷¹.

⁷⁰ Note that centralized powers such as England and France tended to have a greater presence in language than divided states such as Italy and Germany, which became nations in 1861 and 1871, respectively. For more on the growth of vernaculars as one form of nation-building, see for example Delisle and Woodsworth (eds.), *Translators through History*, Benjamins, 1995.

⁷¹ Discussions of non-literary or scientific translation often have to do with issues of terminology, and the fundamental importance of terminology in this form of translation is often held against the subset. As Mailliot has pointed out ("Chapitre 9 : Le Style". Dans : *La Traduction Scientifique et Technique*, 2 éd. 1981), "Cette méconnaissance du rôle que joue le style dans la traduction scientifique et technique

As for format, by the first portrait there developed a preference for a clear, logical, and pleasing style of written communication, seen especially in popular writings as the *dialogue* format, which appears in the Behn and Carter portraits. Even outside this specific format, the influence of such writers as Abraham Cowley⁷² (who argued for a more fluid and accessible essay style), together with the more rigorous logic that underlay the new science, resulted in higher standards of both content and form placed on scientific communication, whether for fellow scientists, or for the public, with better transmission of ideas as a result.

Within the information network, then (whether written or oral), the popularity of vernaculars and of a more accessible style encouraged a wider audience for science and gave female translators the opportunity to hold positions of importance, for example by feeding the growing demand for specialized periodicals, not to mention the positive effects of publishing houses and salons as environments within which women could forge contacts to increase the dissemination of their texts.

Scientific Fads

In the preceding, I have suggested that such venues as salons and periodicals offered science enthusiasts - including female translators - opportunities to play a part in the exchange of scientific thought. Here I note briefly one additional area of interest, scientific fads. Though the five women portrayed in this dissertation did come to influence science, certainly not every woman could find a way to become educated in maths and science, and certainly not every one of even those women would achieve the influence of this particular set. The fact remains that, generally, standards were quite different for men and women. And

est très répandue chez ceux dont l'activité se confine à la traduction dite littéraire. On en trouve un exemple frappant dans ... Koessler ..., à savoir: 'les traductions ... qui ayant un caractère technique et scientifique ne posent que des problèmes de terminologie'".

⁷² Cowley (1618-1667) was an important translator of classics and a writer on translation as well.

even against the more fluid boundaries between amateur and professional science in the earlier years covered by the dissertation, not everyone had access to the privileged setting of the salon. It must also be said that, frankly, not everyone was equally interested in science. For those who preferred or had to stay on the periphery of the new science, scientific fads formed one interface.

Certain fads were considered especially suitable for women, though men pursued them, too. From telescopes and microscopes at first⁷³, to botany⁷⁴, etymology⁷⁵, and geology later, these pursuits were considered to provide a proper lady with enough conversational material and showpieces⁷⁶ to represent her status in polite company, while remaining passive enough to be considered ladylike⁷⁷. All four of these fads involved observing and collecting specimens, without explicitly encouraging experimentation or discovery. Still, through these activities, a woman could maintain some hold in an arena largely dominated by men. Such an audience was another consideration in the dissemination of our translators' works. It is not hard to imagine that a woman with even only a passing interest in the science of the day might nonetheless be inspired by such pursuits, and by ladies' periodicals, to acquire popular translations in the vernacular, such as those by Behn and Carter. This is another instance of how the information network - oral and written - primed a readership for translated materials.

Scientist-Translator "Simpatico"

⁷³ This interest in the very large and the very small is linked to research methods in translation studies in a recent paper by Maria Tymoczko. She writes that, as in seventeenth-century science, translation studies is today confronted with two infinite orders: "the virtually inexhaustible possibilities suggested by segmenting texts into smaller and smaller units, and the equally inexhaustible possibilities offered by the relationship of texts to layer upon layer of context". In *Crosscultural Transgressions - Research Models in Translation Studies II*. Theo Hermans, ed. St. Jerome, 2002.

⁷⁴ See Ann B. Shteir for more information on women and botany.

⁷⁵ See the Appendix for Maria Sybille Merian and the work she and her daughters conducted in etymology.

⁷⁶ Microscopes, telescopes, dried flower or insect collections, and rock cabinets, could be prominently displayed as conversation pieces in the home.

⁷⁷ Curiously, the Linnaean classifications in botany were for a time considered quite scandalous for ladies, involving as they did reference to sexual parts and reproduction in plants.

This half of chapter two, "The Society behind the Portraits" has looked at a number of changes to the information network generated by scientists and by the general public, with an overlap between them that enabled female translators to have influence in disseminating scientific information. Before concluding, I would like to work in two additional sections here, the first on *simpatico*, the second on *repatriation* and *concurrent translation*; these latter two phenomena especially will recur throughout the portraits.

I have spoken of the overlap between formally trained scientists and amateur enthusiasts, as well as the overlap between amateur enthusiasts and the even broader general public. There is also the matter of a different kind of overlap, one between the figure of the scientist and the figure of the translator. In this chapter we have seen how the person of the scientist became more fixed over time, separating out from a larger mix of letters and sciences, and from a mix of true researchers and a general public, to end in a more formalized job classification. In Backdrop One, meanwhile (on invisibility), we saw how the person of the translator, in a parallel, separated out from a larger mix of author/creator/translator to a more distinct and less visible job description of its own. Taken together, these two shifts recall Venuti's notion of *simpatico*, a kind of sympathetic personal fit between a translator and the source text author. Or, as Roscommon earlier expressed it:

... seek a Poet who your way do's bend,
And chuse an Author as you chuse a Friend.
United by this Sympathetick Bond,
You grow Familiar, Intimate and Fond;
Your thoughts, your Words, your Stiles, your Souls agree,
No Longer his Interpreter, but He⁷⁸

⁷⁸ Wentworth Dillon, Earl of Roscommon. "Essay on Translated Verse," 1684: lines 89-100. The fuller citation of this section begins

"Each Poet, with a different Talent writes, One Praises, One Instructs, Another Bites.
Horace did ne're aspire to Epick Bays, Nor lofty Maro stoop to Lyrick Lays.
Examine how your Humour is inclin'd, And which the Ruling Passion of your Mind;
Then, seek a Poet who your way do's bend..." Essay available on-line through The Penn State Archive of Samuel Johnson's Lives of the Poets, Ed. Kathleen Nulton Kemmerer. At
[<http://www.hn.psu.edu/faculty/kkemmerer/poets/roscommon/transl.htm>].

Especially in the first four portraits, though less so in the fifth, we will see how translators and source text authors alike were, in a way, leading a non-conventional existence: the authors by exploring and putting forth radically new scientific ideas; the translators by asserting a place for themselves as women in science, and in positions of influence through *knowledge*, rather than charm or beauty. It strikes me as understandable that these non-conventional figures would cleave to one another in the belief of the mutual importance of their work.

Translation as Repatriation, Concurrent Translation as Branding

This mutual sympathy, in turn, leads well into two trends that are seen in the portrait translations: translation as repatriation and concurrent translation. In Portrait One, we will see how the initial strong resistance to the new heliocentric universe, as exemplified here in Newton's works, was in a way mitigated, or circumvented, by the mediator of translation. I call this strategy *translation as repatriation*.

While English and Continental mathematicians alike worked to demonstrate a logical, mathematical explanation for cosmic phenomena, there was considerable resistance from certain peers, the Church and other authorities, and, collared by this resistance, the general public as well. Yet among those who believed the new system was valid, word also travelled, generating interest and momentum through personal communication and private correspondence at first. As part of this spread, scientific ideas reached such countries as France and Italy, where they were considered and debated, producing written commentary of their own in turn. Some of these texts would reach considerable status of their own, and next go on to be translated "back" into English, returning Newton's ideas to England under the guise of a foreign interpretation of ideas. Perhaps this made the texts less threatening, or at least exotic enough to reinfiltrate the English consciousness which, it must be said, had itself in any intervening years also made progress toward adopting the full implications of Newton

and the heliocentric cosmology. This is an interesting twist on the idea of translation as dissemination of knowledge.

In Portraits Two and Three, Newton's work on optics and the calculus, respectively, are also repatriated. In these cases, this function was important not because the topics were as controversial as cosmology, but because it offered outside interpretation and support of English science, and because this factor presumably formed at least part of the appeal of the texts among English readers. In Portrait Four (Babbage-Lovelace) the translator repatriates the scientist's ideas to a scientific and governmental audience that has grown impatient for results; Lovelace became a staunch defender of Babbage's ideas in England, and saw her translation from the Italian as one of several strategies, which also included financial and political support through her own family, to see his projects through to fruition. By the time of Portrait Five, repatriation is less an issue; there, the geological sciences and electromagnetism were fields of international appeal and competition, and translation was important for keeping scientists abreast of the very latest developments.

Finally, in three of the portraits (Behn, Somerville, and Sabine) appears the phenomenon of *concurrent translation*. By this term I mean the publication of a second, third, even fourth translation of the very same source text at nearly the same time as the female translator portrayed, but by other translators⁷⁹. This raises interesting questions about the nature of the publishing industry and the audience. Barring any malevolent interpretation of these concurrent translations (plagiarism for profit?) I have come to understand this as a type of "branding". In other words, before the large-scale industrialization of science, scientists - even those trained at university - still worked in local groups, under the tutelage of one major

⁷⁹ The idea of the relationship *between target texts* discussed here under concurrent translation is seen also in the larger work of Itamar Evan-Zohar and Gideon Toury on a polysystems approach to translation.

scientist or another. This allegiance to a particular research group is echoed at the political level, when professed loyalty to the ideas of a foreign scientist during times of protracted military struggle, such as still deeply affected Europe, could be risky; the choice for English notation of the calculus, for example, could hinder a mathematician's own progress in the field, while the choice for Continental notation, though ultimately advantageous, could align a scholar against fellow Brits and lead to isolation from the research community and its networks⁸⁰. War could also hinder the transport of published materials over larger distances and across borders, as did the general state of the transportation infrastructure. These factors suggest that a locally available text under the auspices of a known and trusted peer or mentor might take precedence over another text or translation, however similar the two - and many were quite similar, as the translation samples in the portraits will show. In the case of the female translators here, their affiliations with a particular set of scientists would be known, as would their own position in society. In this way, an audience, whether specialist or generalist, could vote a measure of support for their preferred group by choosing a particular translation. More on these ideas, *translation as repatriation* and *concurrent translation*, will appear in each of the portraits.

⁸⁰ A number of scholars, including Thomas Kuhn and Robert Merton, have described the restrictions to change that scientific communities impose upon themselves. In their words I am reminded of links to the women portrayed here at their own forefront of scientific translation. As Merton describes the "Matthew Effect" (1968/1988), it "may serve to heighten the visibility of contributions to science by scientists of acknowledged standing and to reduce the visibility of contributions by authors who are less well-known". This calls to mind the connection I draw in Backdrop One between the visibility of acknowledged authors (whether literary or scientific) and their work as translators. As well, the noting of such an effect serves to underscore just how difficult it must have been for the portrayed women to overcome the boundaries the larger system would have been imposing upon. Yet, as Kuhn describes it, "men [*sic*] who achieve these fundamental inventions of a new paradigm have been either very young or very new to the field whose paradigm they change" (*Structure of Scientific Revolutions*, p.90). In this statement, also on limitations to change, we can see an opening for the five women here precisely in the kinds of novelty they posed to the world of science.

Conclusion

Despite the barriers to visibility discussed in Chapter One, there were, as this second chapter has pointed out, nonetheless certain opportunities for women (of a certain class) in science, whether as enthusiasts, salonnières, researchers, authors, or translators. With this background information on translation and invisibility (Backdrop I), and on the Scientific Revolution as it pertains to opportunities for translation (Backdrop II), I proceed in the following 5 chapters to the individual portraits of Aphra Behn, Elizabeth Carter, Mary Fairfax Somerville, Ada Lovelace, and Elizabeth Sabine.

In these portraits we will see a pattern of evidence that, although female translators of scientific materials were at a number of disadvantages, they are most certainly not altogether absent from the history of translation or the history of scientific ideas.

By way of transition, I conclude this chapter with a word on the format of the portraits. First, recall that these women were chosen according to criteria of period, target language, and availability of material (see the *General Introduction* and the *Appendix* for more). Second, recall that the decision to present these women as a set is not an attempt to reduce 250 years of history to the lives of five individuals; rather, the relative lack of scholarship on women as translators of scientific material in history requires that modern scholarship begin at the beginning, as it were. This makes the set small, but not finite; as the appended material demonstrates, the field is open to considerable future research, which will itself, it is hoped, open yet more avenues of discovery.

Each portrait includes biographical information on the translator, and on the source text author. This information largely relates to how each translator gained access to a scientific life, as well as establishing the importance of the source text, which in turn is discussed in each portrait, with a link to the scientific context explained in this Backdrop II. Each portrait

also includes paratextual information on the woman's translation, as well as a number of excerpts from the translation alongside the original and any concurrent translations. The purpose of these translation samples is to assert the presence of the translator and her work; to demonstrate the translator's particular style of translation; to examine any particularities related to the translation of *scientific* materials; and to offer insight into how each translator may have conceived of her "translation project". Though the samples are brief and restricted in number, they nonetheless offer insights for discussion of these and related points.

Finally, each portrait notes the relationship of the translator's scientific education to her visibility in society and intellectual circles, to her influence as a translator, and to the visibility and influence of her translated text. When concurrent translation and translation as repatriation occur, these are discussed as well. I begin with Aphra Behn's translation of Bernard de Fontenelle.

Portrait One: Aphra Behn (1640-1689)

"All I ask is the privilege... to tread in those successful paths my predecessors have so long thrived in ... If I must not because of my sex, have this freedom, but that you will usurp all to yourselves; I lay down my quill and you shall have no more of me."
– Aphra Behn

0. Introduction

A recent favourite of gender studies and literary criticism, Aphra Behn has risen from successive waves of praise, disdain, and obscurity over the course of more than 300 years to hold renewed interest for an appreciative audience. Today increasingly recognized as the first Englishwoman to earn her living as a writer, Behn is also the focus of scholarly interest for her roles as a playwright, in the development of the novel, and for the authorship of what is considered to be one of the first anti-slavery novels, *Orinooko*. This multi-faceted appeal seems only to be enhanced by the intrigue of Behn's early years, which include a record of espionage in the service of the English throne against the Dutch; as one reviewer describes it, the definitive modern biography by Janet Todd (1997) qualifies as a "rip-roaring read"¹.

As the reader may know, modern analysis ² of Aphra Behn as a major woman writer in the English tradition has been available since the 1970s, and occasional analysis of Behn as a translator since the 1980s. Why, then, offer a portrait of Behn here?

¹ Back cover, Todd's 1997 *The Secret Life of Aphra Behn*. Todd's is the definitive modern biography of Behn and itself incorporates a consideration of materials from previous biographers: as such, her 1997 text serves as a major reference throughout this Behn portrait. Still, even Todd's extensive collection of works on Behn involve a certain amount of speculation, and interpretation, given that documentation on Behn's earlier years, and on her interior and private lives, is lacking. This may be taken as another example of how women, even those with a high adult profile such as Behn, remain in part invisible to posterity. The speculation and interpretation with which Behn scholars work to flesh out her case necessarily also affects the whole of this dissertation portrait, the primary object of which it is. I remind the reader, to explore - as far as current materials allow - Behn's activities as a woman translating science.

² See, for example the following authors, as suggested in Hutner's 'Preface' to *Rereading Aphra Behn*:

The majority of writing on Behn tends to focus on her work in various literary forms other than translation, ignoring or quickly glossing over this additional, important role. Even those authors, such as Todd, who do address Behn's politics of translation³ tend themselves to focus on her role as a *literary* translator. Yet while the majority of Behn's nine published translations were indeed of literary sources, she was also a translator of scientific materials for Bernard de Fontenelle, a grand figure in the French pre-Enlightenment.

Simply put, no known author, historical or modern, has focused on Behn's work as a *scientific translator*. Link (1968) includes in his biography a half-page summary of each of Behn's nine translations; Day (1986) offers an interpretation of Behn's "Essay on Translated Prose", and Todd (1992) begins volume four of her edition of Behn's collected works with a "Textual Introduction to Translation", then continues with an annotated⁴ reprint of several of Behn's translations, including Fontenelle's *Conversations*. More recently, H.A. Hargreaves (1990), in a modern re-translation of Fontenelle, comments briefly on Behn's version, among other concurrent translations (e.g., Glanvill and Domvile [a.k.a. Knight]⁵).

Yet the focus of each of these works is elsewhere. Link aims to provide a brief, modern biography; Day a reappraisal of how educational exclusion affected women; Todd a feminist critique of Behn, as author first and literary translator second; Hargreaves a re-translation for the modern student.

Maureen Duffy (1977), Angeline Goreau (1980), Ruth Perry (1980), Hilda Lee Smith (1982), Moira Ferguson (1985), Jane Spenser (1985), Dale Spender (1986), Elaine Hobby (1988), Janet Todd (1986, 1988, 1989, 2000), Gilbert and Gubar (1985), Katharine M. Rogers and William McCarthy (1987), and Germaine Greer (1988). Also, Day (1986) *Fetter'd or Free*.

³ See, for example, Todd's 1992 edition of Behn's collected works.

⁴ Todd's annotations are largely historico-socio-political, rather than an exploration of Behn's translation project.

⁵ For family information, see <http://www.eurofound.eu.int/about/lhouse.htm>

By contrast, the Behn portrait in this dissertation focuses on her role as *scientific* translator of Fontenelle, rather than literary translator or author. It unites biographical information on Behn and Fontenelle with contextual information on the importance of the source and target texts (1686 and 1688, respectively) against a scientific backdrop at the crossroads of Isaac Newton's stunning mathematic cosmology of 1687⁶.

The portrait notes Behn's rise to visibility as a public figure, the positive combined effect of her visibility and Fontenelle's respectability on the dissemination of the source and target texts, and the role Behn's successful translation played in "translation as repatriation", i.e., in setting the stage in England for a more positive reception of (Newton's) heliocentric cosmology, via the intermediary of a popular and respected French text on this still new scientific idea.

Finally, by including samples from Fontenelle and Behn against two⁷ concurrent translations (Domville, a.k.a. Knight 1687, Glanvill 1688), the translation analysis addresses the phenomenon of concurrent translation, which occurs in the Somerville (#3) and Sabine (#5) portraits as well. The portrait is structured in four main sections: 1. The Translator (Aphra Behn); 2. The Original Author (Bernard de Fontenelle); 3. Translation Commentary and Samples; and 4. Conclusion.

⁶ In one of the great paradigm shifts in the history of science, Newton (1642-1727) was the first to mathematically fully verify the new, heliocentric construct of the universe first proposed by Copernicus (1473-1543), and partially explored by Brahe (1546-1601), Galileo (1564-1652), and Kepler (1571-1630). In fulfillment of what was beginning to be - and stands today as - the true test of scientific validity, Newton's mathematics *explained* previous work, *extended* it, and enabled *prediction* of future physical events.

⁷ A number of additional English translations were later published, including by Gardiner (1715), Gunning (1803), and Hargreaves (1990). This continued interest speaks to the importance of Fontenelle and his source text in the history of scientific (and philosophical) thought.

1. The Translator: Aphra Behn (1640 – 1689)

Generally, the life of Aphra Behn can be structured into a few phases: 1) uncertain origins and early education; 2) espionage, marriage, court and theatre connections, widowhood; 3) debtor's prison, Great Fire, Plague; 4) renewed stability and formal beginnings of life as a writer (1670), death in 1689. Because even her biographers have yet to sort out the scanty details of her birth and early development⁸, there remain two major questions regarding Behn's formation: to what **class** did she belong and, by extension, what was likely her **education**? These questions bear on Behn's later talent for language and translation, a practice she likely undertook for financial support of her primary pursuits as author.

In an attempt to reconcile Behn's later professional talent with her presumed upbringing, scholars have fallen generally into two camps. On the one hand, some argue that Behn was born to modest circumstances, the daughter of a barber and a wet-nurse⁹. Others object, arguing that Behn was a gentlewoman of Canterbury¹⁰:

[a] survey of [Aphra Behn's] works, with their various references and influences, drawn from classical as well as modern English, French, Spanish and Italian literature, shows her to have been, by the standards of her time, a woman of great learning, and the foundations of her scholarship must have been laid in a childhood very different from that likely to have been enjoyed by an ordinary barber's daughter.

⁸ See footnote 1 in this portrait.

⁹ A 1695 document by Anne Finch, Countess of Winchilsea, describes Aphra as the daughter of a barber John Amis and his wife Amy, a wet-nurse, of Wye, in Kent. Finch was a natural philosopher herself, and appears in the Appendix. Todd proposes that this barber and his wife were Bartholomew Johnson and Elizabeth Denham. Elizabeth seems to have been the sister of George Denham (Todd 2000:22); it remains unclear whether they were related to famed writer and translator Sir John Denham II (1615-1659). If there was a connection to Denham, perhaps this in part influenced Behn to delve into translation.

¹⁰ Woodcock 1989:16. This version is supported by Gildon's 1696 *History of Aphra Behn*, and by Thomas Colepeper, a well-known scientist and a fellow of the Royal Society. Aphra's purported foster-brother and the only person who claimed to know Aphra as a child, Colpeper declared that she was born at Sturry or Canterbury, in Kent (Todd 2000:13).

In response to such objections, the “barber camp”, represented most recently by Todd, explains that the 1640s and 1650s (the Cromwellian Interregnum between the fall and death of Charles I and the Restoration of his heir in 1660) formed a turbulent period in English history, between ideologies, ways of life and thinking, during which class barriers were not as rigid as they had been or would be again. Though Behn’s father’s position as barber, or perhaps as barber-surgeon, held little direct status, it may have offered the family exposure to many interesting immigrants from France, The Netherlands, and other parts of England. As Todd puts it, “[t]he daughter of such a man, if she had some linguistic talent, might gain a smattering of languages without stepping far from home”¹¹.

By 1666, when she clearly enters recorded history, Behn was widowed¹² and on her way to Antwerp as an agent for Charles II. In these intervening two years fell a brief but brilliant stage of her social career: She was now a respectably married woman, well-off, in her twenties, full of sparkle and liveliness, and in this character she appears at the theatre-friendly court of Charles II¹³.

During this formative professional period, Behn not only forged important connections¹⁴ in the theatre-going world, but also began studying the stage and audience in preparation for her own upcoming works¹⁵. Inspired by her developing stance on the *purpose* of plays, which she

¹¹ Todd 2000:17, 80.

¹² It is uncertain of what cause Mr. Behn died; the plague has been suggested as likely for the times by both Sackville-West and Todd, for example. He left Aphra no inheritance.

¹³ Sackville-West 1970:31,34.

¹⁴ It is around this time that Behn met John Dryden’s brother-in-law Edward Howard, through whom she is believed to have soon met the great writer and translator himself. Also, Germaine Greer (1989:10) notes Behn’s relationships with “Buckingham and Rochester, Mulgrave and Etherege, D’Urfey and Tate, Creech and Otway, Ravenscroft and Dryden”.

¹⁵ In the nineteen years from 1670 through 1689, the year of her death, Behn produced no fewer than 56 works in almost all available genres; posthumous works increase this total by eight. Like her contemporary Dryden, Behn was “...of a new breed of men and women of letters. Before them authors had been aristocrats, actors or court officials, or they had had some other source of income or function. In this generation, however, a few began to make a living solely from writing. Such authors had to be flexible and write in whatever genre was required or fashionable”. This would extend to translation as

determined were largely to please the audience, and by the occasional female playwrights before her¹⁶, Behn pursued Thomas Betterton¹⁷, manager at the Duke's Company, and saw her very first play, *The Forc'd Marriage*, open on Tuesday, 20 September 1670, to a quite respectable run of six days¹⁸. Her attentiveness to the relationship between audience and author, and to the purpose of such communication, suggests Behn early on had the makings of an insightful translator.

Among the practical lessons she learned as a young author were to develop a thick skin against the public opprobrium for the female playwright - and the female actor, seen as a kind of "new-fangled whore"¹⁹ - and to recognize the great pressure of time and money under which playwrights had to work. These dual pressures of social reprisal and work on demand factor into Behn's translation for Fontenelle as well; as we shall see, along with a number of other on-going projects Behn produced two Fontenelle translations and her own "Essay on Translated Prose" under considerable time pressure and in awareness the non-conventional topic matter relating to heliocentric cosmology and (scientific) education for women:

...the **Novelty** of the Subject in vulgar Languages, and the Author's introducing a **Woman** as one of the Speakers in these five different Discourses, were further Motives for me to undertake this little Work; for I thought an *English* woman might adventure to translate any thing, a *French* Woman may be suppos'd to have spoken....

Indeed, Behn was throughout her life an outspoken advocate of women as equals to men, in education, as in their later professions of choice. This conviction features in the prefaces to several of Behn's works (*The Forc'd Marriage*, *The Luckey Chance*); this practice is not

well, in Behn's case (Todd 2000:159).

¹⁶ Such as Katherine Phillips, who translated Corneille's *Pompey* for the stage.

¹⁷ In fact, Betterton ran the theatre under the supervision of a woman, Mary Lady D'Avenant, wife of founder Sir William. Perhaps she encouraged Behn's efforts.

¹⁸ This was a time when plays had small runs - eight to ten consecutive performances being an exceptional success for a new drama (Todd 2000:132).

¹⁹ Todd 2000:136

unfamiliar to translation studies, where allographic commentary is one common forum for personal expression by the translator. In one representative comment²⁰ (note also the reference to poetry/creation as 'masculine') Behn says,

All I ask, is the privilege for my masculine part, the poet in me.... If I must not, because of my sex, have this freedom, I lay down my quill and you shall hear no more of me, no, not so much as to make comparisons, because I will be kinder to my brothers of the pen than they have been to a defenceless woman, for I am not content to write for a third day only²¹. ... I value fame as much as if I had been born a hero; and if you rob me of that I can retire from the ungrateful world and scorn its fickle favours.

The success of the first play (*The Forc'd Marriage*) seems to have informed her decision to continue writing - and write she did. By 1672, Behn was a known dramatist and poet; just five years after her troubled return to England she could now consider her career successfully launched. Socially, too, she was successful, enjoying a wide circle of artistic and intellectual friends. Periods of carefree enjoyment of urban living alternated with furious writing to procure another period of ease. From her beginnings with *The Forc'd Marriage*, she would now proceed through twenty more plays (including *The Rover*, her most famous²²), to poetry, to essays, capping her career in 1688 with the novel *Orinooko* before dying the following year²³, a role model to whole string of female playwrights who flourished after her death²⁴. Yet these would not be her only successful activities; by 1679 she had also begun to translate.

²⁰ Cited in Sackville-West 1970:65.

²¹ The first day's profits went to the theatre/manager, the second day's to the cast, and the third day's to the playwright, for as long as the play ran. For a run of six days, then, Behn received two days' profits.

²² Her most famous play, *The Rover* (1677) explores conflicted configurations of female desire and the male libertine, revealing Behn's longing for an age in which the sexes love mutually and women are desiring subjects rather than passive objects.

²³ Behn would die in 1689, aged 49, successful but perhaps exhausted from the pace and habit of writing on demand (Todd 2000:163), perhaps also weakened by the effects of syphilis (Goreau 1980:215-216). It is Goreau's suggestion that Behn may have contracted the disease through bisexual lover John Hoyle, a lawyer.

²⁴ These names include Ariadne, Catherine Trotter, Mary Pix, Delarivier Manley, and Suzannah Centlivre. Also, a widely cited quote from Virginia Woolf asserts that "All women together ought to let flowers fall upon the tomb of Aphra Behn, for it was she who earned them the right to speak their minds" (Woolf, *A Room of One's Own*, cited in Todd 2000:3).

Whatever her detractors may have said against writing as a livelihood, or its suitability for a proper woman, by the summer of 1679, when she first began translating, Behn had, through skill and determination, wit and charm, risen well beyond any uncertainties of her birth and early development to a position of visibility (if notoriety) and success amid a circle of social and intellectual peers, not least of whom John Dryden and John Denham, two notable names in translation history to this day, as seen in Backdrop One.

From now until her death in 1689 she would lend her recognized name to 9 translations²⁵, with the recurring *themes* of gender, politics, and morals, and the recurring *strategies* of **domestication** (which fit in with translation expectations of the day, which were laid out above, in Backdrop One) and **interpolation** (which fit in with Behn's playwright interest in communicating directly with the audience).

In her use of such strategies, we see a larger reflection of how Behn negotiated the various territories between **visibility** and **invisibility** to which she was party. First, as a *playwright and author* she had (Restoration) license²⁶ to substantial alterations of others' ideas as well

²⁵ 1680-*A Paraphrase on Oenone to Paris*; 1684-*The Voyage to the Island of Love*; 1685-*Reflections on Morality or Seneca Unmasked*; 1686-*La Montre; or, The Lover's Watch*; 1687-*Aesop's fables, with his Life, newly translated*; 1688-*Agnes de Castro or, The Force of Generous Love*; 1688-*The History of Oracles and the Cheats of the Pagan Priests*; 1688-*A Discovery of New Worlds, translated, with a preface*; 1689-*"Of Trees" in Six Books of Plants by Mr. Abraham Cowley*. *La Montre* and *Agnes de Castro* were both substantial rewrites of original story lines rather than translations as more closely understood today; note that Behn's version of *Agnes de Castro* was translated into French in 1761 by Mme. Thiroux D'Arconville, who appears in the appendix for her translation into French of English chemist Peter Shaw. For more on D'Arconville, see also research by Marie-Laure Girou-Swidorski (Ottawa U.).

²⁶ As Michael Donson explains, "In general our sense of a difference in kind between revivals, adaptations, and new plays based on old is largely anachronistic: as we have seen, all Restoration revivals were to a greater or lesser degree adaptations, as were a great many new plays (even Dryden's [own] *The Wild Gallant*...), and it is often more useful to consider the different purposes to which the Restoration put the older corpus in general than to devote undue attention to matters of authorship and copyright which were only beginning to take their modern shape". Page 48, Chapter Three - Adaptations and Revivals, in: *The Cambridge Companion to English Restoration Theatre* (Deborah

as to direct communication with the audience, including, in particular, the feature of Restoration theatre that were its prologues and epilogues²⁷. Second, though as a *woman*, Behn was scorned by many for such outspokenness, she nonetheless persisted, with particular commentary on her perceived right to earn a living as she saw fit (see page 104), and on the right of other women, too, to become educated, as in the instance of the Marquise protagonist in her Fontenelle translation. Finally, in what I suggest is a kind of synthesis of her other component parts (playwright, author, woman, women's advocate...), as a *translator*, Behn had occasion to negotiate these two poles - of great visibility, as offered in the theatre, and of great invisibility, as expected of her gender – by finding a middle ground between overt intrusion on the source text and simple subjugation to a word-for-word translation.

If Behn's translations are considered an outgrowth of her activities as a writer, one of her many forms of expression, it can come as no surprise that the recurring themes of her writing should feature in her translation as well; it is Behn's style to select source texts with some mixture of love, deceit, gender, politics, morals, religion, and authority in each. Not

Payne Fisk, ed.) Cambridge: Cambridge U. Press, 2000.

²⁷ The age which preceded Dryden's was, above everything, a pamphleteering age; and his own generation had retained at least a full freedom of unlicensed allusion—whether political or other. When we further remember that the mode of the day was a frankness of tongue.... it is not difficult to understand why the prologue and epilogue, instead of adhering to their humbler task of commending to attention and favour a particular play, became accepted vehicles of political praise and blame, intermixed with current social satire of all sorts. In the relatively small area of restoration London, of which the court was the acknowledged centre, these sallies were always transparent and always welcome. The licence which the prologues, and, still more, the epilogues, allowed themselves was, consequently, wide, and ... [t]heir delivery was generally entrusted to stage favourites, who were assured of a hearing and "might say what they liked." Very frequently, as in the case of many of Dryden's, these addresses were composed by leading authors for less known writers, or, again, by personages who wished to remain free from direct responsibility. Their importance may, perhaps, have been exaggerated; but, printed as broadsides, they must often have added to the attractions of a performance, and have been carried home as an enduring remembrance. Thus, the composition of them was assiduously cultivated, and remunerated by a handsome fee. From *The Cambridge History of English and American Literature in 18 Volumes* (1907–21). Volume VIII. The Age of Dryden. §18. Prologues and Epilogues. Available on-line at <<http://www.bartleby.com/218/0118.html>>.

surprisingly, she also valued substantive wit and a pleasurable read in her original authors, as expressed, for example, in her dedication to the translation of Fontenelle's *Entretiens*:

My Lord [Earl of Drumlangrig], I presume to dedicate this little Book to your Lordship, which I ventured to translate, because it pleased me in the *French*; and tho but a trifle, has something in it out of the way of ordinary *Wit* ²⁸

This concern for pleasurable use of language occupied writers and translators alike, and was one topic of discussion in translator circles, where such Behn colleagues as John Dryden moved. Indeed, it was Dryden himself who commissioned Behn's very first translation, of Ovid in 1680. As it so happens, it was together in this very same volume of *Ovid's Epistles* ²⁹, that Dryden's famous essay on the three forms of translation (metaphrase, paraphrase, imitation) also appeared.

It was eight years after this first translation that Behn would produce two Fontenelle translations from the French, *A Discovery of New Worlds* ³⁰ and the *History of Oracles* ³¹, the latter prefaced by Behn's own *Essay on Translated Prose*. In order to help establish the importance of Behn's translation of Fontenelle, I turn now to the importance of this author and his source text in the history of French thought.

2. The Source-Text Author: Bernard de Fontenelle (1657-1757)

It may surprise modern readers to learn that theories of inhabited worlds beyond our own have flourished during a number of remote historical periods³², from Lucian and Plutarch

²⁸ Reprinted in Todd 1992, v.4:72.

²⁹ Publius Ovidius Naso (43 BC - 17 AD, Roman poet). *Ovid's Epistles*, Translated by Several Hands, edited by John Dryden. London: Printed for Jacob Tonson, 1680.

³⁰ Approx. 95 pages.

³¹ Approx. 225 pages long, this was a translation of Fontenelle's own version of Van Dale's *De Oraculis*; in other words, Behn's was a translation at second remove.

³² For a modern overview, see for example Stephen J. Dick's, *Plurality of Worlds: The Origins of the Extraterrestrial Life Debate from Democritus to Kant*. Cambridge: Cambridge U. Press, 1982.

among the ancients, to a revival in the late Middle Ages, to a cluster of activity through the 1600s.

Among this latter group was Bernard de Fontenelle, whose 1686 *Entretiens sur la pluralité des mondes* secured the writer's reputation among his contemporaries as an important communicator of scientific developments³³, and within more recent philosophical scholarship as a major figure in the history of thought³⁴.

The remarkable longevity of Fontenelle's work, in numerous editions and languages during his lifetime and well after his death, echoes his own remarkable life span of just under 100 years. Beginning in the arts and turning later to the sciences as well, Fontenelle's work stands as an exemplary record of developments leading up to the Enlightenment.

Born the son of a Rouen barrister and Corneille's sister, Bernard le Bovier de Fontenelle was educated by Jesuits, passed the bar in deference to his father, then turned to philosophy and literature. Not unlike his translator Behn, Fontenelle began his career as a playwright and essayist. Until roughly 1688 he remained largely in Rouen, where most of his early works were composed in a great flurry of activity, including both source texts for Behn, the *Entretiens*. and the *Histoire des oracles*, both in 1686. As Shackleton summarizes³⁵

Though in science Fontenelle made great progress later in his life, the literary production of the six years 1683-8 was never surpassed by him, and the great bulk of work which now causes him to be regarded as a precursor of the Enlightenment, was published ... before the birth of Montesquieu, whom Fontenelle survived by two years.

³³ For modern commentary on Fontenelle's role as popularizer of Newtonian science, see for example Margaret C. Jacob's *Scientific Culture and the Making of the Industrial West*. New York: Oxford University Press. 1997.

³⁴ For example, Leonard M. Marsak, "Bernard de Fontenelle: The Idea Of Science in the French Enlightenment". Trans. Amer. Philos. Soc. 49 (1959), 1-64.

³⁵ Shackleton 1955:1-2.

It was around 1688, at the end of this period of great literary activity, that Fontenelle took up residence in Paris. The timing of his arrival was quite fortunate for several reasons, for in the backdrop were: the spread of the new scientific method; a growing popular interest in science; the founding of scientific societies and journals; and the Quarrel of the Ancients and Moderns (these events were presented in Backdrops One and Two).

The combination of these movements meant that Fontenelle was particularly well placed for influence - as a man of both letters and science, as a modernist in the Quarrel, and as permanent secretary to the Académie des Sciences. This public profile and a desire for positive change, combined with a gifted intellect and a lifespan of nearly 100 years meant Fontenelle had ample time and opportunity to see his ideas and works disseminated throughout the intellectual and scientific communities of Europe and England; this was true even though his association with certain non-conventional ideas initially put him at odds with the powers that be. Undaunted, he calmly pursued his interests, whether in the Quarrel, for example, or in other questionings of accepted authority figures; as we shall see, this comes through in his choice of the two source texts that Behn would come to translate for him, and suggests (in addition to the championing of science education for the general public, including women) yet another point of what Venuti³⁶ would call “*simpatico*”, i.e., an affinity of ideas, between Behn and Fontenelle.

It is important to note that Fontenelle’s interest in exploring the *status quo*, while at times frowned upon by others, ultimately only strengthened the esteem in which he came to be held by his peers. In fact, Fontenelle’s remaining years were quite successful, as reflected in the many professional memberships he was offered during a time of great growth in such affiliations³⁷:

³⁶ Lawrence Venuti on “*Simpatico*”. In : *Substance* 20 (2) 1991, p.3.

³⁷ Shackleton 1955.

His personal fame grew quickly. He was elected to the Académie française in 1691, four previous attempts having been unsuccessful owing to his too close identification with the cause of the moderns in the Quarrel of the Ancients and Moderns. In 1702 he was elected to the Académie des Inscriptions et des Belles-Lettres. Most important, in 1697 he was appointed perpetual secretary of the Académie des Sciences, which was about to begin the most famous period of its career. He became in due course a member of the Arcadian Academy of Rome, of the Royal Society of London, of the Academies of Berlin and Nancy, as well as that of his native Rouen.

From the previous information on Aphra Behn, taken together with this information on the importance of her source text author, Bernard de Fontenelle, we can see how the particular combination of Fontenelle's *status* as a respected man of letters and Behn's high *visibility* as a daring female Restoration playwright and author might converge in this portrait to make not only the source text, the *Entretiens*, but also its translation, a visible and influential text in the dissemination of early Scientific Revolution thought. The intellectual affinity between Behn and Fontenelle, their common interest in challenging prescribed notions of authority and traditions of knowledge, and their positions of visibility and influence were sure to lend a cachet to the texts they were promoting to the popular audience.

Next, I briefly address these commonalities in relation to Fontenelle's *Histoire des Oracles* and Behn's "Essay on Translated Prose", before finishing with translation samples and commentary on the main source text of this portrait, the *Entretiens*.

3. Translation Commentary and Samples

The Oracles

The *Entretiens* was the second of two translations Behn did of Fontenelle. The first, the 1686-7 *History of oracles, and the cheats of the pagan priests*³⁸, argues in a pair of essays

³⁸ Original 1686, Translation 1688. *Histoire des oracles*. Written in Latin by Dr. Van-Dale; made

written in a para-scientific style that oracles were not the supernatural product of demons and that further, they did not end with the birth of Jesus but rather continued into the early years of the Christian church. In arguing these points, Fontenelle “subtly attacked religious orthodoxy and blind obedience to authority while ostensibly disproving the pagan belief in oracles and upholding the scientific method”³⁹. The Jesuits⁴⁰ quickly published a rebuttal of these views of their former student, to which Fontenelle did not respond.

Such a publication may strike modern readers as an odd, pseudoscientific, even occult text, but it was at the time not unusual (pseudoscience and science were far from being clearly defined, let alone sorted out⁴¹, and, further, science and religion had not yet undergone the dramatic, even unnatural separation they remain viewed under even today); in fact, such topics were of considerable interest to the public, who, in England and France for example, had suffered years of protracted religious warring at the hands of secular and religious rulers,

English by Mrs. Behn. London : Printed by W.O. for Sam. Briscoe. Of note, the French “original” was in fact Fontenelle’s own translation and major reworking of Dutch Anabaptist physician van Dale’s *De Oraculis Ethnicorum* [‘on the pagan oracles’]. Van Dale was the first Christian writer to assert that the pagan oracles were not ‘marvellous’ phenomena, but could rather be explained by non-supernatural causes; as Scribner’s explains, this was a dangerous suggestion, as “it led to casting doubt on miracles – fundamental ideas of Christianity that do not agree with scientific truths discovered through reasoning and experiment” (*Scribner’s Dictionary of Scientific Biography*, entry “Fontenelle”, 1970, p.60).

³⁹ Benet 1948.

⁴⁰ One particularly opposed Jesuit was Jean-François Baltus, who attacked Fontenelle in 1707 and 1708, “following the fifth edition of the *Histoire des oracles*” (*Scribner’s Dictionary of Scientific Biography*, entry “Fontenelle”, 1970, p.60). On Jesuits and science, see Peter Dear, “Chapter 2: Experience and Jesuit Mathematical Science: The Practical Importance of Methodology”. In: *Discipline and Experience: The Mathematical Way in the Scientific Revolution*. Chicago: U. Chicago Press, 1995.

⁴¹ Even Sir Isaac Newton himself, for example, was vigorously curious about alchemy, and conducted many experiments in this area in addition to his many more lasting and illustrious achievements. At the time, the structure and nomenclature of the elements was still almost wholly unestablished. See the Appendix for some examples of important chemical translations, including by D’Arconville and Lavoisier – the latter’s husband one of the fathers of the Chemical Revolution (*Traité Élémentaire de Chimie*, 1789). Related article: Bert Hansen, “The Complementarity of Science and Magic before the Scientific Revolution”. In: *American Scientist* (March 1986).

so that a text challenging such authority came to be quite a curiosity, with French and English reprints well into the 19th century.

Though it is not clear how Behn came into contact with the French original, nor whether she was directly commissioned to translate it⁴², that Behn should have chosen this quirky text soon becomes explicable with even a brief look at the themes of skepticism and (religious) authority therein, as explained well by Behn herself in the Preface to her English translation:

...this small piece...I most humbly dedicate to your Lordship. 'Tis a Discourse of *Religion*, in a time when we have scarce any other Theme;...I believed it ...ridiculous to ...not be arguing some points of Religion. ... But least, ... as many do, ... we shall treat here only of the *Pagan Religion*, and of the abominable Cheats of the *Oracles* and their *Priests* (A5 reprinted in Marsak:1970).

After all, Behn could have chosen any of a number of religious texts⁴³. Here, she was able to keep with a popular theme of the day while working with a text she herself enjoyed as a reader for its wit. As in her theatrical prologues and epilogues, a new and popular form of expression in the Restoration theatre, Behn – as a translator – generally made liberal use of prefaces and footnotes to explain her understanding of a given translation project; this seems in keeping with her outspoken personality in other respects as well, and offers the modern reader a fortunate insight into the translation process, especially as conducted by a woman.

⁴² Again here, the paucity of documentation to date on Behn's *interior* life makes a certain amount of speculation inevitable, though these educated guesses are plausible enough, based as they are on a sizable body of scholarship around Behn and her Restoration milieu.

⁴³ The association of women with the translation of religious texts is not uncommon in the history of translation, though Behn can hardly be said to be fulfilling *that* particular destiny in this instance; neither she nor the source text were of the typically (at least externally) devout, retiring variety of translator explored in modern scholarship on such women. See, for example, Hannay's *Silent but for the Word*.

This first translation for Fontenelle also gave Behn a chance to promote the works of two Continental authors, Dutchman van Dale and Frenchman Fontenelle. As Greer notes, Behn was remarkably well-read in Continental literature:

In order to understand how [Behn's] work overlaps with the work of others we have to pay more and more intelligent attention to her individual contribution, in particular to her awareness of continental literature, not only French but Italian and Spanish as well. ... Aphra Behn was a committed European, drawing her intellectual life-blood from Catholic Europe, at a time when England had cut herself adrift in order to exploit her imperialist, mercantilist, capitalist supremacy (Greer 1989:10).

Again here, common themes and a Continental mindset were not the only reasons Behn would have felt some affinity for the French Catholic author 27 years her junior. After all, he was interested in popularizing texts for the general public, he championed learning for women, he did not shy away from more difficult topics such as religious authority or the (still) new heliocentric cosmology, and he had translated as well as written, especially in his capacity as permanent secretary to the Académie des Sciences. In other words, Fontenelle was highly visible (and esteemed) as a scholarly writer, just as Behn was highly visible (if less positively viewed) as a playwright; in practical terms, this gave Fontenelle's source texts high visibility⁴⁴, and set up the potential for high visibility of any target texts as well, including Behn's⁴⁵.

⁴⁴ For example, refer to Kathleen Nulton Kemmerer's presentation, "Pekuah and Astronomy: The Influence of Fontenelle's *Entretiens sur la pluralité des mondes*". October 27, 1991. East-Central American Society for Eighteenth-Century Studies. Millersville University, Millersville, PA.

⁴⁵ "In 1686 Bernard le Bovier de-Fontenelle published his *Entretiens sur la pluralité des mondes*. ... Seven editions had appeared by 1724, four more were published during the eighteenth century, and at least nine in the nineteenth century. The work became a world-classic with a total of almost one hundred editions in at least six languages. Within two years of its French publication it was translated into English three times, one of the translations, fittingly enough, by a woman, Aphra Behn's *A Discovery of New Worlds. From the French* (1688)". Entry "Virtuoso" by Marjorie Hope Nicolson. In: *The Dictionary of the History of Ideas: Studies of Selected Pivotal Ideas* (Philip P. Wiener, ed.). New York: Charles Scribner's Sons, 1973-74. Now out of print, but available on-line through the Electronic Text Center of the University of Virginia Library.
< <http://etext.lib.virginia.edu/cgi-local/DHI/dhi.cgi?id=dv4-65>>.

Because the focus of this dissertation is on scientific material, the main text of interest here is not the *Oracles*, but the *Entretiens*. In another period of financial strain, yet perhaps buoyed by the success of the *Oracles* translation⁴⁶, Behn now translated this second work by Fontenelle, despite her failing health. It holds a certain additional interest because it is preceded by her "Essay on Translated Prose".

The "Essay on Translated Prose"

Perhaps inspired by the appearance of such translation commentary as Roscommon's 1684 *Essay on Translated Verse*⁴⁷ and Dryden's 1668 *Essay on Dramatick Poesie*, perhaps also eager to contribute a formal essay to the body of works by women as her health began to fail her, Behn prepared what Day⁴⁸ calls a "labor of love" since it "would not have been a very

⁴⁶ As biographer Montague Summers puts it, "Her weakness, lassitude, and despondency are more than apparent; yet bravely buckling to her work, and *encouraged by her success with Fontenelle's Oracles*], she Englished with rare skill his *Theory of the System of Several New Inhabited Worlds*, prefixing thereto a first-rate 'Essay on Translated Prose'" (emphasis mine). Montague Summers, *A Memoir of Mrs. Behn*. Rendered into HTML on Sat Nov 28 16:02:12 1998, by Steve Thomas for The University of Adelaide Library Electronic Texts Collection. On-line at <http://etext.library.adelaide.edu.au/b/b42m/>.

⁴⁷ A friend of Dryden, "Roscommon engaged that great man's sympathy for his favourite project, the founding of a British Academy which should 'refine and fix the standard of our language'." See [<http://www.bartleby.com/218/0814.html>]. Also, As Samuel Johnson himself explains in the *Lives of the Poets*, it was none other than Roscommon who stimulated Dryden to more closely examine his own ideas about the rules of translation: [Roscommon's] great work is his *Essay on Translated Verse*; of which Dryden writes thus in the preface to his *Miscellanies*: 'It was my Lord Roscommon's *Essay on Translated Verse*,' says Dryden, 'which made me uneasy, till I tried whether or no I was capable of following his rules, and of reducing the speculation into practice'. Roscommon, whose other great work on translation was a translation of Horace's *Ars poetica*, as *The Art of Poetry*, urged that "the author should be suitable to the translator's genius; that he should be such as may deserve a translation; that he who intends to translate him should endeavour to understand him; that perspicuity should be studied, and unusual and uncouth names sparingly inserted; and that the style of the original should be copied in its elevation and depression. These are the rules that are celebrated as so definite and important; and for the delivery of which to mankind so much honour has been paid. Roscommon has indeed deserved his praises had they been given with discernment, and bestowed not on the rules themselves, but the art with which they are introduced, and the decorations with which they are adorned...". In: Johnson, Samuel. "Preface to Roscommon." *The Penn State Archive of Samuel Johnson's Lives of the Poets*. Ed. Kathleen Nulton Kemmerer. 1 September 2000. Available on-line at <http://www.hn.psu.edu/faculty/kkemmerer/poets/roscommon/default.html>.

⁴⁸ Day 1986:374. Day's is one of the few scholarly articles on Behn's *Essay*, which he reports had been

salable pamphlet". This essay, roughly sixteen pages long, proceeds from a discussion of etymology and the relative ease of translation across various languages, to a reconciliation of the Copernican system with Biblical cosmology, to a reasoned attack on the factual reliability of Scripture, with a total of four pages devoted to language and translation, all of topical interest. As Behn herself introduces the composite volume on the title page, it contains:

A Discovery of New Worlds. From the French. Made English by Mrs. A. Behn. To which is prefixed a PREFACE, by way of an ESSAY on Translated Prose: wherein the Arguments of Father *Tacquet*, and others, against the System of *Copernicus* (as to the Motion of the Earth) are likewise considered, and answered: Wholly new...[1688].

Throughout, Behn applies logic and a close examination and comparison of texts, a method unusual for men or women of her time, though essential to the modern reader. As Day opines, if in the occasional low spot the style is crabbed, the syntax cloudy, nonetheless Behn's examples are historical and descriptive, and her defence of the Copernican system is still advanced for her time. As well, the pure skills of reasoning demonstrated by Behn in the *Essay* are certainly among those required of the diligent translator, and as such are to be inferred as among Behn's own conscious or unconscious skills for successful translation.

Specifically, Behn's thoughts on translation in the *Essay* are not uncommonly summarized with the following citation, which is discussed more below in connection with Carter's praxis:

...this is the great Misfortune of translating French into English: If one endeavours to make it *English* Standard, it is no Translation. If one follows their Flourishes and Embroideries, it is worse than *French* Tinsel.

treated only twice previously, in Turner (*Notes and Queries* 199, December 1954) and in an anonymous article in the *St. James Magazine* (1863, available in Duchovnay 1971:235-6).

Whether to domesticate or to foreignize, to be *cibliste* or *sourcier*, was a common concern then as now, even if those terms as such would not have been familiar to Restoration translators; as Dryden put it⁴⁹:

In short, the verbal copier [i.e., translator] is encumbered with so many difficulties at once, that he can never disentangle himself from all. He is to consider, at the same time, the thought of his author, and his words, and to find out the counterpart to each in another language; and, besides this, he is to confine himself to the compass of numbers, and the slavery of rhyme. 'Tis much like dancing on ropes with fettered legs: a man may shun a fall by using caution; but the gracefulness of motion is not to be expected: and when we have said the best of it, 'tis but a foolish task; for no sober man would put himself into a danger for the applause of escaping without breaking his neck.

Still, at the time, the English climate for translation, influenced as it was by literature, recognized the importance of the writer-as-translator, and accepted a range of expressive forms, from strict translation through distant imitation (see also footnote 24), though Dryden did caution against going all too far astray from the source text⁵⁰, of which practice he perceived his colleague Cowley⁵¹, for example, to be guilty.

It is important to note that Behn's *Essay on Translated Prose* can be understood as referring as much as to prose *that has been translated* (and is one source of Behn's learning, such as it is demonstrated in the *Essay*), as to *how to translate* prose; for it was in part prior access to *translations* in the vernacular (i.e., prose that had been translated) that likely offered Behn the

⁴⁹ From the Preface to Dryden's translation of Ovid's *Epistles*, reprinted in Schulte, R. and Biguenet, J. *Theories of Translation: An Anthology of Essays from Dryden to Derrida*. Chicago 1992, p.17.

⁵⁰ As explained in "About Translation" (Central Institute of Indian Languages, Mysore), John Dryden (1697) *initially* advised paraphrase (translation with latitude where the author's words are not so strictly followed as his sense), but later advocated a point *between* paraphrase and metaphrase (Word by word and line-by-line translation). On-line at www.anukriti.net.

⁵¹ In his preface to his Pindaric odes, Cowley argues that a good translator must not simply aim to create a close copy of an original in another language [because] "I never saw a *Copy* better then the *Original*, which indeed cannot be otherwise, for men resolving in no case to shoot *beyond the Mark*, it is a thousand to one if they shoot not short of it." "Upon this ground," as a good translator -- and Cowley finds the term inadequate for what he does -- he has "taken, left out, and added what I please." Ellen Moody (George Mason University), "Anne Finch as Translator", 1993-4. On-line article available at <http://www.jimandellen.org/finch/astranslator.html>.

impressive background knowledge outside formal education, traditionally reserved for males⁵². As such, it is not unusual that those of Behn's comments related to the practice of translation amount to only one quarter of the text⁵³; this was not her only demonstration point in the essay. While not a towering presence in the annals of translation commentary, Behn's *Essay* nonetheless warrants consideration in the context of her not unconsiderable knowledge, the translation dialogue of her day, and as an expression of a translator's voice in association with what was to become a widely circulated volume (see footnote 45, p.113). Finally, Behn's *Essay* bears witness to a woman writing in reasoned essay form on a topic of recognized importance among her peers: translation.

The *Entretiens sur la pluralité des mondes* / *Conversations on the Plurality of Worlds*

Topic

As noted previously, in Backdrop Two, 1680s Europe (when both the original *Entretiens* and its English translation(s) were published) was marked by considerable interest in cosmology. This interest was fed by a number of unusual events in astronomy, including the appearance of comets in 1665 and 1680 (Halley's); unusual sunspot activity in 1676, 1684, and 1686; an eclipse of the sun in 1684, and the discovery of two new satellites of Saturn. The nature of comets would continue to be widely discussed, and Fontenelle himself published a 1681 comedy *La Comète*, traces of which - according to Shackleton - can be seen in the *Entretiens* (Shackleton 1955:7).

Yet underlying these visible phenomena was the true spark: the "new", heliocentric

⁵² Interestingly, both Day (1986) and the anonymous author of *Defense of the Female Sex* (1696) argue that women may ultimately have *benefited* from a lack of formal education by the unprejudiced inquiries and insights into a variety of topics that resulted. For a comparative example of a boy counterpart's childhood education, see the Appendix on the Westminster School Curriculum in Winn's 1987 John Dryden biography.

⁵³ By comparison, Dryden's *Preface* (to *Ovid's Epistles*) of nineteen pages contains nine pages directly on translation.

cosmology, also discussed in Backdrop Two. These practical and theoretical developments in cosmology, together with a growing general audience for science, and a demand for texts in the vernacular⁵⁴, meant that the *Entretiens* arrived against a ready backdrop, both *recording* and *contributing* to the major currents of early Enlightenment thought.

Structure and Format

Both a popular defence of the new heliocentric cosmology and a stylistically fanciful discussion, the *Entretiens* includes a preface and a (fictional) letter in support of teaching women (natural) philosophy. These are followed by the main text: six philosophical dialogues over the course of six evenings of instruction in natural philosophy (mainly the heliocentric cosmology) between the narrator and an unnamed Marquise, whose real identity has been much speculated upon.

A useful summary of the six evenings' content is offered here⁵⁵:

Fontenelle's visit with an unnamed marquise serves as the occasion for six dialogues that tell about the universe and its mode of operation. The first, in which Fontenelle has a chance to expound the Copernican system. The second chapter describes the appearance and behaviour of the moon, and considers the possibility of inhabitants on that body. The same treatment is accorded the planets in the third, while the solar system as a whole is explained in terms of the Cartesian vortex [*tourbillon*] in the chapter that follows. The last conversation expands the field of the vortices to include the fixed stars and the systems of planets that Fontenelle was sure they carry with them. To these five conversations [was later] added a sixth in which the author provided a metaphysical foundation for the description offered previously.

⁵⁴ According to Shackleton, "French was rapidly replacing Latin as the language of learned intercourse, and scientific problems were becoming increasingly the concern of polite society" (1955:2). In more recent scholarship, England's own toward the vernacular is identified as having begun even earlier; see, for example, the forthcoming *Medical and Scientific Writing in Late Medieval English*, (Irma Taavitsainen and Paivi Pahta, eds.). Cambridge: Cambridge U. Press, (Not yet published - available from December 2003).

For women and the vernacular, see also Barbara T. Gates and Ann B. Shteir. *Science in the vernacular: women who have popularized science*. U. of Wisconsin Press, 1997.

⁵⁵ Shackleton 1955:xxvii.

As his format, Fontenelle chooses dialogues; this light touch that invites serious consideration was to captivate his audience, as a “first example in French of a learned work placed within the reach of an educated but nonspecialized public”⁵⁶. Meanwhile, *outside* France, this successful format had actually preceded Fontenelle’s in works such as by Galileo⁵⁷ and Kepler⁵⁸, and came to be imitated in many works thereafter, including not only Fontenelle’s but also in the Algarotti text in Portrait Two (Carter), and, even into the 19th century, in Jane Marcet’s *Conversations on Chemistry*, a bestseller of the 1800s⁵⁹. Indeed, both the topic and the format reveal Fontenelle’s taste for “the exposition of scientific ideas and his censorious and mocking attitude towards everything that seemed to him to be preconception or myth”⁶⁰. Also evident is his sensitivity to human feeling and an ability “to draw subtle moral observations in a lively style, by placing his characters in comical situations”⁶¹. These traits locate Fontenelle as within his – pre-Enlightenment – day, with its growing taste for rational / scientific expression and for humour and wit in form.

⁵⁶ Gillispie 1970.

⁵⁷ “La divulgación de las ciencias, como género literario, comenzó en los siglos XVII y XVIII. Es muy difícil señalar una obra y una fecha como la primera, pero no hay duda de que una obra precursora es el *Dialogo sopra i due massimi sistemi del mondo, tolemaico e copernicano* (1632) de Galileo Galilei, escrita en lengua vulgar y en forma de diálogo entre tres personajes”. Vladimir de Semir (Instituto Municipal de Investigación Médica – IMIM). “Aproximación a la historia de la divulgación científica - Introduction to science popularization”. Editorial in: *QUARK (Ciencia, Medicina, Comunicación y Cultura)*, special issue *Divulgadores de la Ciencia* octubre 2002 - diciembre 2002, Número 26. Available on-line at <<http://www.imim.es/quark/num26/>>.

⁵⁸ Kepler, Johann, (1610), *Kepler’s Conversations with Galileo’s Sidereal Messenger, 1st complete translation, with an Introduction and Notes*, by Edward Rosen (New York: Johnson Reprint Corp., 1965).

⁵⁹ Jane Haldimand Marcet (1769 – 1858) married a Swiss doctor and professor of medicine, and soon thereafter began writing instructive books for young people, on a range of topics. Her *Conversations on Chemistry*, for example, first appeared in 1806 and was a long-running title. In an interesting shift from the earlier format of Fontenelle and Algarotti, its three protagonists are *all* women: the instructor (Mrs. B.) as well as her two young students, Caroline and Emily. This would seem to represent a positive step in the long development toward the acceptance of women in science.

⁶⁰ Gillispie 1970:58.

⁶¹ Gillispie 1970:59.

Audience and Reception

Fontenelle's intentions to explore ideas and engage the reader were complemented by his desire to popularize knowledge for an uninitiated audience, as represented by the Marchioness. Though the *Entretiens* was not destined solely for women, it was part of a growing trend toward both popularizations of science in general, and of popular science for women; as Fontenelle himself later clarified, "les ignorants étaient mes vraies marquises"⁶².

The work was greeted with several positive reviews, including the brief first (*Journal des savants*, 22 April 1686, anonymous), and a more lengthy treatment by Bayle (*Nouvelles de la République des lettres*, May 1686)⁶³. Whether the arrival of Newton's *Principia* just one year after the French original is interpreted as fortunate (further promotion of the heliocentric universe) or unfortunate (rejection of Cartesian vortices) the fact remains that Fontenelle's *Conversations on the Plurality of Worlds* stands as a recognized landmark in the popularization of science.

Concurrent Translation as Branding

In one measure of the work's popularity and reach, the *Entretiens* went through no fewer than 20 editions (see footnote 43) from 1686 into the 19th century, as well as becoming the object of a number of (concurrent) English translations⁶⁴, excerpts from which appear below in the **Samples** section. Nonetheless, Behn's translation remains closely associated with Fontenelle, and widely recognized. I take this as a measure of their combined standing in

⁶² 1699, reprint in Shackleton 1955:178.

⁶³ There was also praise from Montesquieu and irreverent acknowledgement from Voltaire in the form of a satire, *Micromégas* and by the 1694 La Bruyère character Cydias in *Les Caractères* (Shackleton 1955: 11).

⁶⁴ Including those by John Glanvill (1688, published for R. Bentley and S. Magnes, who were Behn's publishers as well), and William Damvile, whose name also appears as Damville or Domville, a.k.a. W.D. Knight (1687, by Andr. Cook and Sam. Helsham, for William Norman). A more recent translation appeared by H.A. Hargreaves in 1990.

society, and their shared intentions, or “simpatico”. Given the very minor variation across the concurrent samples below, Behn’s dominance can be interpreted as *branding*, an idea discussed in Backdrop Two. In other words, a certain external factor, in this case Behn’s active lifestyle in the theatre and letters, served to generate an advance audience for a publication that would stand out as recognizable and widely obtainable. The second translation thread, *translation as repatriation*, is discussed next.

Translation as Repatriation

Note especially that, although Newton’s ideas on a range of subjects were indisputably in circulation (at least to a small audience of trusted colleagues) the *Entretiens* appeared in 1686, i.e., one year before Newton’s masterpiece the *Principia* itself was published, even though his ideas were already in circulation. This fortunate timing helped Fontenelle and Behn set the popular stage for Newtonism, which would require well over an entire further century of explication, by a wide range of writers, for scientists as well as the popular audience.

In the meantime, works such as this translation by Behn had the effect of repatriating Newton’s still new and radical cosmology into England via the intermediary of a highly regarded French intellectual. Fontenelle’s support of Newton’s work, coupled with his accessible style and his own considerable standing in society, would have encouraged a wide readership to consider ideas that were still unfamiliar and even threatening. Filtered through the eyes of “an Other” (as translation studies might call Fontenelle) Newton’s ideas could now be considered at a remove (of distance, of ideas, of translation) by the English audience, and with a sense of pride in one of their own so highly regarded by a Frenchman. Taken as such, Behn’s translation is important not just for the timely dissemination of new scientific thought, but also for its effect of scientific engagement with a growing popular audience, an audience

that would in turn shape how scientists interacted with the world around them.

Behn's Translation Project

As Behn explains in the *Essay*, she was interested in translating *Discovery* for several reasons: the success of the French original both in France and England; Fontenelle's reputation; the novelty of the subject in vernacular languages; and the depiction of a woman learning science. Though little copy exists in Behn's own hand on her translation habits, the speed with which she produced good results suggests she wrote swiftly and fluently, whether out of character or habit, or the one become the other. Nonetheless, there *were* difficulties during this translation, as Behn herself reports; poor health and time pressure may have contributed (emphasis mine):

And I resolv'd to give you the French Book into English, or to give you the subject quite changed and made my own; but *having neither health nor leisure for the last* I offer you the first such as it is⁶⁵.

As it was, the bulk of her preparation may have focussed on the prefixed *Essay*, which required not only personal research on points of history, Biblical content, and linguistics, as mentioned earlier, but also several scientific updates and corrections to Fontenelle's text based on Behn's familiarity with such scientists (natural philosophers) as Descartes and his French popularizer Rohault, as in this example:

I have made bold to correct a Fault of the *French Copy*, as to the height of our Air of Sphere of Activity of the Earth, which the *French Copy* makes twenty or thirty Leagues, I call it two or three, because sure this was a Fault of the Printer, and not a mistake of the Author. For Monsieur Des Cartes and Monsieur *Rohalt*, both assert it to be but two or three Leagues.

As for her source text author, Behn generally finds Fontenelle's "way of Arguing extreamly

⁶⁵ Reprint in Todd 1996:86.

fine, and his Examples and Comparisons are for the most part extraordinary, just, natural, and lofty" ⁶⁶. Nonetheless, she finds both the source text and the depiction of the Marquise inconsistent in places: [the Marquise alternates from] "a great many very silly things" to "Observations so learned, that the greatest Philosophers in *Europe* could make no better". Perhaps it was the message of mitigated female intelligence in this practice that rubbed Behn the wrong way, despite her general praise for Fontenelle and his intentions as popularizer.

Concurrent Translations: Glanvill and Damvile

As for the concurrent translations, I include samples from John Glanvill and Sir William Damvile (a.k.a., W.D. Knight). Relatively little is known of either of these men as translators, apart from some biographical and professional information⁶⁷. Translation seems to have been an only occasional activity for both, and how they came to select or be commissioned for the *Entretiens* text is unclear. Certainly their relative lack of authorial visibility seems to have left both men quite a low profile compared to that of Behn and her translation, despite the fact that she, as a woman, might otherwise have been less visible than they.

Though Glanvill did write a number of panegyrics and odes, Damvile seems to have been

⁶⁶ Behn, "Essay on Translated Prose". Spearing and Todd, among others, have argued that Behn, with her experience in espionage, of becoming the other, and in "passing" in a world of men, was well-suited to cohabitation with the original author.

⁶⁷ John Glanvill, b. 1659, married July 20, 1698, at St. Paul's Cathedral, Miss Anne Eyre of the ancient family of Eyre of Wiltshire, but did not leave any issue. John eventually retired to Putney, where he died; on a black gravestone in Putney churchyard is the following inscription to his memory: "Here lyeth interr'd the body of / John Glanville, Esqre, late of Broadhinton/ in the county of Wilts, who/ departed this life the/ 24 day of August, Anno Dom. 1715,/ in the 56 year of his age." See Jay Glanville's website for *Records of the Anglo-Norman House of Glanvill*.

[<http://ourworld.compuserve.com/homepages/jglanville/glanville.htm>]

William Domville II (also Damvile, dates uncertain) represented the Borough of Antrim in Parliament, and was knighted by the Duke of Ormond. Information on his family is transcribed and posted at [<http://indigo.ie/~kfinlay/ball1-6/balllist.htm>], and was originally published by Francis Elrington Ball in *A History of the County Dublin/The people, parishes and antiquities from the earliest times to the close of the eighteenth century*. (Dublin, January, 1902; see Chapter 4).

primarily a figure in legal and political circles. Whether they became acquainted with one another this way, or remained unaware of the concurrent translations, is as yet unknown. At the very least, though, Glanvill and Behn did share the same publishers, R. Bentley and S. Magnes.

As for the close dates of publication (Damville, 1687; Glanvill in 1688; and Behn also in 1688), when nearly identical materials appear so close on the heels of a first translation, one concern becomes whether the second and third texts were somehow copied from the first. The rush to publish was certainly known to authors in history as much as today; a less reputable publisher might have commissioned multiple translators, offering payment to the first to finish; or the popularity⁶⁸ of the text may have moved several potential translators within the overlapping social and scientific circles to take on Fontenelle; or Fontenelle himself may have had contact with only one of the three, the other two having operated independently or in the service of a wealthy or royal patron. This coincidence of nearly simultaneous translations occurs in several of the portraits in this dissertation, and will be treated in each case.

Finally, if Behn's translation (1688) appeared after Damville's (1687), however soon thereafter, might it not have been *Behn* who copied from *his* work, if even only to "improve" upon it? Accusations of plagiarism were notably flung at her for her original writing⁶⁹, which she (and her supporters) defended as thorough reworkings and improvements of defective texts or story lines; this Elizabethan practice was not uncommon into the Restoration. If, as the samples above demonstrate, there is no major distinction across the three translations, what motivation could Behn possibly have had for challenging Damville's publication with one of her own? Did the geographical distances between cities, even London and Dublin, make

⁶⁸ As Shackleton notes, "That it was, almost at once, scientifically superseded by Newton's *Principia*, did not prevent it from having a very wide diffusion both in France and abroad" (1955: 45).

⁶⁹ See, for example, "Chapter XV" of Duffy's *The Passionate Shepherdess* (1977).

for slow and uncertain transmission of Damvile's translation to the English capital, opening up a market for Behn, whose audience (or publishers) would have heard reports of a translation in the works, and wanted one for themselves? As for Glanvill, perhaps publishers felt a translation by a man would sell better, once Behn's novelty as a free-spirit had begun to pale. Given her tremendous output at the time, though, it is of course possible that Behn accepted or was commissioned the translation, then risked not meeting the obligation quickly enough, forcing her publishers to turn over the project to a back-up client, Glanvill. Whatever the reasons, the fact remains that it is Behn's translation that stands associated with Fontenelle, and her visibility that lent her text its cachet.

Overview of the Samples

Regarding the samples seen below, I note first and foremost that here, as in all subsequent portraits, they are brief, and have been selected to give readers an impression of the text and of the translator's approach. Their purpose is not to undertake an examination of minutiae, but rather simply to demonstrate, in this case:

the fact of Behn's work as a scientific translator

the stylistic influence of Behn's primary occupation of playwright⁷⁰;

the moderately close correlation to the source text (rather closer than in Behn's more assertive work as literary translator or author / playwright / imitator – this suggests she chose her translation styles in accordance with cues perceived within the source text genre);

the existence of concurrent translations;

and the similarities across the Behn, Glanvill, and Damvile texts, though with Behn in

⁷⁰ Also, it is useful to recall that Behn "revered [Abraham] Cowley's achievement as a poet" (Spearing 1985: 155) and that while his metaphysical poetry soon fell out of favor, Cowley was also one of the pioneers of a new style of essay: his essays "were written in an easy, artless, almost conversational style, in marked contrast with the formal manner of earlier essay-writers such as Bacon" (Morrah 1979:96). To the extent that it is possible to assume the style of another, Behn may have chosen Cowley's artless conversation as a model in translating the five dialogues between the Marquise and her visitor.

places noticeably expanding the non-scientific content, as was her wont.

Since Behn herself finds Fontenelle's book "very unequal; the first, fourth, and the beginning of the fifth Discourses are incomparably the best" (reprint in Todd 1996:77), I offer below selections from the first Discourse, along with comparative samples by translators Glanvill and Damvile. In Behn's own words, "I have laid the Scene at *Paris*, where the Original was writ; and have translated the Book near the Words of the Author" (reprint in Todd 1996:86).

The first sample features a series of standard, gendered pleasantries between the Marquise and her visitor, before he is persuaded finally to teach her. The second moves to the Marquise's central challenge to the visiting instructor: she wants to learn about Natural Philosophy. The third sample shows the Marquise overcoming the visitor's initial resistance; he begins what he intends to be just one brief night of instruction, a night that turns into the full five of the *Conversations* (six in a subsequent Fontenelle edition). The fourth and final sample shows how far the dialogue has shifted from the social discourse of beauty and romance in the beginning of the first night (Sample One) to the factual, though still witty, scientific instruction that sets in just a few pages into the text (Sample Four).

Aspects of Behn's Translation Praxis : Samples and Commentary

The fact of Aphra Behn's work as a scientific translator and the existence of concurrent translators, as well as information on the *Essay on Translated Prose* and the *Oracles*, have appeared in the preceding sections of this portrait.

The purpose of this section, and the translation samples it includes, is not to offer an exhaustive analysis of Behn's body of (non-literary) translation (i.e., her *Essay on Translated Prose*, her translation of Fontenelle/Van Dale's *Oracles*, her translation of Fontenelle's *Conversations*, or even her translation of *Seneca's Maxims* by La Rochefoucauld), but rather

more to discuss a number of specific aspects of Behn's translation praxis.

In their structure of presentation, these aspects will highlight Behn's various forms of visibility (as a writer, as a translator, as a scientific translator, as a woman translating science), as well as locating her within the translation and scientific backdrops of her day.

1. Behn's (underlying) visibility as writer

The potential status conferred upon translators and their translations by the primary occupation of writer was explored in Backdrop One. In Aphra Behn's case, her primary recognition was achieved through her work as England's first professional female author, in particular as a playwright. Behn's experience in this field of literature comes through in her translation as well, expressed, for example, in facets of enhanced **communication with the audience**.

By this I mean simply two things: to inscribe Behn (as writer) within the communicative thrust of her Restoration milieu, and to underscore her affinity (as translator) with the dialogue format of Fontenelle's source text. For, as Benedict⁷¹ points out, Behn's concern, (both as playwright, and as editor of various miscellanies - a form that enjoyed considerable growth in the day) with **oral immediacy** locates her within an anthological movement that aimed, among other goals, to celebrate "a coherent court culture unified by Royalist ideology that blends political and social themes" and, in transferring oral verse to print, to "[equate] theatrical verse with classical literature", thus "[embodying] high literary culture for a middle-class audience". These predilections for oral expression, blended themes, and dissemination to the masses meant Behn was well within line of the scientific, didactic, and feminist angles of Fontenelle's text, especially expressed as they were in a series of

⁷¹ Barbara M. Benedict . *Making the Modern Reader: Cultural Mediation in Early Modern Literary Anthologies*. "Chapter Two: Reading and Heteroglossia in the Restoration". Princeton U. Press, 1996.

dialogues between the Marquise and her visiting instructor.

Thus, at the macrolevel, Behn's attention to communication⁷², even outside the playhouse, can be seen in her very choice to translate Fontenelle, who wrote the *Conversations* source text in what was then a relatively new and increasingly popular **dialogue format**, a format generally suited to Behn's playwright interest in mimicking spoken expression.

2. Behn's visibility as a translator

Proceeding now from these underlying imprints left by Behn's *writerly* foundations, I find that Behn's visibility as a *translator*, too, can be seen in her use of a number of strategies, **paratextual** as well as **textual**.

2.a Paratextual commentary

Behn makes use of paratextual commentary for a number of purposes. First, in the *Essay* that precedes her translation of the *Conversations*, Behn begins by explaining **why** she was interested in translating this text : the success of the French original both in France and England; Fontenelle's reputation; the novelty of the subject in vernacular languages; and the depiction of a woman learning science. In her own words⁷³:

The general Applause this little Book of the Discovery of several Worlds has met with, both in *France* and *England* in the Original; made me attempt to translate it into *English*. The Reputation of the Author, (who is the fame that writ, *The Dialogues of the Dead*,)

On-line at <http://pup.princeton.edu/books/benedict/>.

⁷² This overarching interest is seen also in Behn's reported reverence for (fellow translator) Abraham Cowley's achievements as a poet and essayist (Spearing 1985 :155). As Morrah notes (1979:96), while Cowley's metaphysical poetry soon fell out of favor, he remained one of the pioneers of a new style of essay: his essays "were written in an easy, artless, almost conversational style, in marked contrast with the formal manner of earlier essay-writers such as Bacon". To the extent that it is possible to assume the style of another, Behn may have chosen Cowley's artless conversation as one important model in translating Fontenelle's dialogues between the Marquise and her visitor.

⁷³ *Essay on Translated Prose*. Available on-line through the generosity of the Emory Women Writers Resource Project, Professor Sheila Cavanaugh, Director.
Go to: <http://chaucer.library.emory.edu>

the Novelty of the Subject in vulgar Languages, and the Author's introducing a Woman as one of the Speakers in these five different Discourses, were further Motives for me to undertake this little Work.

Next, she offers her assessment of Fontenelle as a source text author whose "way of Arguing [is] extremely fine, and [whose] Examples and Comparisons are for the most part extraordinary, just, natural, and lofty" ⁷⁴. Nonetheless, she does qualify this admiration by finding the text "very unequal; the first, fourth, and the beginning of the fifth Discourses are incomparably the best". ⁷⁵

In an instance of her understanding of source text content, Behn also takes a paratextual opportunity to correct what she interprets to be a printer's mathematical fault, thereby demonstrating not only her understanding of her role as translator, but also her familiarity with such scientists as Descartes and his French popularizer Rohault:

I have made bold to correct a Fault of the *French Copy*, as to the height of our Air of Sphere of Activity of the Earth, which the *French Copy* makes twenty or thirty Leagues, I call it two or three, because sure this was a Fault of the Printer, and not a mistake of the Author. For Monsieur Des Cartes and Monsieur *Rohault*, both assert it to be but two or three Leagues.

Also in the *Essay*, Behn comments more directly on issues of translation, including such essential difficulties as the incommensurability of language, and the search for a just medium between word-for-word and sense-for-sense approaches, as in the following two quotes introduced earlier :

I thought an *English* woman might adventure to translate any thing, a *French* Woman may be suppos'd to have spoken: But when I had made a Tryal, I found the Task not so easy as I believ'd at first.
... [For] this is the great Misfortune of translating French into English: If one

⁷⁴ Behn, "Essay on Translated Prose". Spearing and Todd, among others, have argued that Behn, with her experience in espionage, of becoming the other, and in "passing" in a world of men, was well-suited to cohabitation with the original author.

⁷⁵ Reprinted in Todd 1996:77.

endeavours to make it *English* Standard, it is no Translation. If one follows their Flourishes and Embroideries, it is worse than *French* Tinsel.⁷⁶

Was this profession of difficulty simply a gesture in deference to the modesty often seen in translators' prefaces, particularly those by women, or had Behn had real difficulties with the text? She *had* translated French many times before, and she had recently published another translation of Fontenelle; so, whence her difficulties? One possible answer is found in another example of paratextual commentary on the overall project; in this quote, also first introduced above, Behn suggests that poor health and time pressure may have played their part, leading to an altered approach to the source text, away from a liberal rendering and ultimately closer to a strict translation:

And I resolv'd to give you the French Book into English, or to give you the subject quite changed and made my own; but having neither health nor leisure for the last I offer you the first such as it is⁷⁷.

And yet, Behn's result ultimately belies this tension between strict translation and her original intention of actually reworking the text. For while her stated strategy was to remain close to the source text ("I have laid the Scene at *Paris*, where the Original was writ; and have translated the Book near the Words of the Author"⁷⁸) in fact Behn *did* interpolate material into the translation, to varying effect, as we see next in the textual commentary samples.

2.b Textual commentary

Although, regrettably, no known commentary exists by Behn herself on the actual choices and changes she made in the process from *Conversations* source text to target text, I note here a number of techniques she used, and possible interpretations of them. I have structured these techniques into two main groupings, namely techniques Behn used with *non-scientific*

⁷⁶ Reprinted in Todd 1996:73.

⁷⁷ Reprinted in Todd 1996:86.

⁷⁸ Reprinted in Todd 1996:86.

content, and techniques she used with *scientific* content. This structure is used to underscore my impression that Behn applied conscious strategies for translation in response to perceived text-types.

Approaches to non-scientific content

In a number of ways, Aphra Behn's choices in the *Conversations* translation can be seen to mark her as a product of her times. First, she was a writer in a time of carry-over from the overlapping understanding of source text, adaptation, imitation, etc. that previously marked the Elizabethan era and continued on into Behn's own Restoration environment (see Donson footnote, p.26 this portrait). Second, she was a translator at a time in English translation when rules were only just beginning to be codified (see Backdrop One), and when the creativity of the English translator-as-artist was held up as a primary ideal. Third, she was a woman actively engaged in recognition for her gender, and in the promotion of women's education, despite - ironically enough - precisely the co-opting of new, pseudo-scientific arguments to support the notion of women as defective.⁷⁹

Not surprisingly, then, Behn's textual commentary suggests a blend of these environmental influences, where the translator's license is expressed on points of **gender and power** as well as on points of **science**, though with apparent conscious distinction between the two. In Behn's approach to the *non-scientific* content of the *Conversations*, we see evidence of her general tendency toward expansion and amplification of the source text, especially in connection with recreating a spoken-word effect (as discussed also above under **Communicating with the audience**), and in connection with passages relating to gender

⁷⁹ In "Learned Ladies, 1650-1750" <http://www.litencyc.com/php/topics.php?rec=true&UID=664>, Laura Favero Carraro (University of Padua) notes how new pseudo-scientific theories at first were used to *strengthen* such negative ideas about the female gender, though increasingly, and increasingly vigorously, they came to be questioned in such publications as *The Female Spectator* (another of the

relationships, as in the following examples.

The excerpts here are all taken from the first Dialogue in the *Conversations*, judged by Behn herself to be among the best in the source text, and important here especially for how it sets the tone for the entire text. For it is over the course of this first Dialogue that the Marquise exerts her will on a visiting scientist until he is finally persuaded to teach her about the new heliocentric cosmology, initially very much against his professed will, but very much in line with the Marquise's own conscious wishes to be educated in the latest scientific developments.

In the following paragraphs (italics mine) consider the **cumulative effect** of the flirtatious, sensualized note carried in Behn's choices, choices which are both well within her purview as an original author with a particular interest in gender and power, and stronger than any pre-existing sensuous suggestion in the gendered pleasantries of the French original.

Note in particular the addition in the following paragraph of "pleasure and power of charming", "Ecstasie" and "powerful attractions" of the Night;

[Fontenelle] Ce n'est rien que la beauté, répliqua-t-elle, si elle ne touche. Avouez que le jour ne vous eût jamais jeté dans une rêverie aussi douce que celle où je vous ai vu prêt de tomber tout à l'heure, à la vue de cette belle nuit.

[Behn] But, said she, Beauty is *insipid*, if it want the *pleasure and power of charming*; and you must acknowledge that the brightest day that ever you saw could never have engaged you in so agreeable an *Ecstasie*, as you were just now like to have fain into by the powerful *attractions* of this Night.

then, continuing, with the addition of "all the advantages obscurity can give it";

J'en conviens, répondis-je; mais en récompense, une blonde comme vous me ferait encore mieux rêver que la plus belle nuit du monde, avec toute sa beauté brune.

I agree to what you say, Madam, said I, but I must own at the same time, that a Beauty of your complexion would give me *another sort of transport* than the finest Night with *all*

popular, and learned, publications for women discussed also in Backdrop Two).

the advantages obscurity can give it.

and, drawing on the sensuality again in this paragraph, with the addition of “pleasing” and “touching”:

Quand cela sera vrai, répliqua-t-elle, ...[p]ourquoi les amants, qui sont bons juges de ce qui touche, ne s'adressent-ils jamais qu'à la nuit dans toutes les chansons et dans toutes les élégies que je connais?... Le jour ne s'attire point leurs confidences, d'où cela vient-il?

Though that were true,... [h]ow comes it that Lovers who are the best Judges of what is *pleasing and touching*, do always address themselves to the Night, in all their Songs and Elegies? ... The Day receives all their Complaints, from whence proceeds that?

In the subsequent paragraph, Behn introduces even more presence, doubling up on “silence and gloom” and “passionate and languishing”, adding an anthropomorphisation of the Night as “charm[ing]” all things to repose, and finally introducing entirely her own material on the opportunities for hidden pleasure as suggested by “Solitudes, dark recesses, Groves and Grottoes, equally obscure and silent as the Night itself”:

C'est apparemment, répondis-je, qu'il n'inspire point je ne sais quoi de triste et de passionné. Il semble pendant la nuit que tout soit en repos.

The *silence* and *gloom* of the Night, said I, inspired the *restless sigher* with thoughts very passionate and languishing, *which the busier day diverts a thousand little ways* (though one would think the Night should *charm* all things to repose) *and through the day affords Solitudes, dark recesses, Groves and Grottoes, equally obscure and silent as the Night it self.*

In this interplay between the Marquise and her visitor, note not only the fact of Behn's interference with the text, but also how she seems specifically to link the Marquise with the *direct* terms of pleasure and power, while it is the male visitor in contrast, as in the paragraph above, who is made to suggest Behn's more *covert* ideas of darkness, obscurity, and silence. That the visitor is held sway to the persuasive Marquise continues to be underscored in later paragraphs of this first Dialogue as well. Not long after their introduction, the Marquise and her visitor proceed to an evening walk in the park, during which the visitor is otherwise content to gaze at the sky, yet finds himself distracted; for Fontenelle's “une si aimable dame”, note

here instead Behn's translation as "a *person* of her *Wit* and Beauty". The contrast between the powerfully focussed person of the Marquise and her sensually distracted visitor may hint at an underlying belief or message of Behn's that women are in fact well-suited to education, were it not for the desire of men to sexualize their interactions.

Such sexualization can soon be seen again, in Behn's choices for the following paragraphs, during which the visitor finally gives in to the Marquise's scientific curiosity. This shift begins with Behn's charged "engaged past retreat"

..et quand je fus hors d'état de m'en pouvoir dédire, et que je voulus parler, je vis que je ne savais par où commencer mon discours: car avec une personne comme elle, qui ne savait rien en matière de physique, il fallait prendre les choses de bien loin, pour lui prouver que la terre pouvait être une planète, et les planètes autant de terres, et toutes les étoiles autant de soleils qui éclairaient des mondes.

...but when I found myself engaged past retreat, and had a design to speak, I knew not where to begin my discourse, for to prove to her (who understood nothing of Natural Philosophy) that the Earth was a Planet, and all the other Planets so many Earths, and all the Stars Worlds, it was necessary for the explaining my self, to bring my Arguments a great way off;

and rises to a crescendo entirely of Behn's own making ("and at last to *satisfie* her")

À la fin cependant, pour lui donner une idée générale de la philosophie, voici par où je commençai. ...

but I pleaded to no Purpose, *and at last to satisfie her*, and give her a general Idea of Philosophy, I made use of this way of arguing. ...

Nonetheless, as we see next, Behn does not insert such material indiscriminately.

Approaches to *scientific* content

The examples above underscore not only Behn's interest in issues relating to gender and power, as well as conversational style, but also that her use of amplification occurs in connection with *non-scientific* content in the source text. When it comes to scientific content, meanwhile, it seems Behn makes a conscious distinction between acceptable and

unacceptable interference with the source text. Whatever license Behn takes in other (non-scientific) instances, such as in the samples above, here she takes a clearly less invasive approach, focussing mainly on the discrete **concretization** of scientific ideas, with clarifying and didactic effects as a result, to examples of which I now proceed.

Domestication / functional equivalents

Earlier I argued that Behn's desire to communicate a text to the audience can be seen at the macrolevel in her interests in conversational style and her proposed affinity with Fontenelle's own dialogue format. At the microlevel, such communication can be seen in her domestication of scientific/specialized terms, by which I here mean inserting familiar, functional equivalents for discrete source terms; such domestication is in keeping with a long tradition of target-text orientation in the Anglo-American sphere (see Backdrop One).

In the *Essay on Translated Prose*, for example, Behn translates the French term 'Petites-Maisons'⁸⁰ as 'Bethlam'⁸¹, the equivalent proper name for the London asylum. In another such *Essay* example, Behn translates 'Journal des sçavans' as 'Philosophical Transactions'; here, we see Behn's awareness of these publications as equivalent major organs of scientific communication in the trends toward the professionalization of science and toward a scholarly publications network that marked both Behn and Fontenelle's contemporary experiences.

⁸⁰ In full: l'Hôpital des Petites Maisons. This Parisian facility for the indigent and the mentally infirm was supported in part by a yearly alms tax on all inhabitants of Paris, and was administered by the central bureau of the poor (*grand bureau des pauvres*), established under Francis I for the relief of the indigent.

⁸¹ Patricia Allderidge explains part of the history of Bedlam, which dates back to 1247: "As one early patient list (1598) already shows, patients were admitted to this London facility from all over the country. This reflects the fact that for several centuries, Bethlem [Bethlehem, Bethlam, Bedlam] was the only public institution for the mentally disordered. The main local alternatives which were to grow up later were the private madhouses, which flourished from the eighteenth century on, and the county asylums of the nineteenth century". From "A Brief History of Bethlam". On-line at

Progression of Concretization

In the body of the *Conversations*, Behn continues this concretization of scientific entities for her English audience. In the first example, Behn translates « Peut-etre aussi que le spectacle du jour est trop uniforme » as « Besides, the Scene of the *Universe* by day-light appears too Uniform ». Note here Behn's insertion of *Universe*, the first such instance of specifically cosmological vocabulary in the Dialogue, and as such a foreshadowing of all such vocabulary to come:

This gentle progression toward the scientific bulk of the *Dialogues* is seen two paragraphs later, where Behn again introduces somewhat more concrete vocabulary than the source text, to wit : *pleasant Objects* for ce spectacle, *silent contemplation* for rêvé, *person of Wit* and *Beauty* for aimable dame,

La lune était levée il y avait peut-être une heure, et ses rayons...faisaient un agréable mélange d'un blanc fort vif avec tout ce vert qui paraissait noir. Il n'y avait pas un nuage qui dérobat ou qui obscurcît la moindre étoile; elles étaient toutes d'un or pur et éclatant...**Ce spectacle** me fit rêver, et peut-être sans la Marquise **eussé-je rêvé** assez longtemps; mais la présence d'une si **aimable** dame ne me permit pas de m'abandonner à la lune et aux étoiles.

The Moon was about an hour high, which shining through the Boughs of the Trees, made a most agreeable Mixture,...there was no Cloud to be seen that could hide from us, or obscure the smallest of the Stars, which lookt all like pure polisht Gold...**These pleasant Objects** set me thinking, and had it not been for Madam la Marquiese, I might have continued longer in that **silent contemplation**; but the presence of a person of her **Wit and Beauty** hindered me from giving up my thoughts intirely to the Moon and Stars.

and, in the subsequent paragraph, the repetition of "*and only treat the Mind*".

Quoi donc! reprit-elle, croyez-vous qu'on soit incapable des plaisirs **qui ne sont que dans la raison**? Je veux tout à l'heure vous faire voir le contraire; apprenez-moi vos étoiles. ...

What, replied she, do you think me then incapable of all those Pleasures **which entertain our Reason, and only treat the Mind?** I will instantly shew you the contrary, at least as soon as you have told me what you know of your Stars.

This accumulation suggests Behn wishes to underscore the concrete purpose of the text (to instruct readers, including women, in a new and exciting scientific field) even while enhancing its descriptive and pleasant nature, in parallel reminiscent of her wish to be taken seriously as a person with a concrete purpose (a writerly life without censure) despite the presumption of her gender as being [required to be] stereotypically “pleasant”. In any event, these inclusions of Behn’s also act against any invisibility of the translator, and (as in the example of « *person* of her Wit and Beauty ») of the woman as translator.

By the next samples, now, the Marquise has overcome her visitor’s resistance and is well engaged in learning about the structure of the Universe. If one of Behn’s underlying aims in this project was to communicate new scientific ideas effectively, just like her source text author Fontenelle, evidence of this didactic / clarifying slant can now be seen, especially in comparison to her concurrent translators Glanvill and Damvile.

In the first such example, Behn specifies « last, or *lowest* Heaven » in describing the relationship of the Earth to the other planets and to the Heavens.

De la terre où nous sommes, ce que nous voyons de plus éloigné, ... ***Entre la terre et cette dernière voûte des cieux sont suspendus à différentes hauteurs***, le soleil, la lune, et les cinq autres astres qu’on appelle des planètes, Mercure, Vénus, Mars, Jupiter et Saturne.

[Behn] From the Earth where we are, that which we see at the greatest distance from us,... ***between the Earth and the last, or lowest Heaven; are hung at different heights***, the Sun, the Moon, and five other Stars, which are called Planets, Mercury, Venus, Mars, Jupiter, and Saturn.

[Glanvill] That then which appears farthest from the Earth, (where we reside)...***[between the Earth and this great Vault (as I may call it) hang at different heights*** the Sun, and the Moon, with the other Stars, Mercury, Venus, Mars, Jupiter, and Saturn, which we call the Planets.

[Damvile/Knight] From this Earth where we are, that which we behold at the greatest distance, is that Blue Sky...***Between the Earth and that xtreamest Arch of the Heavens, are hung at different heights*** the Sun, Moon, and five other Stars which are called Planets. Mercury, Venus, Mars, Jupiter, and Saturn.

Behn's use of what would have been for her contemporary audience a particularly familiar / recognizable term (*Heaven*), especially as strengthened by the clarification of « lowest » in direct apposition to « last » makes her translation particularly effective in communicating the relationship of the Earth to the exteriorized solar system, a novel idea at the time, and one especially needy of attention to detail. By comparison to Behn's *mot juste*, the Glanvill and Damvile translations (this great Vault, as I may call it; that Blue Sky) struggle with more expansive language, where concrete terms seem more called for.

In a final example of Behn's concrete/didactic approach to the *Conversations* translation, I cite here from the three paragraphs subsequent to the above. Among other information, these final samples show how far the dialogue has shifted from the social discourse of beauty and romance at the beginning of the first night, to the factual, though still witty, scientific instruction that sets in just a few pages into the text⁸².

First, we see Behn's skill at communicating the explosive changes wrought by Copernicus' interpretation of the universe.

Figurez-vous un Allemand nommé Copernic, ***qui fait main basse sur tous ces cercles différents***, et sur tous ***ces cieux solides*** qui avaient été imaginés par ***l'antiquité***.

[Behn] Know then, that a certain German, named Copernicus, ***does at one blow cut off all these different Circles***, and the ***Cristalline Spheres***, invented by the ***Ancients***;

[Glanvill] Imagine then a German call'd Copernicus ***confounding every thing***, tearing in pieces the ***beloved Circles of Antiquity***...

⁸² Paragraphs 13 though 16 in Behn's translation of Dialogue One.

[Damville/Knight] ...represent only to your self a certain German call'ed Copernicus, who ***pull'd down all those different Circles*** and solid Heavens that were set up by ***Antiquity***;

With « at one blow », « the Cristalline Spheres » and « the Ancients », Behn makes real the dramatic, passionate, even violent shift from geocentric to heliocentric cosmos; no sign here of social niceties or gender politics - Behn is all business now, and using pointed and forceful imagery appropriate to the content of the source text.

Next, while Glanvill reverts to a kind of Bible-talk (snatcheth...placeth),

Saisi d'une noble fureur d'astronome, il ***prend*** la terre, et ***l'envoie*** bien loin du centre de l'univers, où elle s'était placée, et dans le centre il y met le soleil, a qui cet honneur était bien mieux dû.

[Behn]... and being inspired with a Noble Astronomical Fury, ***takes*** the Earth, and ***hangs*** it at a vast distance from the Centre of the World, and sets the Sun in its place, to whom that Honour does more properly belong;

[Glanvill] ...seiz'd with the noble Rage of Astronomy, he ***snatcheth*** up the Earth from the Centre of the Universe, sends her packing, and ***placeth*** the Sun in the Centre to which it did more justly belong,

[Knight] ...and, possess'd with a noble Astronomical Fury, he ***takes*** the Earth and ***throws it out*** of the center of the World, where it had long been fixt, and in the place of it puts the Sun, as much more deserving of that Honour;

... and neither Glanvill nor Knight as *unambiguously* communicates the relationship of the Moon to the Earth (i.e., moon around the Earth; Earth and moon together around the sun),

Les planètes ne tournent plus autour de la terre...Tout tourne présentement autour du soleil ... [et] il ne lui est demeuré que la lune qui tourne encore ***autour d'elle***.

[Behn] the Planets do no longer turn round the Earth...: All things now turn round the Sun...save only the Moon, whose natural course it is, ***to turn round the Earth***.

[Glanvill] the Planets no longer turn round the Earth...All now turns round the Sun... [the Earth] hath nothing left her but the Moon, which still turns ***round about her***.

[Damville] the Planets turn no more about the Earth...All turns now about the Sun, even the Earth it self...no more remains but the Moon which still ***rolls about her***.

Behn, for her part, proceeds in a logical succession of ideas, choosing to *enhance* the concrete and *avoid* ambiguity in the planetary relationship 'Earth-moon-sun'. This suggests she understands both the content and the didactic function of Fontenelle's text, as well as her responsibility to communicate with the reader.

Praxis - Conclusion

In this praxis section, examples have been offered of how Aphra Behn asserted her visibility [as a woman] in [scientific] translation. Her impetus can be seen to derive both from her primary communicative experience as playwright, and from her experience as a translator operating in relation to some of the major (English) translation concerns of her day (including a balance between reaching the audience, as in domestication, and the desire to respect the creativity of the translator-as-artist), and in relation to the scientific developments of her day, specifically the shift to heliocentric cosmology against considerable and remarkably persistent resistance. Behn's presence in the *Conversations* translation occurs in both paratextual and textual commentary, and is further distinguished by the practical recognition of scientific and non-scientific content as subject to different limits of acceptable interference, whether or not Behn ever independently asserted such genre distinctions / text typologies.

4. Portrait Conclusion

Bernard de Fontenelle's *Entretiens* has been described as the first French example of a scientific text written for the uninitiated; it seems fitting, then, that his translation into English should belong to another groundbreaking individual, England's first professional female writer, Aphra Behn. Already a visible – if controversial – figure for her choice of profession and the outspokenness of her ideas on women's education, among other topics, Behn was no

'invisible translator' in her day, but rather a visible person working on a visible source text and thereby lending a cachet to her translation, even in the face of several concurrent translators.

Together, through the many editions of their source and target texts, Behn and Fontenelle were responsible for the wide circulation of new ideas about science to an interested and growing audience for vernacular materials. The repatriation of Newton's still new ideas to the English audience was to set the stage for further works on the many research topics of this monumental scientist, as will be seen in Portraits Two (Carter) and Three (Somerville).

In the forward-thinking content and public-friendly format of Fontenelle's text, Behn could find affinities with the source-text author, for, despite the political conflict between their nations, both these figures were internationally-minded and strove, through individual forms, to communicate new ideas – about science, and about women - throughout Europe and England.

In this environment along the cusp between amateur and professional science, between pre-Newtonian and Newtonian science, and between Latin and vernacular science writing, Behn's dissemination, whether done for financial or intellectual gain, stands as part of the history of scientific ideas, just as she and Fontenelle would come to serve as role models for other popularizers of Newtonian science: in the next Portrait (Elizabeth Carter) we will see how Fontenelle's dialogue format serves as the unmediated model for Algarotti's work on Newton's *Opticks*.

Portrait Two: Elizabeth Carter (1717-1806)

0. Introduction

In a roundabout way, the year of Aphra Behn's death, 1689, links her to a subsequent generation of learned women, and to this second portrait. In that same year was born Lady Mary Wortley Montagu¹, herself a worldly writer, translator, and activist whose sister-in-law, Elizabeth Montagu, in turn, was a member of the Bluestocking circle.

As Kelly² explains in a recent 6-volume collection of these women's writings, the Bluestocking Circle was originally an informal circle of intelligent, learned, and sociable women of eighteenth-century London who hosted literary and intellectual salons; their name has come in modern times to be a pejorative term for an earnest or pedantic woman.

Fortunately, recent scholarship has rescued the "Bluestocking Ladies" from their marginal position, seeing their significance in the intellectual and social context of their time.

¹ See, for example, Isobel Grundy's works on Montagu and this period, including *Lady Mary Wortley Montagu*. Oxford: Oxford U. Press, 2001. Grundy calls Montagu "one of the most important women writers between Aphra Behn and Jane Austen, and one of her period's most provocative and entertaining writers of either sex". General contextualization of Montagu and her colleagues can be found in *The Feminist Companion to Literature in English: Women Writers from the Middle Ages to the Present* (Virginia Blain, Patricia Clements, Isobel Grundy, eds.) New Haven: Yale U. Press, 1990, and in *Women Writers of the Restoration and the Eighteenth Century* (York, Penn.: York College of Pennsylvania, 1986).

² Kelly, Gary, ed. *Bluestocking Feminism: Writings of the Bluestocking Circle, 1738-1790*. 6 vols. Volume 2 – Elizabeth Carter. London: Pickering & Chatto, 1999.

This collection reprints works by the prime movers such as Elizabeth Montagu, Elizabeth Carter, and Hester Chapone as well as more minor figures associated with the circle. It includes diverse genres: fiction, poetry and literary criticism, translation, education manuals, advice books, theology, essays, and letters. Essays and notes by the editors, a group of eighteenth-century specialists, links and elucidate the works. According to Small's review of this set, "Pickering & Chatto are offering, to their credit, the best editions yet produced of Carter, Montagu and Talbot, and provocative recastings of the achievements of Seward, Reeve and Scott". Helen Small, *The Times Literary Supplement*. Cited at <http://www.pickeringchatto.com/bluestocking.htm>

Today, this intellectual and social circle remains well-known for having promulgated the ideals of learning, virtue and friendship among a set of middle and upper-class English members, in particular for women.

Among the most admired of Montagu's Bluestocking colleagues was Elizabeth Carter (1717-1806), who earned no small measure of fame in England's learned society for her translation of and commentary on the collected works of Greek Stoic philosopher Epictetus³. As Boswell once praised her combination of literary skill and more traditional womanly achievements, "My old friend, Mrs. Carter, could make a pudding as well as translate Epictetus".

Yet, though this literary work remains Carter's legacy, it was neither her first nor her only translation success: fully 19 years before the acclaimed translation of *Epictetus* ultimately brought her long-term financial independence without resort to marriage or a court appointment, and while still a young woman of 20 making a name for herself in London, Carter was commissioned for a scientific translation, *Il Newtonianismo per le Dame* [*Newtonism explain'd for the Use of Ladies*], a popularization by Francesco Algarotti, a dashing young Italian connoisseur of the arts and sciences who, in another link, was the object of Lady Montague's affections.

The combination of Algarotti's wide-ranging European connections in both the arts and sciences, and Carter's burgeoning place of virtuous esteem in London society, together with the appealing subject matter and an accessible dialogue format of presentation, led both the

³ Interestingly, it was Lady Mary Wortley Montagu who translated Epictetus from the *Latin* intermediate into English (Spacks 2000:6). Lady Montagu deserves mention not only as an influential thinker, writer, and translator, but also in the history of medicine for the application of her scientific convictions and influence at the court of Queen Caroline to finally introduce vaccination into England, though this advancement has traditionally been associated with Sir Edward Jenner (1749-1823).

source text and the translation to be broadly and well received, promoting popular interest in (Newtonian) science and scientific education for women. That this success has been transmitted so poorly down through history as part of Carter's accomplishments is an unfortunate lapse this portrait hopes to counteract.

In this portrait, we see a continuation of the interest in Newtonian science (this time in his optical experiments), and a growing acceptability of the visibility and influence of another female translator of science, Elizabeth Carter, with her visibility linked to the growth of the periodical industry in London (see also p.86, p.147) and to her affiliation with the Bluestocking Circle (see also p.150).

As well, we see an interesting twist on the thread of "translation as repatriation" begun in Portrait One. Finally, as for the issue of "concurrent translation" (also begun in Portrait One), it, too, is revealed to be unusual in Carter's case; here, an obviously revised second translation in 1742, three years after Carter's first translation of 1739 (and presumed to be by her as well) is presented as a kind of concurrent translation, competing as it would have for the same readership.

In its structure, the chapter looks first at Elizabeth Carter, then at the source text author Algarotti; this is followed by information on the source text (including some relevant information on optics, beyond that found earlier in Backdrop Two) and translation samples and commentary, including a direct connection to Fontenelle's *Conversations on the Plurality of Worlds*, the source text in Portrait One.

1. **The Translator: Elizabeth Carter (1717-1806)**

*"She was much inclined to believe, that women
had not their proper station in society, and that
their mental powers were not rated sufficiently high"*
~ Montagu Pennington⁴

In broad strokes, Carter's life can be seen in four major phases: broad, liberal childhood education in Deal (1717-1734); successful stay in London (1734-1739), including the Algarotti translation (1739); return to Deal (1739-1806), including her legacy, the Epictetus translation (1758); continued life of the mind until death in 1806. Certain details of these phases are of particular interest, and I turn to them here below.

Childhood in Deal

In the relative calm of Georgian England, between the religious and political turmoil of the Restoration and later British fervour for expansionism⁵ and colonial power, Margaret and Nicholas Carter raised five children in the seaside village of Deal, Kent, several hours east of London. Though Elizabeth, their eldest, was burdened by the family responsibilities typical for a girl in her day⁶, she was blessed with the fortune of a forward-thinking father⁷ who saw to it

⁴ Nephew Montagu Pennington on his aunt Carter, cited in Myers 1990:vii. Original edition is: *Memoirs of the Life of Mrs. Elizabeth Carter, with a New Edition of Her Poems, Some of Which Have Never Appeared before; to Which Are Added Some Miscellaneous Essays in Prose, Together with Her Notes on the Bible, and Answers to Objections Concerning the Christian Religions* by the Rev. Montagu Pennington, M.A. London: Printed for F.C. and J. Rivington, 1807. First edition.

⁵ Carter's lifespan was marked by the accession of George I (1714-1727), George II (1727-1760), and George III (1760-1820), of the Hanoverian Protestant branch. From 1721 to 1742 England's politics were dominated by Sir Robert Walpole who, in the long absences of George I and II in Germany, ushered in modern ministerial rule in England. Power increasingly passed to the House of Commons, and industrialism was on the rise. There was relative peace and prosperity, but not without corruption. George III's reign, a period of expansionism, marked the rise of England as colonial power.

⁶ As eldest, Elizabeth was charged with care of her younger siblings (Nicolas, James, John, and Margaret) as well as her stepsiblings (Mary, called Polly, and Henry) upon her father's second marriage. Elizabeth later tutored Henry in the classics to prepare him for Cambridge (Myers 1990:45). Even after her London successes and return to Deal, Carter often joked about the number of shirts she had to sew for the male members of the family, a task which took time away from her love of study. For Carter's own words see Myers 1990:167.

⁷ The Reverend Dr. Nicholas Carter was Perpetual Curate of the Church of St. George the Martyr at

that his sons and daughters alike were well educated in Greek, Latin, and Hebrew, as well as astronomy, ancient geography, and ancient and modern history.

In another sign of her father's open attitude, Elizabeth was sent away while still a teenager to perfect her French in a Huguenot family in Canterbury. Her linguistic interests eventually extended to also include first Italian and Spanish, later Portuguese, Arabic, and German.⁸

Among the other influential figures in her early development were family friends Edward Cave and Thomas Birch, who would now figure in the next stage of Elizabeth's development, the stay in London.

Elizabeth in London (1734-1739)

Around 1734, aged 17, Carter left Deal for London, where she lived with an uncle at Bishopsgate, though correspondence⁹ indicates she also spent a fair bit of time at the St. John's Gate household of Edward Cave, one of a new breed of publishers and a mentor to Carter during her formative experiences in publishing. Through the Cave family, Carter also would become acquainted with the sights and figures of greater London, including formal introductions to scientists, and trips to Oxford¹⁰. The three major features of Carter's stay in London were: the new periodicals, the Bluestockings, and the Algarotti translation.

Deal, and one of the Six Preachers at Canterbury.

⁸ Learning German was at the suggestion of family friend and mentor George Oxenden, who, concerned for the unwed woman's long-term financial security, may have envisioned her preferment at the court of George II. Myers notes that Carter set an example for her friends by reading a bit in each language every day, to maintain her proficiency (1990:264).

⁹ Carter's extensive correspondence indicates she and her father wrote each other in Latin; in these early letters, he encourages her to come to her own decisions in life, large and small.

¹⁰ Myers 1990:55. In addition to Myers' scholarship on Carter (Sylvia H. Myers, *The Bluestocking Circle: Women, Friendship, and the Life of the Mind in Eighteenth-Century England*. Oxford: Clarendon Press, 1990), which forms a major source for this dissertation portrait, there is, for example, Judith Hawey (ed., *Bluestocking Feminism: Writings of The Bluestocking Circle, 1738-1785*, vol. 2, Elizabeth Carter. Brookfield, VT: Pickering and Chatto, 1999), as well as a considerable collection of letters between Carter and fellow Bluestockings; it is fortunate for posterity that one of the tenets of the Circle was lifelong intellectual friendship, expressed and simultaneously recorded in personal

London 1: The New Periodicals

By now considered a prodigy in her abilities and interests, Carter went to London around 1734 to work for the *Gentleman's Magazine*¹¹ - a venture produced by Edward Cave (one of her father's friends¹²), and one of the growing number of English periodicals since John Dunton's *Athenian Mercury* began its run in 1690, 44 years before. The rise of London periodicals was discussed in Backdrop Two (see p.86). Of particular interest in the exploration of women translating science, two *overlapping* features of this type of publication were the production of periodicals *by* women and *for* women, and the introduction of *scientific content*.

As Adburgham relates, "[t]he idea of publishing periodicals addressed solely or in part to women readers can be traced back to John Dunton, an idealistic and eccentric bookseller...called a 'lunatic' by his contemporaries"¹³. Though Dunton died in poverty and wretchedness, his influence on the publishing world was undeniable, and included not only an interest in a female target audience, but also the hiring of many female *contributors*.

In the "cordially haphazard" intersections of these publishing circles operated a "curious collection of women who, at a time when it was [still] considered humiliating for a

correspondence. Editions thereof include Elizabeth Montagu's *Letters from Mrs. Elizabeth Carter, to Mrs. Montagu, between the Years 1755 and 1800 Chiefly upon Literary and Moral Subjects* (London, 1817), and *Elizabeth Carter, A Series of Letters between Mrs. Elizabeth Carter and Miss Catherine Talbot, from the Year 1741 to 1770: To which are added, Letters from Mrs. Elizabeth Carter to Mrs. Vesey, between the Years 1763 and 1787* (London, 1808). A related article is Leonore H. Ewert's "Elizabeth Montagu to Elizabeth Carter: Literary Gossip and Critical Opinions from the Pen of the Queen of the Blues". Article cited in *DAI* 29 [1968]: 566A-67A.

¹¹ Agorni:2002 also discusses "Women and Education in the Pages of the *Gentleman's Magazine*".

¹² Myers speculates Revd. Carter may have sent his daughter to London in part to have his sermons printed and distributed through Cave's press, in addition to his daughter's work, to supplement the family's modest income.

¹³ Adburgham 1972:26.

gentlewoman to earn money, contrived to support themselves by writing, editing, or publishing...sometimes even supporting husbands and children as well”¹⁴.

And while “a high moral tone was almost invariably their editorial policy” and “they promulgated against fast-living society,”¹⁵ these publications were nonetheless clearly open to the idea of study and public activity for women, including authorship. In other words, in relation to the ideas on invisibility first mentioned in Backdrop One, this primary access to authorship would mean greater translation visibility and potential influence for a young women such as Carter; her original contributions included riddles, poems, imitations, and translation, all popular forms of expression.

Specifically, between Dunton’s groundbreaking *Mercury* (1690) and Carter’s arrival in London around 1734, there appeared no fewer than sixty London periodicals, of which no fewer than eight were geared specifically toward women¹⁶, raising questions about their condition in addition to providing scientific and artistic entertainments.

For example, the *Ladies’ Diary (or The Women’s Almanack)* (1703/4), which was run by John Tipper, a mathematician of distinction, specialized in such scientific content as difficult mathematical problems and paradoxes of geography and astrology in addition to literary enigmas, and both the *Tatler* and the *Spectator* were overseen by Richard Steele, an ardent defender (in his youth) of women’s choice in marriage, financial matters, and intellectual pursuits; his publications came to represent another important resource for women of the day.

¹⁴ Adburgham 1972:9. For a select bibliography of 17 additional writers on Women’s Periodicals, visit <http://www.soton.ac.uk/~jeb/ladysmag2.htm>.

¹⁵ Adburgham 1972:22.

¹⁶ Myers (1972) offers an extensive list of periodicals first issued from 1690 to 1830, including the *Ladies’ Diary (or The Women’s Almanack)*, the *Tatler*, and the *Spectator*, major publications that

Many of these publications were wildly successful, selling out in locations remote to London. As Pickering & Chatto¹⁷ point out, "By 1741 Johnson could claim that 'the GENTLEMAN'S MAGAZINE'¹⁸ is read as far as the English Language extends, and we see it reprinted from several Presses in Great Britain, Ireland, and the Plantations". Clearly, the public appetite for women-friendly as for scientific content was no passing fancy, no minor event, and the fortunate overlap of intellectual and society circles in a vibrant city such as London meant that it was often scientists and mathematicians themselves who had a direct hand in the publication process. One important effect of the combined presence of these authors and the periodicals in which they published, then, was placing those women who participated in the periodicals industry, such as young Elizabeth Carter, in contact with the thinkers and movers of her day, as well as encouraging young writers by constant reminder of the audience that awaited their work.

included content by and for women.

¹⁷ <http://www.pickeringchatto.com/gentlemansmag.htm>

¹⁸ Despite its paradoxical name, the *Gentleman's Magazine* was also intended for women.

Underscoring its importance as representative of the trends in periodical content and in the publishing industry of the day, Pickering & Chatto continue, "The Gentleman's Magazine, founded by Edward Cave in 1731 under his famous pseudonym 'Sylvanus Urban', is one of the great untapped resources of the eighteenth century. A uniquely rich and compendious record of eighteenth-century life in all its aspects, it not only has relevance to literary, historical, media and gender studies but is also a fascinating serial work in its own right. In its early years it had a higher renown, wider circulation and larger impacts than any other periodical of the time, and it effectively inaugurated one of the most characteristic and influential publishing modes in modern culture. Cave is rightly credited in Samuel Johnson's Dictionary of 1755 with having given the term 'magazine' (a storehouse or arsenal) its now modern sense: 'Of late this word has signified a miscellaneous pamphlet, from a periodical miscellany named the Gentleman's Magazine, by Edward Cave.' Drawing his ideas from a range of earlier publications, Cave defined the form in the most inclusive possible way, and provide his readership with a generous monthly digest of all the material necessary - news, opinion, poetry, science - for participation in genteel life.

Exploiting the lax copyright law of the day, the magazine combined material plundered from the leading newspapers and political journals with extracts from the latest books and a wealth of original copy, and elaborate networks of regional distribution were used to build up an extensive readership throughout the country. It is now widely recognised (following the attention drawn to it by Jürgen Habermas) as a crucial component and stimulant of the eighteenth-century public sphere". Cited at <http://www.pickeringchatto.com/gentlemansmag.htm>. Scanned volumes are available on-line at <http://www-2.cs.cmu.edu/People/spok/serials/gentlemans.html>.

This combination of a vibrant, open working environment and a receptive readership – within both of which groups female learning was associated with moral fiber rather than sexual laxity - must have encouraged Carter to continue along the path of learning and writing begun in Deal. Indeed the ideals of learning and intellectual friendship she first came to value through her father's influence were only strengthened by the positive emphasis placed on learning for women in the periodicals environment of her London stay; it can hardly come as a surprise that these ideals would feed directly into Carter's next London connection to visibility, in the form of the Bluestocking Circle.

London 2: The Bluestockings

It is human nature that like-minded people should find ways to exchange ideas and values. In Elizabeth Carter's day, one of the most important groups for intellectual friendship was the Bluestocking Circle. Though today the term *bluestocking* has persisted nearly exclusively in a negative connotation, associating a learned woman with bookishness and pedantry¹⁹, this limited general definition denies the lasting importance of the group in the English life of the mind, as recognized by scholars.

In fact, the Bluestocking Circle filled a considerable void in the formation of girls and women. For it was within this environment that women could pursue *intellectual* exchange, a public and private part in intellectual life, and life-long friendship through a salon culture and correspondence, all explicit aims of the circle. Compared to the typical pastimes for women - handiwork, spinning, knotting, drawing, reading, writing, walking, picking herbs, jewelrymaking, crafts, billiards, looking over prints, cribbage, coffee, and tea, for example - the prospect of cultivating one's personal development must have been quite appealing.

¹⁹ Webster's New World, 3rd ed.

In the overlap between her activities for publisher Cave, and what would become a life-long affiliation with the Bluestockings, Carter can be seen as particularly fortunate to have moved within such important circles, for her education and skill were beginning to earn her visibility and influence in London, setting the stage for the reception of her translations. And if, in retrospect, the Bluestocking movement can be said to have run approximately from 1740 to 1800, with its height from 1775 onward, then Carter's London stay from 1734-1739 placed her at the very beginnings of what was to become a lifelong affiliation, ensuring her legacy as one of the group's most important and respected members, with a cachet thereby conferred upon her production, including her translations.

Later, we will see how these strong ties to fellow intellectuals kept Carter in contact with London colleagues and the English audience long after her return to the geographical isolation of Deal.

London 3: The Algarotti Translation

Meanwhile, in what I have designated as the third major event during Carter's London stay, she was commissioned to translate Algarotti, presumably through fellow Bluestocking Lady Montague, who was linked to the young Italian from 1736 to 1742. Because the 1739 and 1742 translations will be discussed below (in the translation commentary) I skip here to the final stage in Carter's biography, her return to Deal.

Return to Deal - Continued Contact, Continued Success

Taken against her 89 years, Carter's London career was, at just five years, brief; nonetheless, it thoroughly shaped her future and her legacy. In fact, Carter's stay in London went beyond personal satisfaction to include recognition and warm praise for her periodical contributions

from a number of reviewers, including no less than Samuel Johnson²⁰. As a result - and in keeping with her reputation for modesty and gentility (features discussed further in the translation commentary) - soon after the added success of the Algarotti translation only months later, the reserved Carter decided to remove herself from the London spotlight altogether, returning to the relative calm of Deal, despite attempts by other Bluestockings to draw her back into the city for fear her considerable presence and talents - first made evident in the capital - might otherwise be wasted.

Yet the intellectual and professional suicide her friends feared she was committing was, fortunately, not to be the case. In fact, Carter's greatest success, the *Epictetus* translation, would come in 1758, fully 19 years after she had returned to Deal. As it happens, this contract, which capped her critical success and procured financial independence, was proposed to Carter by yet another fellow Bluestocking, Catherine Talbot. The importance of such networks to the life of the mind can not be underestimated; nor their importance in the *practical* aspects of writerly life, including dissemination.

In one indication of the dissemination of her works, it was Carter's many contacts from her London beginnings - among which were Bluestocking enthusiasts and key religious figures, as well as mentor Sir George Oxenden, her father's patron - that enabled Carter to amass 1,031 subscriptions to her *Epictetus* translation, for example, in a list headed by the Prince of Wales himself, and extending to various college libraries^{21, 22}.

20 - "I have compos'd a Greek Epigram to Eliza, and think She ought to be celebrated in as many different Languages as Lewis le Grand" Johnson, *Letters*, i,11, reprinted in Myers.

²¹ Myers 1990:168.

²² According to her nephew, Montagu Pennington, printing of the 539 quarto page volume began in June 1757 and was completed by April 1758, "ma[king] a great noise all over Europe", and Carter a profit of almost £1000. In Pennington's *Memoirs* of Carter.

With the financial windfall, Carter was able to buy a duplex house in Deal for £200 pounds, which she split with her father. A later inheritance and an annuity from Mrs. Montagu improved and solidified her modest financial security. At least equally as important, though, the publication was judged a sign that, if women had

the benefit of liberal instruction, if they were inured to study, and accustomed to learned conversation - in short, if they had the same opportunity of improvement with the men, there can be no doubt that they would be equally capable of reaching any intellectual attainment²³.

Thanks to the growth of the periodicals trade, this encouraging assessment of women's capacities - which appeared in the respected *Monthly Review* - could now be transmitted to an even wider audience, just like Carter's Algarotti translations of 1739 and 1742.

Biography Conclusion

Held in esteem for her knowledge and faith, Elizabeth Carter was among the most prominent of the early Bluestockings. Through the well-rounded education (including science and languages) and the confidence instilled in her during her formative years, Carter was able to counteract the invisibility still largely expected of (learned) women. In her contributions to London periodicals, her well-received translations, and her model to other women, Carter was a living example of the positive effects of educational opportunity and a writerly life on women. And while the mores of her time made visibility for women subject to an expectation of modesty, extending even to anonymity, Carter's compliance with this code of virtue afforded her, paradoxically, with the very experiences, opportunities, and lasting influence considered largely outside the norm for a lady in her day. This interplay of visibility and invisibility, reminiscent also of the expectations of translators discussed in Backdrop One, was changing,

²³ *Monthly Review*, June 1758, reprinted in Myers 1990:169. As Timperley explains, Ralph Griffiths' *Monthly Review*, founded in 1749, was the best of the London critical journals. Timperley, C.H., *A dictionary of printers and printing*, London, 1842.

progressing toward a peak of influence in the next portrait, on Mary Fairfax Somerville. In the meantime, Carter (primary occupation - author; background - increased science education) serves as one example of the transition from Behn (author, little science education) to Somerville (expositor, solid science education).

Having addressed the factors in Carter's biography that enabled her (and her translation) a position of influence, I turn now briefly to the source text author (Algarotti), then to the source text itself (with a short reminder on Newton's *Opticks*), followed by commentary on samples from Carter's 1739 translation in comparison with an anonymous 1742 translation that is taken to represent Carter's own revisions.

2. Source Text Author: Francesco Algarotti

As first noted in Backdrop Two, one thread that runs through portraits 1, 2, and 3 is a focus on Newtonian science. Between the popular account of Newton's difficult *Principia* in Portrait One (Aphra Behn) and the more mathematician-oriented explication of Newton's mechanics by Mary Somerville (Portrait Three) comes Carter's translation of Algarotti. In 1737, this young Italian *aficionado* of the arts and sciences expressed the admiration he felt for Newton – and for Fontenelle (Portrait One) in a set of witty dialogues called *Il Newtonianismo per le Dame*.

If, as we shall see, it was in large part the more accessible²⁴ *format* and *content* of Newton's *Opticks* that led to its own immediate and lasting success with a broader audience, this source

²⁴ This increased accessibility is hardly surprising, considering that, in this case, Newton was not attempting to account for and synthesize anywhere near the amount or magnitude of information contained in the *Principia*, along with all its implications. For more on the accessibility of the *Opticks*, see for example the 1952 reprint, which points out, "Here is one of the most readable of the great classics of physical science. First published in 1704, Newton's *Opticks* provides not only a survey of the 18th century knowledge about all aspects of light, but also a countless number of the author's unique scientific insights. It will impress the modern reader by its surprisingly contemporary viewpoint". Jacket to Newton, Isaac, and Albert Einstein (foreword), Edmund Whittaker (Introduction) Bernard Cohen (Preface), *Opticks : Or a Treatise of the Reflections Inflections and*

text had the additional effect of inspiring a number of popular responses, among which an interest in microscopes and telescopes (see also footnote on the Amici microscope ordered for the Somervilles, Portrait Three), and in popular texts, such as Algarotti's. Relatively unknown today outside Italy, Algarotti nonetheless played a prominent role in the artistic and scientific communication of his day.

Born in Venice in 1712, just five years before Carter, Francesco Algarotti was the son of a rich merchant, and studied privately in Bologna. Two of his tutors there were "eminent scientists"²⁵ and seem to have shown him an appreciation of Newton's genius. Yet Algarotti's interests extended well beyond science to include the arts and letters, as is clear not only from his biography, but also from his publications on a range of such topics²⁶.

This wide-ranging knowledge together with a dashing personality made Algarotti quite the social success as he now began what would become a lifetime of travel through Europe's professional and aristocratic circles. Through Voltaire, whom he met on a trip to Paris ²⁷, Algarotti had important introductions in England, where he travelled for the first time in 1736, one year before *Il Newtonianismo* was published²⁸. Among these early English introductions were Queen Caroline, Lord Hervey (Vice-Chamberlain to the King), and Prime Minister Sir Robert Walpole. Not unlike his future translator, Algarotti was creating a name for himself amid London circles of influence, thereby priming interest in his eventual popularization of Newton.

Colours of Light. Dover, 1952.

²⁵ Pantazzi 1980:23.

²⁶ See Algarotti's collected works in the Livorno edition, for example, or the complete edition with biography published by D. Michelessi (1791-1794).

²⁷ As Pantazzi explains, through Voltaire in Paris Algarotti also met - among others - Maupertuis and Madame du Châtelet, a major salon figure and supporter of Newtonian science, and Newton's translator into French of the *Principia* (1980:23).

²⁸ Pantazzi 1980:23.

Dismissed by some as “a philosopher for ladies, a versifier for kings and hanger-on of celebrities” because he was handsome, intelligent, witty, and charming, Count Algarotti was, by other accounts, a “brilliant figure who played an important role in the cultural relations between Italy and England”.²⁹ Of note for this Carter portrait, it was during Algarotti’s first London visit in 1736 that he was nominated to the Royal Society, and elected to the Society of Antiquarians, this again not unlike the case of his future translator placing him in direct contact with the scientific current of the day.

In another fortuitous instance of how these networked currents supported the visibility and influence of source texts, target texts, and their authors/translators, it was there, among Algarotti’s Royal Society contacts, that Carter family acquaintance Thomas Birch was found. It was he, together with Samuel Johnson, who insisted that Carter now apply her talents to a translation for publication. As it happens, Birch knew both Carter and Algarotti personally, and persuaded Carter to choose *Il Newtonianismo* as a source text. Later, once the translation was complete, Lady Mary Wortley Montague left to rendez-vous with Algarotti in Italy³⁰, with a copy of the Italian original and the English translation in her bags.

The remainder of Algarotti’s life is marked by extensive travel, through such locations as England, Russia, and the German states, with such high-ranking missions as art broker for Augustus III and King Frederick, in whose court he was named Count. These many contacts and well-placed patrons offered Algarotti a large readership for the numerous publications and voluminous correspondence (considered his most important work³¹) he managed to produce despite the hectic pace.

²⁹ Pantazzi 1980:23.

³⁰ For Montagu’s connection to Italy, see Grundy, “Lady Mary Wortley Montagu’s ‘Italian Memoir’”, *Age of Johnson* 6 (1994), 321-46.

³¹ See, for example, the “Algarotti” entry in the *Dictionary of Scientific Biography*.

In an interesting reminder of such different women as Aphra Behn and Elizabeth Carter, Pantazzi underscores that “Algarotti was ambitious, but he was not peripatetic by inclination: his travels from court to court were an attempt to obtain a permanent and secure living” (Pantazzi 1980:25). This wish for a secure living through a life of intellectual curiosity, and a willingness to do whatever necessary to achieve it – whether to travel against one’s inclinations (Algarotti), to withstand the abandonment of the King for whom she spied, and the scorn of a moralistic public (Behn), or to forego the trappings of learned success in London for a suitably chaste life in Deal - is a type of motivation that all five of the female translators portrayed here knew, motivation that, on some level, I suspect, would have bound each in an affinity for the struggles of the others.

Algarotti eventually returned to Italy in 1752, where he died from consumption at only 40. Yet, though he died young, the standing he had achieved in Italian society was clear: his tomb in the Campo Santo was designed by architect Mauro Tesi and finished under the direction of sculptor Carlo Bianconi, both famous names in the Italian arts. The expenses of its erection were paid by Frederick the Great, who directed that it should bear the following inscription: “Algarottus Ovidii Aemulus Newtoni Discipulo Fridericus Rex” [Algarotti: Ovid’s rival, Newton’s student - King Frederick]. In Carter as his translator, Algarotti (though not known for his chasteness...) would find a public figure suitably matched to his status and influence, as well as sympathetic to the idea of popularized science and science for women.

3. The Source Text: *Il Newtonianismo per le Dame* (1737)

*"Nature, and all its laws hid in night
God said, let Newton be, and all was light"
~Pope's inscription for Newton's tomb*

FORM

Algarotti's admiration for the great minds of Europe fell early on Sir Isaac Newton; it also came to include the work of Enlightenment scholar Bernard de Fontenelle. In a prefatory letter to his own work, Algarotti acknowledges the direct debt owed to Fontenelle for the idea of a **popularization** as well as for the **dialogue format** so well-received by Fontenelle and Behn's audience some 50 years before. In the 16-page letter to Fontenelle that precedes the dialogues, Algarotti writes:

...how much greater Reason have I to dedicate these Discourses to one of the most illustrious among the Living [Fontenelle lived 1657-1757], whom I am indebted to for the Example which first set me upon composing them, and who has given me so perfect a Model of polite Wit and agreeable Writing?

Your Plurality of Worlds first softened the savage Nature of Philosophy, and called it from the solitary Closets and Libraries of the Learned, to introduce it into the Circles and Toilets of Ladies.

... The Success was answerable to the Beauty and Novelty of the Undertaking. That half of our World, which always commands the Votes of the other, has given its Approbation to your Book, and in the most agreeable manner consecrated it to Posterity.

May I venture to flatter myself, that my Light and Colours will have the same fate as your Worlds? (tr. Carter 1739: i-iii).

CONTENT

In **content**, *Il Newtonianismo* is a popularization of Newton's final published work, the 1704 *Opticks, or a Treatise of the Reflexions, Refractions, Inflexions, and Colours of Light*, which historiographer I. Bernard Cohen calls a "masterpiece" of "extraordinary [popular] appeal"³².

Though the reader may be struck that fully thirty-five years passed between Newton's original (1704) and the appearance of Carter's English popularization (1739), the fact is that Newton's monumental ideas remained a source of popular interest and scientific inquiry even well beyond this span. The continued relevance of his topics taken together with prior enthusiasm generated by Fontenelle's style of scientific dialogue, and the rise of a middle-class readership, provided a more than adequate base of readers, twelve years after Newton's death as well as through the entire 18th century, and into the 19th. Add to these factors that Newton's original was in English, with only a subsequent 1706 translation by Samuel Clarke into Latin at Newton's personal request, and the popular dissemination is further explained. This is one example of important scientific publication in the vernacular.

That import of the *Opticks* relevant to this dissertation was summarized earlier in Backdrop Two, but I note a few reminders here. The nature of the relationship between colour and light, the perfection of telescopic equipment, and the corporeal theory of light were the major contributions of Newton's book. In a natural overlap between art and science, Newton's thoughts on colour proceeded from - among other sources - historical attempts to understand

³² That this comment comes in a 1952 reprint is one indication of the continued modern interest in the 1704 text; the repercussions of these concepts of light and colour continue even today to engage scientists in active debate. The 1952 reprint is of a certain additional appeal to the modern reader, containing as it does a forward by Albert Einstein, an introduction by Sir Edmund Whittaker, a preface by I. Bernard Cohen, and an analytical table of contents by Duane H.D. Roller.

artists' colours and musical harmonies. Aristotle's long influential notion of colour, abandoned in the Renaissance, held that

yellow, red, violet, green, and blue fit between white and black in a 7-colour scale from light to dark, and that the colours were mixtures of the two extremes. As in music, simple ratios of white and black in combination yielded colours pleasing to the senses.³³

Renaissance painters³⁴ then revolutionized the ancient notions of colour, reinvigorating problems about colour for natural philosophers. Specifically,

[w]hen Renaissance painters began to mix pigment,...they found they had to *separate* the chromatic colours from black and white. This then prompted them to search for the basic or *primary* colours from which all others could be made -- though they did not meet with much immediate success.³⁵

Later, by the early 1600s, the new mechanical philosophies allowed natural philosophers to think of *all* colours as affected by light. Newton's 1666 experiments³⁶ eventually led him to the now-familiar ROYGBIV³⁷ chromatic scale of colours, in imitation of the seven steps of the musical scale³⁸, thus arriving at a depiction of light and colour as both expressing harmonies. Again, this artistic mimesis³⁹ is reminiscent of the historic association between translation and such sister arts as painting (as explored, for example, in T.R. Steiner).

³³ Allchin website. Allchin, Douglas. "Newton's Colors". SHIPS Resource Center, U. Minnesota. Article on-line at [<http://www1.umn.edu/ships/updates/newton1.htm>].

³⁴ See Pierre Paul Rubens' 1611 Juno and Argus for a celebration of red, yellow and blue that celebrated the early 17th-century discovery of the primary colours. Noted in Allchin website.

³⁵ Allchin website, italics mine.

³⁶ As Allchin explains, Newton pinned much of his light and colour arguments on one particular experiment - his 44th - that he selected from a series of trials he made in 1666 while still a student at Cambridge. There is no evidence from his notebooks, however, that Newton saw this trial as crucial when he first performed it.

³⁷ Light, or the visible portion of the spectrum of electromagnetic radiation, is composed of red, orange, yellow, green, blue, indigo, and violet wavelengths.

³⁸ As Allchin points out, note the converse influence of the colour scale on musical terminology, which calls the accidental or half-steps on a scale "chromatics".

³⁹ The interconnectedness of art forms continues to hold fascination. In his series on Music and Technology for CBC Radio One (DNTO), music historian Rob Bowman links the introduction of synthesizers into music to the idea of colour in the expression "tone music". As well, this type of discussion recalls the medical condition of synaesthesia, in which senses are mixed, e.g., colours are

STRUCTURE

In a direct imitation of Fontenelle, these ideas on colour and light appear in Algarotti's popularization in the form of six dialogues (two volumes of three dialogues each). The whole is preceded by a 16-page letter dedicated to Bernard de Fontenelle, half of which addresses the issues of content and target audience, and the second half of which addresses issues of style.

In all three areas - content, audience, and style - Algarotti acknowledges his debt to Fontenelle, who offered his readers an interesting topic in an agreeable yet stimulating style. With the otherwise raucous flavour of Restoration England now years in the past, the refined yet knowledgeable model of Fontenelle's *Conversations* remained an admirable standard for popular science; as Algarotti explains in his introduction, "I have endeavoured to set Truth...in a pleasing Light...to soften the Newtonian [philosophy], and render its severities agreeable". In doing so, Algarotti offered his readers a text that was "neither Grammar nor Sonnet", i.e. of worldly matters and yet with an aim to please through language, a laudable aim for today's scientific writers and translators as well.

Reverse repatriation

Of particular interest in this dissertation is the thread of translation as repatriation that runs especially through the first four portraits. In these examples of repatriation, ideas that were found censorious or stale⁴⁰ by the English audience were processed through the intermediary

tasted, sounds are smelled, etc. In an interesting tie-in to the brief relation made earlier (Backdrop Two) between musical scales and Newton's theory, it eventually came to be found out that refraction occurs also when *sound* or *heat* passes through materials of different densities, lending further credibility to Newton's thinking on the topic.

⁴⁰ The risks associated with promoting a heliocentric view of the universe have already been discussed in Backdrop One. This feature appears in the Behn portrait especially. As for 'stale' ideas, in the Carter, Somerville, and Lovelace portraits trends in scientific content can be seen to come and go: in Carter, the interest in optics is a feature of the 1660s, when both Newton's *Opticks* and Hooke's

of an outside culture, such as France or Italy, where they spawned related writings which were then themselves translated back into English, and in this way re-presented to the English readership.

In the case of Algarotti we find a curious reverse repatriation, as it were: upon its release, Algarotti's own *Il Newtonianismo*, referring as it did to the still censored idea of heliocentrism, was placed on the *Index Librorum Prohibitorum* [Index of Prohibited Books]. This prohibition, however, could not prevent the text from being translated into English, French, and Russian. Given the close scientific ties between England and Italy, it is not hard to imagine that, curiously enough, the English translation of Algarotti's work would also find its way back to the Italian source audience⁴¹, only this time in the form of Carter's English version, whatever the prohibition against the original Italian. Once again we find translation acting as a mitigating force in disseminating controversial content to a broad audience.

Concurrent translation

In the case of this portrait, the issue of concurrent translation does not appear *per se*, as seen previously in the Behn portrait (with concurrent translators Glanvill and Domville). However, there *do* exist two English translations - of 1739 and 1742 - with, in places, clear differences. The samples included below (in **Commentary and Samples**) are taken from these two translations, published by Cave and Hawkins, respectively. Neither title-page names Carter,

Micrographia appeared; in Somerville, Newton's cosmology reappears after processing in France by Laplace, who took the Englishman's ideas to new heights; in Lovelace we see how Babbage, who had come to be written off as a lost financial cause for his obsession with calculating machines, is revived through the intermediary of Luigi Menabrea, whose French-language account Lovelace translated into English. Finally, in Sabine's epilogous portrait, the ideas treated are neither risky nor stale, but rather at the cutting edge of the great scientific interests in geomagnetism and arctic exploration. Perhaps her operation within the mainstream, as it were, is part of what kept translator Elizabeth Sabine unsung for so long.

⁴¹ See for example Agorni 2002 for representations of Italy in England at this time.

but the 1739 translation was widely known to be by Carter, and the 1742 printing, though seemingly revised for language rather than content, contains the very same explanatory footnotes added by Carter to the first edition.

This footnote continuity suggests that the 1742 translation is also attributable to Carter, though why exactly the style was reworked is not known. Perhaps Carter's great concern with "elegance of polite literature"⁴², "that stumbling block of many eighteenth-century writers"⁴³ led her to forever adjust and refine, an impulsion familiar to many translators. Perhaps the 1742 version, with its more expansive expression, better reflects a more confident style that the now slightly older and more experienced Carter would have used in her own literary pursuits, rather than the more straightforward style of the 1739 edition. Whatever the case, it is the footnote concordance between 1739 and 1742 that suggests both translations are Carter's, rather than a third party's lifting of her notes to their own version, though this latter practice cannot be entirely ruled out⁴⁴.

In the upcoming **Commentary and Samples** section, I discuss more on how these changes between the 1739 and 1742 translations - *concurrent* translations - can be framed as an expression of Carter as a woman operating within certain social codes and as a translator operating within a Georgian aesthetic, though to uneven effect.

⁴² Carter cited in *The Cambridge History of English and American Literature in 18 Volumes* (1907-21). Volume XI. The Period of the French Revolution. XV. The Bluestockings. 6. Mrs. Elizabeth Carter. On-line at www.bartleby.com/221/1506.html.

⁴³ *op. cit.*

⁴⁴ See footnote 20, p.147, above for plundering in the publishing industry. Also, as Benedict explains, "...piracy was still widely practiced and seldom punished, even after the 1709-1710 Act for the Encouragement of Learning that confirmed current copyrights for twenty-one years and guaranteed new ones for fourteen. This bill, moreover, ignored the "rights" of authors. Indeed, most authors and editors, although not all, exercised less control over the presentation and printing of their material than had their seventeenth-century predecessors, although some like Pope did correct "accidentals" as well as substantives. As authors complained about booksellers' avarice, booksellers complained about piracy, and both appealed to the consumer for sympathy or purchasing discrimination". Barbara M. Benedict. *Making the Modern Reader: Cultural Mediation in Early Modern Literary Anthologies*. Chapter 3. On-line at http://pup.princeton.edu/books/benedict/chapter_3.html#p51

Although the practice of anonymous publication leaves us without absolute certainty, the presence of two highly similar yet nonetheless distinct translations, can be seen as a type of **concurrent translation**, even when both are argued to be by the same translator. In such a case as Carter's, one or the other translation might hold a particular appeal to a discerning audience intent on elegance of diction as among the highest criteria⁴⁵, thus drawing readership away from one text to the other, however minor these changes may strike the modern reader.

Reception

That two translations appeared so closely spaced also suggests the public appeal of these source and target texts. In fact, Carter's translation was quite well-received. In the *Gentleman's Magazine* of June 1739, reviewer Dr. J. Swan

acknowledged Algarotti's contribution in providing a clear and easy explanation of Newton's ideas, and especially praised the effect of Carter's translation:

*Now may the British fair, with Newton, soar
To worlds remote, and range all nature o'er; ...*

[Swan] regarded Miss Carter as the one who had made it possible for British women to understand science:

*Ah why should modesty conceal thy name?
The attempt were vain to hide such worth from fame;
The polish'd page Eliza's hand betrays,
And marks her well-known softness, warmth, and ease (322).*

In Swan's comments, note especially the consciousness of how translation disseminates scientific knowledge (soar / To worlds remote), as well as the references to British imperialism

⁴⁵ See Backdrop One for predominant historical criteria of expression in the Anglo-American translation sphere.

(Now may the British fair, ... range all nature o'er), anonymous publication and Carter's distinctive style of translating / writing (The polish'd page Eliza's hand betrays), and praise for Carter's ability as combined with feminine gentility (*her well-known softness, warmth, and ease*).

Though her translation was published by Cave, for whom she worked, and though this warm review appeared in the very publication - the *Gentleman's Magazine* - for which she had gone to London to write, this praise for the Algarotti translation can not be discounted as mere grandstanding. Rather, Carter's previous work in London had already won her a receptive audience, and a women-friendly magazine such as the (counter-intuitively named) *Gentleman's Magazine* was hardly an unlikely place for her work to be reviewed. One additional reviewer was Thomas Birch, who - readers will recall - not only urged Carter to the contract, but seems to have met with her to assist during the translation. Though this contact seems to have called forth unwelcome and unreciprocated romantic feelings on his part, Birch's highly favourable review of Carter in one of the over 600 articles he contributed to Bayle's *General Dictionary*⁴⁶ was surely at least as helpful as his initial brokering of the commission in furthering Carter's career.

⁴⁶ As Boswell cites Johnson in Chapter VIII of *Life of Johnson*, "Bayle's Dictionary is a very useful work for those to consult who love the biographical part of literature, which is what I love most". Further, "In his masterpiece *Dictionnaire historique et critique* (1697-1702), Bayle surveyed and skeptically criticized the various facets of the seventeenth-century intellectual world. Bayle's Dictionary launched the Age of Reason, by providing what Voltaire called "The Arsenal of the Enlightenment." Bayle had pulled together all the strains of skepticism and had laid bare all the defects of the theories of the time, undermining the quest for any metaphysical or theological certainty. *Dictionary of the History of Ideas*, "Skepticism in Modern Thought". Available on-line at <http://etext.lib.virginia.edu/DicHist/dict.html>

A general dictionary : historical and critical: in which a new and accurate translation of that of the celebrated Mr. Bayle, with the corrections and observations printed in the late edition at Paris, is included; and interspersed with several thousand lives never before published. The whole containing the history of the most illustrious persons of all ages and nations particularly those of Great Britain and Ireland, distinguished by their rank, actions, learning and other accomplishments. With reflections on such passages of Bayle, as seem to favor scepticism and the Manichee system / By the Reverend Mr. John Peter Bernard, F.R.S., The Reverend Mr. Thomas Birch ... Mr. John Lockman; and other hands.

**4. Carter's Translation Praxis : Commentary and Samples
(*Sir Isaac Newton's Philosophy explain'd...*, 1739 and 1742 editions)**

In preceding sections I presented ideas about Carter's translation of Algarotti as a form of repatriation of Newtonian science into England, and of the two English versions (1739 and 1742) as a form of concurrent translation, competing as they did for a comparable readership just three years apart.

In this section I discuss aspects of Carter's translation praxis, as seen in her Algarotti translation, by direct means of commentary and samples. In parallel to the other four portraits of the dissertation, the purpose in this praxis section is to underscore Carter's role as a woman translating - and disseminating - science, against the particular translation and science backdrops of her day. I do this not by conducting an exhaustive translation analysis, but rather by highlighting certain key points, including the following :

- similarities and differences in the texts by Algarotti / Carter and Fontenelle / Behn
- Carter's inclusion of paratextual knowledge
- Carter's translation choices in non-scientific vs. scientific content
- Carter's translation as within the "culture of sensibility" associated with Georgian aesthetics.

In this portrait, rather than relate the 1739 and 1742 editions directly to the Italian source text, (not one of my accredited languages), I instead draw commentary from a consideration of the two English editions themselves⁴⁷.

London : Printed by J. Bettenham, 1734-1741.

⁴⁷ For translators of Italian, I do note here, however, that through the effort and generosity of such on-line projects as *Liber liber*, the Algarotti original (*Dialoghi sopra l'ottica newtoniana*) is available

Text Similarities and Differences : Carter/Algarotti & Behn/Fontenelle

Similarities

As discussed in Portrait One, Aphra Behn's translation of Fontenelle's popularization of Newtonian ideas, the *Conversations on the Plurality of Worlds*, was published in 1688. Among those readers impressed with Fontenelle's project to bring science to a wider readership was Francesco Algarotti himself, who produced his own *Dialoghi* some 50 years later⁴⁸. In the **Form** section earlier in this portrait (see page 158), I suggested how a concern with didactic communication (in this instance, as popularization) can be recognized in both the Fontenelle and Algarotti source texts (and their respective translations), particularly in the use of a dialogue format for an audience of scientific novices; in that section I also cited Algarotti's direct recognition of Fontenelle as his model author⁴⁹.

Differences

Yet by the time that Algarotti's source text (1737) and Carter's translations (1739, 1742) appeared, some 50 years after Fontenelle and Behn, certain things had changed. First, after the initial shock of Newton's cosmology, the genius of his intellect saw Newtonian science, and its impressive range of topics, inevitably become firmly accepted in both England and abroad. Second, topical interest had shifted from his cosmological work to the study of optics, or light and colour. These two points were discussed earlier in Backdrop Two, on the science behind the dissertation.

as an e-text on the Web: <http://www.liberliber.it/biblioteca/a/algarotti/index.htm>.

⁴⁸ Note that, even though 50 years had passed between Fontenelle's *Conversations* and Algarotti's *Dialoghi*, the latter were still within Fontenelle's own long lifespan of nearly 100 years (1657-1757). It would be interesting to discover evidence (letters, diaries, other personal or professional communication...) of Fontenelle's awareness of Algarotti's homage.

⁴⁹ Whether Algarotti read Fontenelle in the original French or in Behn's (or a concurrent) translation is unfortunately not yet known. Clarification of this point would offer insight into the dissemination of the French and/or English texts to Italy.

Third, social codes for (middle-class) women in Carter's Georgian England had shifted toward a more conservative slant than in Behn's previous Restoration milieu. Fourth, the literary aesthetics of Georgian England, which informed the translation aesthetic of the day, included a shift away from the central place theretofore held by poetry and the poet toward a culture of sensibility. In the following I link especially these latter two ideas to samples.

Carter: Operating within more conservative codes for women

Previous to Carter, when Aphra Behn was exploring sexual politics on the stage and in her translations, a certain license in creative expression was par for the course (whether in the theatre, in authorship, or in translation), as was a certain fluidity in social boundaries. As Carraro explains on this point, the preceding years of religious warfare in Europe had thrust Restoration women into positions of visibility, power, and influence while the men were off fighting, positions from which the women were not so eager to retire once the men had returned: "the religious and political turmoil ... had a liberating effect on women who had bravely coped with the challenges of war and were benefiting from greater independence"⁵⁰.

Yet by the time this Stuart reign had passed and a succession of Hanoverian rulers ushered in the Georgian era, the turbulence of Protestant-Catholic warfare had subsided, giving way to a desire for renewed stability and constancy. So, while even in her own day Behn was considered quite outspoken in her woman's search for freedom of thought and expression, this difference had become not less, but *even more* pronounced to the settled generation that followed her, i.e., Carter's. Indeed, not all progress is linear⁵¹.

⁵⁰ Carraro, Laura Favero. "Learned Ladies, 1650-1750". On-line article, available through www.LitEncyc.com.

⁵¹ The idea of non-linearity has been, and continues to be, explored by many scholars; one example is Espen J. Aarseth's "Nonlinearity and Literary Theory," in *Hyper/Text/Theory* (George P. Landow,

As Vickery explains, especially then for Elizabeth Carter and her like of middle-class women (which emerging class – and which readership⁵², including for scientific materials – continued to grow) the Georgian social backdrop praised the attributes of being

...polite, civil, genteel, well-bred and polished. As brides they aimed to appear aimiable and accomplished. ... Their possessions were contrived to have a genteel effect, rather than a dazzling elegance, and their entertainments aimed at generous liberality not sumptuous magnificence. ... As a shorthand description, I have labelled this group 'the polite' or 'the genteel'. While polite manners could be practised at lower social depths and amplified at greater heights, this label captures the moderate social eminence I wish to convey, combined with an emphasis on outward behaviour, while not prejudging an individual's source of income⁵³.

According to Paul Langford⁵⁴, it was in fact this collaboration of "the landed gentry and the upper elements of bourgeois society ... [that constituted] that category of the indisputably "polite", which in the last analysis forms *the closest thing to a governing class* in Georgian England" (emphasis mine), in contrast to "an aristocracy that is mad, bad, and dangerous to know" – an aristocracy not unlike the sexually liberal court of Charles II in Aphra Behn's day⁵⁵.

Note how gentility is clearly expressed as a desirable trait *throughout* the whole of the following samples (both 1739 and 1742) from Carter's translation of the *Dialoghi*⁵⁶:

ed.). Baltimore: Johns Hopkins U. Press, 1994 pp. 51-86.

⁵² As John Brewer explores in *The Pleasures of the Imagination: English Culture in the Eighteenth Century* (Chicago: U. Chicago Press, 2000), what made this period special was the exodus of culture from the court to the street, for a number of reasons: literacy rates were on the up, as was urbanization; meanwhile, more schools opened their doors, and cities became an ideal breeding ground for a wider popular readership, a need to which a growing publishing industry responded, as did the new libraries, where an annual fee could amount to less than the price of a single volume.

⁵³ Amanda Vickery, *The Gentlewoman's Daughter: Women's Lives in Georgian England*, pp. 13-14.

⁵⁴ Cited in Vickery, p.14.

⁵⁵ Vickery, p.14.

⁵⁶ This particular sample is intended generally to *contextualize* Carter as a translator within the Georgian era, rather than to comment on the differences between the 1839 and 1842 translations. Nonetheless, I do note here that the reader will be struck by the differences between the two texts, differences which are discussed later in the textual commentary. I am struck, for example, by the more pronounced favour shown educated women in the 1842 translation, for example at the end of paragraph two "and can also, when Occasion offers, propose the most abstracted Questions, and support the most

CARTER 1739

To the Charms of Wit, and the most polite Imagination she joined an uncommon strength of Judgement, and to the most refined Sentiments a learned Curiosity.

Superior to the rest of her Sex, without being solicitous to appear so, she could talk of Ornament and Dress whenever there was occasion for it, and ask proper Questions upon more important Subjects.

A natural Negligence, an easy Unaffectedness imbellished all she said.

She had Beauty enough to gain her Consort many friends, and was judicious enough not to shew any one a particular Regard, and these accomplishments being seldom found united except in Books and the Imagination of Authors, is the Reason, I believe, that Learning in Ladies does not meet with so universal an Applause from the World as their Beauty.

[CARTER] 1742

In her, the most sprightly Wit and sublime Imagination is tempered by the greatest Delicacy, and a surprising Strength of Judgement.

Superior to the rest of her Sex, without being solicitous to appear so, she can, when Conversation takes that Turn, chat of Jewels, Lace and Fashions; and can also, when Occasion offers, propose the most abstracted Questions, and support the most grave and solid Conversations.

She speaks without Study or Affectation ; but you are won by the Sweetness and Ease of her Manner, and struck with the Life and Fire which shines in all she says.

In short, though her Beauty engages many to solicit her Husband's Friendship, her Virtue guards her against being particular to any one of them. She had indeed collected in herself all the valuable Qualities, which we so seldom see joined together, except in the feigned Characters of Authors, who give a Loose to their Fancy : And hence it is, perhaps, that we are more apt to make our Addresses to Ladies on Account of their personal Attractions, than to pay the due Applause to their intrinsick Merit.

As an educated provincial woman of modest financial origins, and as woman writing, then, Carter was as much a *product* of the codes for genteel women as she was a *reinforcer* of such values through her pursuit of a chaste yet acclaimed writerly life in affiliation with kindred

grave and solid Conversations," as well as at the end of paragraph four "... we are more apt to make our Addresses to Ladies on Account of their personal Attractions, than to pay the due Applause to their Intrinsick Merit". See page 179 for related comments.

spirits in the Bluestocking circle, which group promoted a moral lifestyle through learning. Her membership, if you will, in this 'closest thing to a governing class in Georgian England' as well as in the Bluestocking environment, offered Carter an opportunity to achieve visibility and exert influence, even as an unmarried woman, especially provided her works (original writing as well as translations) were *modest* as well as learned, a combination that, from biographical accounts, seems to have suited her personality well in any case.

On the other hand, while his source text would have pleased her for its depiction of a woman learning science, we are left to wonder what Carter must have thought, for example, of the condescension in certain of Algarotti's prefatory comments on the purpose of popular science texts such as his *Dialoghi*, which, in contrast to Fontenelle's *mixed* intended audience, was geared *specifically* to women: because the female audience "must be pleased to be instructed" and can only "rather perceive than understand", novel concepts are "beautified for the beautiful", for the "most amiable Part of the Universe". "Lines and figures" are excluded, the bare minimum of "terms" is explained familiarly, and the whole is interspersed with embellishments "as a composition for the Theatre...to move the heart"⁵⁷.

This tension around the instruction of women (whether in England or Italy, apparently) suggests Algarotti was still struggling, as were many in 18th-century Italy, with the question of (learned) women's appropriate place⁵⁸. As Rebecca Messberger recently explained, amid a

⁵⁷ *Sir Newton's Philosophy Explain'd...*, Prefatory letter from Algarotti to Fontenelle, Carter's translation.

⁵⁸ Ultimately, the Marchioness featured in the *Dialogues* is portrayed as a clear exception to a regrettable rule of ignorant, affected, vapid beauties, a unique and therefore non-threatening case in a world where only those few women who combine all desirable qualities can be found "superior". This enormous tension around beauty and intellect in women gave rise to techniques that "permitted men to reconcile their praise of a particular gifted woman with their sense of the incapacities of most women" (Myers 1990:182), as in this sample from a letter to Elizabeth Montagu: "Do you think then I will write Postscripts to you as I would to a Woman? There is as much Difference between your Genius and that of your sex as between a murmuring Stream and the Ocean" (Letter from George Lyttleton, scholar,

formal controversy about their authority Italian women were nonetheless gaining power through education and academia, leading contemporary Italian playwright Pietro Chiari for example to call his age “the century of women”⁵⁹.

Evidence of the social backdrop against which Carter functioned can be interpreted in her translator’s approach to the *Dialoghi* source text, in particular in the paratextual features.

Paratextual features

In contrast to the concurrent translations seen in Portrait One (Fontenelle/ Behn-Glanvill-Damvile) Carter’s appears to have been the only translation of Algarotti into English. Although it appeared without her name on the title-page it “was widely known to be by her”⁶⁰ and appeared in at least two editions, in 1739 and 1742⁶¹; later editions appeared in 1765 (Glasgow) and 1772 (London, a “new” edition). The number and time span of these editions indicate continued demand for the text.

Specifically, Carter’s translation includes *no* translator’s preface. In this *paratextual* behaviour, she differs not only from more outspoken women such as her predecessor Behn, but also apparently from other authors of her day generally, as we see in the following *textual*

poet, and politician. Montagu’s Letters MO639, cited in Myers 1990:182). Still, by the time of the 1842 translation, Carter has worked to cast a more favourable image of women, as in footnote four, above, or, in another passage, by changing *understand* to *know* (see page 35 for more on this particular switch).

⁵⁹ Rebecca Messberger, *The Century of Women: Representations of Women in Eighteenth-Century Italian Public Discourse*, U. of T. Press, 2002.

⁶⁰ Myers 1990:53.

⁶¹ From 1739 to 1742 the English title changed slightly, from *Sir Isaac Newton’s Philosophy Explain’d for the Use of the Ladies. In Six Dialogues on Light and Colours. From the Italian of Sig. Algarotti* to *Sir Isaac Newton’s Theory of Light and Colours, and his Principle of Attraction, made familiar to the Ladies in Several Entertainments. In Two Volumes. Translated from the Original Italian of Signor Algarotti*. The printer changed as well, from E. Cave (the Carter family friend) to G. Hawkins.

comment by the narrator on his first night of dialogue with the Marchioness⁶²:

[1739] And the natural Desire that every Author has to appear in print, (whatever these Gentlemen may tell us in their long Prefaces) engages me at present to publish this account. It is entirely philosophical, and composed of certain Discourses which I had with that polite Lady on the Subject of Light and Colours.

[1742] All Authors are fond of appearing in Print, however they labour to persuade us to the contrary in their long-winded Prefaces ; and, for my Share, I confess, the flattering Insinuations of the same natural Desire encourage me to publish my Narrative: A Story merely philosophical, made up entirely of some Conversations which I had with that charming Lady, upon the Subject of *Light and Colours*.

Interesting here, too, is Carter's change from **Gentlemen** in the 1739 version to the more inclusive **Authors**, without gender distinction, on the 1742 version. Perhaps, in a stroke of gentility, she found it unfair to attribute long-windedness solely to men, or perhaps, in line with her beliefs in the importance of female education, she wished to mark *author* as a profession open to both genders⁶³.

On another paratextual point of interest beyond the lack of translator's preface, Carter's additions are largely confined to *footnotes* that explain historical and geographical references perhaps unfamiliar to her contemporary English audience. In the following sample, for example, she explains the importance of Laura Bassi, a famed Italian scholar⁶⁴. It is

⁶² Carter's translations (1839, 1842) of Algarotti, "First Dialogue" in each.

⁶³ For another such instance of equalizing the genders, see the sample and discussion (pages 186-87) of Carter's translation of "molti altri". The term, which can refer either to males only, or to a mixed group, is translated by Carter as "many others", which neutral / mixed English solution effectively conserves both possibilities of gender. In other words, whether or not the plural refers to a mixed-gender or purely male group, men, too, were occasionally at a loss to explain the new natural Philosophy; ignorance was not the exclusive domain of women. Rather, science, as any other pursuit, held the interest of a subset of society, and taxed their abilities indiscriminately.

⁶⁴ Bassi was the first woman ever to receive a Doctorate at the University of Bologna - and at only 19 years of age. (Bassi would later go on to teach there, though not without continued resistance from more conservative faculty; today she remains recognized as an important mathematician in Italy's history.) Whether Carter became aware of Bassi through personal communication with Algarotti, or through the Bluestockings, or through her own research efforts, this footnote, and generally other

interesting to see how Carter here has chosen to provide additional information on a fellow female scholar:

[1739] Now we are speaking of Epithets, is not *the sevenfold Light*, which I read of some time ago, (replied the Marchioness) in an Ode made in Honour of the Philosophical Lady [footnote ref.] of *Bologna*...?

[The footnote reads: "*Laura Maria Katherina Bassi*, a Learned Lady in Italy, who, in 1732, at 19 Years old, held a philosophical Disputation at *Bologna*, upon which she was admitted to the Degree of Doctor in that University".]

[1742] ...pray what am I to understand by the *Seven-fold Light* an Expression which I lately met with, in a Song, addressed to the Philosophick [footnote ref.] Lady of *Bologna*? Is it not a Kind of Hieroglyphick? 'Tis at least to me, and to many others whom I have, in vain, desired to explain it.

[The footnote is identical to the first edition of 1739, see above paragraph.]

Also in her footnotes, Carter provides bi-text translations (translation/adaptation plus footnoted original) for the Italian verses that pepper the source text, such as in this example⁶⁵:

... *turba, e scolora*
le tante stelle ond'è l'Olimpo adorno.

- with superior Blaze,
Dims the pale Lustre of the starry Rays

references of the kind, show that an awareness of other learned women was spreading throughout Europe, reinforcing the convictions of education reformers. That the reference to Bassi is not explained in the Italian text suggests Bassi was already well enough known to the domestic audience not to require further comment, an impressive standing in itself.

⁶⁵ Samples of verses in the "First Dialogue", taken from <http://www.liberliber.it/biblioteca/a/algarotti/> :

... Di qui è che il sole, nel cui vortice pur siamo, e la cui lontananza da noi è di soli cento milioni di miglia, al suo apparir

... *turba, e scolora*
le tante stelle ond'è l'Olimpo adorno.

=====

E così il filosofo vi dà di che dipingere
L'erbetta verde, e i fior di color mille,
di che variare a vostro piacimento la faccia dell'universo.

=====

Voi vi siete un po' troppo lasciata andare all'immaginazione
dolci cose ad udire, e dolci inganni.

Whether these verse translations are her own or from a pre-existing source is unclear, though in either case the footnotes as a whole suggest her wide-ranging knowledge, her attention to detail, and her research skills, all of which desirable traits in a translator, past or present. In addition to fostering an impression of competence, the footnotes suggest that Carter's understanding of the translation project was, at least in part, didactic.

I interpret Carter's use and style of paratextual commentary (i.e., footnotes) as in line with her belief in a life of modest yet diligent learning; she includes straightforward factual references to broaden her reader's knowledge, yet does not rework the main body of the text to do so. In other words, she maintains a clear distinction between source text and target text, with her own role one of complement to the source text, which retains its distinct identity. Here we see the difference between Carter and Behn, who asserted much more of an authorial presence in the fact of, and actual comments contained in, the *Essay on Translated Prose* that preceded her Fontenelle translation.

I find that this shifted focus (from Behn as a more 'interfering' translator – both paratextually and textually, to Carter as a rather less interfering translator) is indicative not simply of Carter as one individual translating with a given personal translation project in mind, but also as indicative of Carter as a translator operating within the professional climate of her day, more of which I discuss next.

Carter: (Writing) and translating within the aesthetic of her day

In order to locate Carter, I begin by briefly recalling the climate within which her predecessor Behn translated. At the time Aphra Behn was translating Fontenelle, translators such as

(Abraham) Cowley and (John) Denham, and Dryden in response to them, were exerting considerable influence on the world of translation through their ongoing dialogue on the acceptable limits of translation and the translator's place in the process. One feature of this Restoration translation was a focus on the identification of the translator as a poet, a creative spirit with sensitivities of his/her own to be respected and given expression, even while the status of the source text (often enough classics in this neoclassical age) was revered.

Consider, for example, Denham's⁶⁶ praise of fellow translator Fanshawe, as cited by none other than Samuel Johnson (emphasis mine)⁶⁷:

That servile path thou nobly dost decline,
Of tracing word by word, and line by line.
Those are the labour'd births of slavish brains,
Not the effect of poetry, but pains:
Cheap vulgar arts, whose narrowness affords
No flight for thoughts, but poorly stick at words.
A new and nobler way thou dost pursue,
To make translations and translators too.
They but preserve the ashes, thou the flame,
True to his sense, *but truer to his fame.*

The sensitivity and status – the 'fame' - of the poet-author and poet-translator coincide here, and take on a central importance. Indeed, in contrast to the generally more audience-centred approaches of its French counterparts around the time Behn was translating⁶⁸, the Anglo-American sphere was associated with a more poet-centred approach to translation on the whole⁶⁹.

Yet Carter was translating 50 years later, and so within a *Georgian* aesthetic, which was

⁶⁶ Sir John Denham, 1615-1659.

⁶⁷ Johnson, Samuel. "The Life of John Denham." *The Penn State Archive of Samuel Johnson's Lives of the Poets*. Ed. Kathleen Nulton Kemmerer. <http://www.hn.psu.edu/faculty/kkemmerer/poets/denham/default.html>. Originally published as *Works of the English Poets with prefaces, Biographical and Critical*, by Samuel Johnson. 68 vols. Vol 9. London: J. Nichols, 1779.

⁶⁸ The influence of the French translators on their English colleagues is touched on in Backdrop One.

moving away from hallowed reverence for poetry (and poets), and toward a “culture of sensibility”. These changes came to bear in (at least) two ways. First, as Benedict notes⁷⁰, in a move away from poetry as most hallowed form:

By the mid-eighteenth century, poetry was seriously challenged as the most influential form of high literature. Novels, periodical journals and magazines, and collections of prose anecdotes, extracts, and vignettes were attracting multiple readers, as well as popular ...authors.

Second, and simultaneously, as Barker Bensfield explains⁷¹, in a more general preoccupation with others (emphasis mine):

In British society of the eighteenth century, having a heightened consciousness of feelings, one's own *and other people's*, took on immense moral significance. The cultivation of sensibility, as this consciousness was known, was largely identified with women, and had as its primary concern the improvement of men's treatment of women.

In these two citations, we see how literature (and, hence) translation was being affected by changing author-reader systems that now drew translators' attention *outward* toward other genres (not just poetry) and toward other people (including, presumably, the audience). This incorporation of the outside world, the other, the reader, seems in part to have led to a changing awareness of the translator's role as now more practical and delimited in relation to the source text / source text author, rather than the more privately artistic fusing of creative minds and spirits sought after by previous generations.

⁶⁹ See T.R. Steiner on this contrast.

⁷⁰ Barbara M. Benedict. Page 1 of “Chapter Four: Reading Systems in the Mid-Eighteenth Century”. In: *Making the Modern Reader: Cultural Mediation in Early Modern Literary Anthologies*. Princeton U. Press 1996. Available on-line at <http://pup.Princeton.edu/books/benedict/chapter_4.html>

⁷¹ Barker-Benfield, G. J. *The Culture of Sensibility: Sex and Society in Eighteenth-Century Britain*. Chicago: U. Chicago Press, 1992. Back cover.

In Italy, meanwhile, not to forget Algarotti's source text, a focus on practicality - not unlike the English interest in sensibility - was coming to the fore. As pointed out here⁷² (emphasis mine),

The distinctive feature of the Italian Enlightenment ... as befitted the country that produced such scientists as Luigi Galvani and Alessandro Volta, was its *practical* tendency--as if speculation were a luxury amid so much disorder and poverty.

In both the source text culture and the target text culture, then, there are signs of the practical, sensible - yet sensitive - aesthetic within which Carter would have been operating. To recap thus far, in terms of the three threads throughout this dissertation, (translators, science, women) we have seen that social codes for (learned, middle-class) **women** prized gentility and sensibility (in England and in Italy), just as we have seen that these preferences overlapped with the **literary/translation climate** of the day, which was casting an outward focus on the needs of those other than just the poet. In other words, we see that two influences - social and aesthetic - converge to make Carter, (as expected based on this information) a - paratextually - more conservative translator than, say, Aphra Behn.

Having set up these two points, I now finish with commentary and samples related to Carter's intervention at the *textual* level, which section also leads to the third and final thread, on Carter's handling of **scientific** content.

Examples of Carter's *textual* praxis

In this section, we see that, although paratextually conservative, at the *textual* level Carter nonetheless does interfere with the text, with a number of changes between the 1739 and 1742 translations. Yet her alterations seem uneven, making it harder to determine her specific

⁷² "The Enlightenment Throughout Europe". In: *The International History Project*, 1995. On-line at

consciousness of a translation project, though I can, and do, propose some ideas on her approach.

First, I suggest there is evidence in her textual interference that Carter acted for (at least) one purpose: to present an improved image of educated women. This is not unlike her paratextual approach of including footnotes, but it *is* surprising considering the more conservative codes within which Carter functioned, both as woman and as translator.

Consider, for example, the 'gentility excerpt' proposed earlier (see page 27, and footnote 60). In fact, the whole of the 1742 passage is striking for its noticeable expansion, its wordiness, as compared to the 1739 text; while this alone demonstrates Carter's presence in the translation, there is also an enhanced focus on the intelligence of women, as in "and can also, when Occasion offers, propose *the most abstracted* Questions, and *support the most grave and solid* Conversations", or here, "and struck with the Life and Fire which shines in all she says", or here, "She had indeed collected in herself all the valuable Qualities" (note also the active agent "she had collected" in this 1742 clause, compared to the passive "found united" of the 1739 text), or, especially, here, "than to pay the due Applause to their Intrinsick Merit" (see also footnote 56, p.169).

This favourable image of women appears in other textual examples as well. Where, early on the first evening of dialogue, the Marchioness is trying to persuade the narrator to teach her about Newton's *Opticks*, Carter modifies her 1739 translation from "If you *understood* the whole force of that Expression" to "If you *knew* the Force of this Epithet". As I touched upon in an earlier footnote (59), this shift from *understood* to *knew* is important because "if you understood" implies the woman has been told but can not understand, while "if you knew"

suggests that she need only be given the opportunity to hear the idea explained, and she will in fact be quite able to understand; this second (1742) translation is clearly more favourable in its implication.

In a third example of Carter's suspected project to cast a more favourable light on women and their abilities via the character of the Marchioness, Carter again employs an agent switch during the persuasion scenario of the first night's Dialogue, taking power from others, in this case from the narrator, and repositioning it with the Marchioness, e.g., from "*Being willing to give her some Idea of the system to which these Verses refer*" to "*At length she prevailed upon me* to attempt giving her some Notion of that Theory to which I had alluded". The full paragraph⁷³ is here:

[1739] *Being willing to give her* some Idea of the System to which these Verses refer, and thinking that the Marchioness would for once be like other Ladies, who are often desirous of seeming to understand what they are not supposed to have the least Notion of,

[1742] *At length she prevailed upon me*, to attempt giving her some Notion of that Theory to which I had alluded in my Verses ; and (as I suspected that for this one time of her Life, she might have fallen into the Humour of a Number of Ladies, who pique themselves upon saying, that they thoroughly understand Matters, of whose very Elements they have not the least Idea)

⁷³ As for the content of this sample, it falls within a close imitation of the story line first proposed by Fontenelle in his *Conversations*, though with a certain disdain not evident in that earlier author. The comment against women who pretend to be knowledgeable must have struck a chord with Carter, as the Bluestockings and their sympathizers found it was only when women who desire higher learning are *kept from it* that they cling to the consolation prize of pretence, as it were. Ultimately, we may never know whether the reader was intended to identify primarily with the reticent yet yielding narrator or with the charming yet insistent Marchioness, or whether the narrator's stance on teaching women is to be read as a mockery, a refutation, of those who would keep women from learning, placing both positions in consensus.

When it comes to Carter's involvement in the scientific content of the text, however, her agenda, if there is one, is not as decipherable. Her expansion seems indiscriminate, with, in some places, the revisions adding clarity, yet in others, only an unhappy verbosity. This lack of pattern suggests an overriding effort to imbue the translation with contemporary concern for elegance of diction⁷⁴ above all, rather than any other underlying project vis-à-vis the scientific content, though a *didactic* goal may be what drives her.

In the case of the previous portrait, that of Aphra Behn, I argued that the translator modulated her approach depending on whether she was translating scientific or non-scientific portions of the source text, with less and more interference, respectively. By contrast, in the case of Carter, the point of interest around scientific content are the *differences* between her two translations, the 1739 text and the 1742 text.

Specifically, Carter expands her 1742 translation on *both* levels, non-scientific and scientific, with what I take to be (at least) two purposes in mind. The (clearer) first seems to be to generate a favourable impression of women learning science; this has been seen above in commentary and samples. The (murkier) second of Carter's slants seems to be didactic, i.e., to aim for ever greater clarity in the communication of the theme at the very heart of the *Dialogues*, light and optics. Yet this goal of greater clarity is not, I contend, always achieved.

On the point of inconsistency, consider, for example, the following **sequence of four samples** from the scientific discussions at the heart of the *Dialogues*. In the first sample, the Marchioness is warming the narrator up to a discussion of the central idea, that white light is composed of seven colours of light:

[1739] You mean, answered I,

⁷⁴ This behaviour is seen 19 years later in Carter's *Epictetus* translation as well. When Thomas Secker (Bishop of Oxford and later Archbishop of Canterbury) proofread a first draft, he found its only fault was its elegance of diction, which contrasted inappropriately with the character of a Greek slave.

The sevenfold Light
Whence ev'ry pleasing Charm of Colour
springs.
And forms the gay variety of Things

[1742] You mean, Madam, these Lines --

That Seven-fold Light, that golden Ray,
Shot forth from the bright Orb of Day,
In whose direct transparent Line,
United, all the Colours shine
Whose Beam, as thro' the Universe it burns,
All Objects shews, and while it shews, adorns.

Remarkably, in a complete departure from the original text⁷⁵, Carter expands the 1739 light poem from 3 lines to fully 6 lines, showing her own 'true colours' as a writer. Perhaps because the Italian designates the (fictional) narrator as the poet, the translator felt free to embellish the poem to create an imitation rather than more closely observe the poetry of an actual author.

True enough, the 1742 poem does offer slightly more information on the composition of light, but in doing so it jumps the gun on what Algarotti seems to have intended to keep under wraps until a slightly later, and narratively more appropriate, passage, seen here in both the 1739 and 1742 texts:

[1739] I told her, as briefly as I could, That according to Sir *Isaac Newton's* Opinion, or rather as the thing really is, **every Ray of Light is composed of an infinite number of**

⁷⁵ Available on-line through LiberLiber at <http://www.liberliber.it/biblioteca/a/algarotti/>
Vorreste voi dire - ripres'io con vivezza - di que' versi,
O dell'aurata
luce settemplice
i varioardenti, e misti almi color?

other Rays, some of which are red, some orange-colour, others green, some blue, some indigo, and others violet;

and that **from the Composition of these seven Colours** in a direct Ray from the Sun, **arises the** white or rather golden **Colour of Light** :

That if this direct Ray from the Sun is refracted by a certain **Glass** called a Prism, these Rays, of which it is composed differing in Colour, differ also in Degrees of Refrangibility...

[1742] I began in a most Laconick Way to tell her, that, by means of *Newton's* Discoveries, and pursuant to natural Truth, we are taught, That **every Ray of Light is composed of a Multitude of smaller rays**, whereof some are *Red*, some are *Orange-colour'd*, some *Yellow*, some *Green*, others *Azure*, others *Indigo*, and others again *Violet*.

That **from these seven Colours, blended together** (as they really are in a Ray darted from the Sun) **there arises** one white, or rather yellowish Colour, which is **the Colour of Light**.

That if this direct Ray be refracted by a certain *Piece of Crystal*, called a Prism, then all the smaller Rays, of which it is composed, being of different Colours, and **consequently** of different Degrees of Refrangibility -- ...

It is here that the narrator presents the Marchioness with the thesis, the very core, of Newton's landmark theory of light and colour: that white light is a composite of seven rays of colour, and that these rays differ in their refrangibility, or passage through materials of different density⁷⁶. Thence, all other scientific content flows from this key concept, which is presented just thirteen pages into the body of the 400+-page work. Still, Carter's motivation for foreshadowing Algarotti's own source text content by the inclusion of her expanded 1742 poem is not clear; did she feel the novel ideas needed explaining twice, or was it an interest in pleasant language that lay at the source of her creativity in this example?

⁷⁶ In an interesting tie-in to the brief relation made earlier between musical scales and Newton's theory, it would eventually be found out that such refraction occurs also when *sound* or *heat* passes through

Indeed, whether the 1742 translation represents an improvement, or any particular agenda, is hard to say. On the one hand, perhaps for the uninitiated reader, such changes as “multitude” for “an infinite number”, “blended together” for “composition”, “which is” as a relative phrase added to “colour of light”, “piece of crystal” for “glass” (which itself could also mean mirror), and the inclusion of “consequently” made the second edition a closer approximation of the way a teacher might describe, and a novice therefore understand, these new concepts - whether or not Algarotti’s own words were thus.

On the other hand, the overall effect of Carter’s 1742 expansions can also be said to *distract* from the *simplicity* of the 1739 translation, where simplicity itself would have been didactic and therefore quite desirable, even preferable. Indeed, though her motivations for improving the depiction of women in the later translation seem understandable within her biography, why would Carter have expanded the *scientific* content of the translation from 1739 to 1742 at all? The answer may be simple. By this point in her developing career, Carter surely had continued to read and write extensively (even from the relative quiet of Deal), her personal style changing along the way, so that she simply may have felt the familiar ‘translator’s urge’ to revise her earlier edition, however content she originally was with it. The evidence Carter’s changes leave of such a process speaks to the great freedom and responsibility of translation: the original remains the same, while a translation is dynamic.

In the final two samples, Carter’s indiscriminate (scientific) revisions are seen again:

[1739]...and since all you said was spoke with an Air of Seriousness and such Confidence that you did not scruple saying, according to Sir Isaac Newton’s Opinion, or rather **as the Thing really is**, you have made me extremely desirous of becoming a Newtonian.

materials of different densities, lending further credibility to Newton’s thinking on the topic.

...It signified nothing for me to plead Incapacity and many other Excuses, which are made use of on the like Occasions, and which occurred to me upon this. The Marchioness insisted upon seeing my **Newtonian Picture** as she called it. I begged she would at least have Patience till Evening...

...[Yet] I was absolutely obliged to begin, but the Difficulty was how to do it; for she had not the least Notion of **Physics**, which it was necessary to give her a general Idea of, before I proceeded to a **Discourse upon Light** and the **Newtonian System**.

[1742] ...you seem to speak with such an Air of Curiosity , and so seriously join together Newton's Discoveries and the **Truths of Nature**, that I am impatient to become a Newtonian too.

...It was to no Purpose that I pleaded my Incapacity, and offered all the little Excuses which are usually made on the like Occasions : The Marchioness insisted on seeing my **Newtonian Picture**, as she called it. I beg'd she would at least have Patience 'till the Evening...

[Yet] was I absolutely obliged to begin ; but how to do it was the Difficulty : For, as the Marchioness was utterly unacquainted with **Natural Philosophy**, I found it necessary to give her some general Idea of it, before I proceeded to explain [---] **Newton's Theory**.

Here, the 1742 translation does selectively incorporate the more current, and formally scientific, vocabulary of "Truths of Nature" for "the thing as it really is", and "Natural Philosophy" for "Physics," suggesting the text did reflect the continuing spread of science. Yet Carter also removes the explanatory "a Discourse on Light" entirely from the 1739 to the 1742 text, then finishes by switching back Newtonian *System* to the more scientific expression Newton's *Theory*. It seems she can not decide how to consistently meet the didactic task I suggest she had set herself. What decision-making processes might she have been struggling with?

Indeed, a struggle of sorts is seen in the final sample. In this passage, the narrator is contextualizing the urge from which first evolved a desire to understand and explain the nature of light. Though not a highly technical passage, it nonetheless forms part of the scientific exposition at the heart of Algarotti's work, and I therefore categorize the sample as belonging to Carter's treatment of *scientific* ideas, and not merely to her use of social

dialogue. Interestingly, this sample demonstrates an overlap with Carter's handling of gender roles.

[1739]...It is natural to suppose that after Society was so well established among **Mankind**, that some of them had nothing to do (which I look upon as the Epoque of its Perfection) these **Persons**...

...applied themselves to consider the Variety of Things of which this Universe is composed, their Differences and Effects.

It is probable too, that one of the first Speculations that these **idle People**, who afterwards assumed the Name of Philosophers, employed themselves about, was concerning the Nature of Light...

...But the Misfortune is, that Experiments and Observation require Patience and Time, and very often we are indebted to mere Chance for the most useful and entertaining among them On the other Hand, **Men** are always in haste to arrive at Knowledge, or at least to have the Appearance of it.

[1742] When once Society was so far established, as not to need the Labour of all it's [*sic*] **Members** (and this I look upon as it's [*sic*] first Step towards Perfection)...

...[**Men**] began to turn their Enquiries upon such Things as compose the Universe, their various Relations, Differences, and Effects.

These **speculative People** soon assumed the Title of Philosophers : ... [and Light] became, in all Likelihood, one of the first Objects of their Speculations...

...But herein lies the Misfortune : Experiments and Observations require a great deal of Time, much Pains, and unwearied Application ; (not but that some of the most useful and curious have been struck out by meer [*sic*] Chance ;) or, on the other Side, **Mankind** is generally in too great a Hurry to become knowing, or, at least, to appear so to the World.

In this last sample, Carter switches back and forth in her gender assignment and depiction of scientists, downgrading (?) *Persons* to *Men* (paragraph one), yet upgrading *idle people* to *speculative people* (paragraph 3), but then broadening *Men* to *Mankind* in paragraph 4 (presumably, our modern variation, Humankind, was not yet available to Carter's vocabulary). This shift from "Men" to "Mankind" in the final paragraph may be in parallel to the "many

others" (molti altri) of Sample Three; just as ignorance was not the sole domain of women, neither was pretence the sole domain of men.

From this particular sequence of four (more scientific) samples first begun on page 181, the reader can form a sense of how much more difficult it is to determine Carter's approach to scientific content than, say, her interest in social codes for women and translator codes for sensibility. I propose this is one reflection of how Carter, as a woman, and as an author, was placed in relation to science education. For, as a primarily literary author, Carter's exposure to science was through the social and intellectual channels of private tutoring, then contact with the periodicals industry in London, then through life-long contact with the social and intellectual networks of her day, among which the Bluestocking Circle. Thus, while her interest in promoting science can be seen as part of a larger interest in education for women, and as an effect of the social milieu, within which science was being promoted to the general public, Carter nonetheless, like Behn before her, was a science enthusiast rather than a more intensively trained scientist *per se*. For such a case on the continuity of women in science, I refer to the next portrait, that of Mary Somerville.

5. Portrait Conclusion

In the portrait of Elizabeth Carter, the positive effects of education for women are evident. From her forward-thinking father, to her mentors, acquaintances and friends at the London periodicals and in the Bluestocking Circle, Carter's education, combined with her own will to knowledge, placed her in intellectual and social circles that would come to represent a lifetime of commitment to learning, extending to include her own contributions in the form of authorship and translation. Taken together with the earlier success of the Behn-Fontenelle texts, and the European presence of the source-text author Algarotti, these connections made both the **person** of the translator and her **translation** itself visible and influential. Carter's

early success as a contributor to the *Gentleman's Magazine* was confirmed by her Algarotti translation and spread by her major presence within the Bluestocking Circle, and all three factors, combined with a personal reputation for modesty, lent her translation a cachet of desirability and respectability.

Continuing along a thread of interest in Newton's ideas seen first in the Behn portrait, Carter's translation echoed the source text in promoting science for women and encouraging the popular audience's interest in science. Through the intermediary of Algarotti's Italian text, Carter thus helped repatriate Newton's ideas to the English audience, as well as continuing the use of a dialogue format for the presentation of scientific content to a popular audience⁷⁷. In the reworking of her second, 1742, translation, Carter played a sort of concurrent translator to her own 1739 text, ever reaching for the most refined text possible within the social expectations for gentility and the Georgian aesthetic for sensibility.

Though Carter did not directly seek out Algarotti's source text, Thomas Birch's specific commission nonetheless had the effect of associating her with a feature common to all the portraits: that translations were made with an eye to disseminating major developments in scientific thought to a wider audience, whether by crossing mere barriers of language for trained scientists, or for overcoming more substantial gaps in conceptualization, for scientists or the uninitiated. In this sense, Carter was doubly fortunate in being commissioned not only for the translation of a *popularization* (i.e., Algarotti's, itself based on Fontenelle's winning formula) but also of a popularization based on one of Newton's more *accessible* works, the *Opticks*. The topic focus on light also links Carter to a tradition of research in this major field of

⁷⁷ As well as the Fontenelle/Behn and Algarotti/Carter examples, there is the subsequent example of Jane Haldimand Marcet (1769-1858), a highly successful English popularizer of science, whose texts, such as *Conversations on Chemistry* and *Conversations on Botany*, went through numerous editions in England and America, as well as a French translation.

inquiry, including eventual research on electromagnetism⁷⁸, seen again later in Portrait Five (Sabine).

Meanwhile, we proceed to Portrait Three, on Mary Fairfax Somerville. Where the raciness of the Restoration earlier spilled over into Behn's oft-criticized private life, and the relative calm of Georgian England next was reflected in the composure of Carter's life, now the barriers these women and their associates had helped challenge were lowered further still. By Somerville's time (1780-1872) the partial link I have proposed between science education and visibility/influence reaches a peak, with both the *translator* and her *text* prominently acclaimed for their **direct connection** to science. Somerville's case is striking for this reputation that rests firmly on science, and not, as in the cases of Behn and Carter, first on non-scientific forms of expression, i.e., literature.

⁷⁸ See, for example, Cohen's *Revolution in Science*. See also Dr. Russell Naughton, (Monash U. Australia) "Investigations with Light : 1704 – 1887". On-line at [http://www.acmi.net.au/AIC/LIGHT_CHRON.html].

Portrait Three: Mary Fairfax Somerville (1780-1872)

0. Introduction

In November 1831, after a flurry of final fact-checking and title suggestions, a translation was published in London of Pierre-Simon Laplace's *Mécanique céleste*. This mathematical work, entitled *Mechanism of the Heavens* in translation, was considered by scientific contemporaries the single most important contribution¹ by the mind of man (after Newton's *Principia*, which had appeared 145 years before in 1686. Four years in the making, this English version received enormous attention, and garnered a reputation for the translator that made not only specialists, but also the general public, regard Somerville with awe and pride as a champion of English science².

The case of Mary Somerville represents several firsts in the series of five translators portrayed here. Somerville, unlike Behn or Carter before her, was *primarily* a math and science enthusiast, author, and explicator rather than a *literary* figure who also participated in scientific translation. Compared to other translations in this dissertation, Somerville's *Mechanism of the Heavens* – in another first, an *explication* even more than a translation – held a peak of visibility across both popular and professional audiences, as did the woman herself, not to mention the high status of her source text and source text author: Pierre-Simon Laplace stands in the history of French science as “the Newton of France”³. Together, these two prominent and gregarious figures (Laplace and Somerville),

¹ See Russell McNeil's 2001 (2nd) edition of Mary Somerville's *Mechanism of the Heavens*. Foreword, page xxiv, footnote 4. Available on-line at <http://www.mala.bc.ca/~mcneil/somerville/07.pdf>

² For more, see, for example, Ruth Watts, “‘Suggestive Books’: the Role of the Writings of Mary Somerville in Science and Gender History”. In: *Paedagogica Historica*, Volume 38 Number 1 2002.

³ How Laplace came to be honoured with this accolade at the age of 24 is, as Shea opines, “a tale of mathematical complexities admirably told by Gillispie”. William R. Shea, (Institut d'Histoire des Sciences, Université Louis Pasteur de Strasbourg, 7, rue de l'Université, 67000 Strasbourg, France) “Celestial calculations” (Book review) in : *Nature* 391, 855 - 856 (1998). In fact, Gillispie's body of work on Laplace serves as a major source of biographical and contextual information on Laplace in this dissertation portrait. In Shea's words, “Gillispie's distinguished biography is a magisterial survey of one of the most influential scientists of the past two centuries. It is also a history of

who knew and corresponded with each other, would repatriate yet another generation of interest in Newton's mechanics into England via Laplace's insistence that his English colleagues undertake a closer *analysis* of what had theretofore been studied as Newton's great *synthetic* work, the *Principia*. This analytical movement would even extend to the new America, another novel point of interest in Somerville's case. Finally, this portrait includes the existence of fully five concurrent translations of the *Mécanique céleste*, (by Toplis, Young, Harte, Bowditch, and Peirce), more than in any other portrait.

1. The Translator: Mary Fairfax Somerville (1780-1872)

Early Education

Mary Fairfax was born in Jedburgh, Scotland on 26 December 1780 to a Royal Navy Lieutenant, Englishman William George Fairfax, and his second wife, Scot Margaret Charters. As was not unusual for the period, Mary's early education focused on social and domestic skills, with a minimum of additional book learning. Then, when Mary was nine, her father returned from a period of sea duty to find his daughter "was hardly able to read, unable to write, and had no knowledge of language or numbers"⁴. Not for the last time would Mary have the good fortune of an enlightened male in her life to make her way at least less obstructed than was unfortunately typical for most other girls. Mary was sent to a "fashionable and expensive boarding school at Musselburgh"⁵ that, while apparently unsuited to remedy anything more than the most basic of educational deficits, nonetheless seems to have done far better for stimulating her already lively, curious, and eager mind.

Among the most important investments Mary made during these early years of learning was feeding her great curiosity for algebraic problems⁶ and puzzles, which were a usual

science at its most challenging. The 36-page critical bibliography is up to date and opens the way for future research by taking potential students a few steps along the right path".

⁴ Patterson 1983:1

⁵ Patterson 1983:2

⁶ For an explanation of how Mary was drawn into algebra, see, for example, Luetta and Wilmer Reimer (eds.), "The Mystery of X and Y. Mary Somerville". In: *Mathematicians Are People, Too (Volume II)*. Dale Seymour Publications, 1995.

part of ladies' fashion magazines of the day, "inserted for the amusement and entertainment of readers"⁷.

The cumulative importance of such publications, signaled in Backdrop Two and Portrait Two (Carter) is seen here even more strongly, for Somerville is the first portrait to mark a woman's primary interest in mathematic/scientific materials, rather than literary pursuits. Between the ages of 13 and 15, Mary acquired copies of Euclid's *Elements* and Bonnycastle's *Algebra* through her younger brother's tutor, since "[a]t the date it would have been unthinkable for a young lady of her position to enter an Edinburgh bookshop and ask for these volumes"^{8,9}.

All the more fortunate, then, that at every stage of her life, Somerville could count on the support of certain mentors; for this formative period there was her uncle Somerville (as it so happens, a future father-in-law), who taught her Virgil and inspired her with stories of ancient women scholars. Ultimately, though some of her family later tried to dissuade young Mary from the "strain of the abstract" for fear it might injure her "tender female frame"¹⁰ this initial exposure, as well as her own focus, would eventually lead Somerville to success¹¹.

⁷ Patterson 1983:2

⁸ Patterson 1983:2

⁹ As Toth and Toth remind the modern reader, "The kinds of obstacles Mary Fairfax was facing may seem quaint [to us today]. Yet they were the lot of all women of her era. Determination, a willingness to be considered peculiar, lucky accidents, and male friends helped her to overcome them. Still, for a long time, she felt her studies were purposeless, and she was depressed". Bruce Toth and Emily Toth, "Mary Who?". In: *Johns Hopkins Magazine*, January 1978:26.

¹⁰ Toth and Toth 1978:26.

¹¹ The notion that the pursuit of higher education is harmful to women remains a topic of modern contention and relevance. As recently as 1994, for example, in a highly public case on the Virginia Military Institute (The Citadel),

"The Court recounted in detail [the State of] Virginia's refusal to provide higher education to daughters, which Virginia considered to be "dangerous" for women; then providing women with schools that lacked equal resources and stature to men's schools; and finally transforming all of its public colleges from single-sex schools into coeducational institutions, except for VMI. ... Although the lower courts found that the admission of women would materially change VMI, the Supreme Court rejected the argument that women would destroy VMI as a "self-fulfilling prophec[y]" no different than similar arguments used throughout history to deny women access to male-only education, the military, and many professions, including the law". Valorie K. Vojdik,

Building a Career in Edinburgh and London

In 1804 Mary married her first husband, cousin Samuel Greig. Though this successful naval captain was not sympathetic to his wife's mathematical pursuits, she was able to travel with him on postings, including to London, before he died in 1807. Back in Edinburgh, this left Mary an independent widow with a sense of possibilities, a modest inheritance, and two sons. Somerville could now set out openly to pursue her calling to mathematics,

ignoring the censure of relations and acquaintances who at best thought her foolish and eccentric. The greater part of each day was occupied with her children, and evenings with filial obligations, yet she managed to study 'plane and spherical trigonometry, conic sections and Fergusson's [sic] *Astronomy* before attempting Newton's *Principia*, which she later declared she 'certainly did not understand ... till I returned to it some time after, when I studied that wonderful work with great assiduity ... and obtained the loan of what I believe was called the Jesuit's edition, which helped me'¹².

The combination of Somerville's keen interest in maths and the new freedom to develop it put her in a unique position among the women, scientists, and translators of her day, linking her to the three threads of the dissertation. Specifically, in addition to her impressive education in British maths, which focused on algebra, Somerville was to become one of the most well-versed students of the new *French* influence in maths, and as such one of the best prepared to translate such material. For, as the differing mathematical approaches in France and England are categorized in Grolier (emphasis mine)¹³:

Whereas *analysis* and *geometry* received great attention on the Continent, British mathematicians tended to pursue *algebra* and its applications to *geometry*. Continental mathematics was eventually promoted in Britain, however, by such mathematicians as Charles Babbage, Sir John Herschel, and George Peacock, all

"Girls' Schools after VMI: Do they make the grade?": In: 4 Duke J. Gender L. & Pol'y, page 69. Case: VMI V, 116 S. Ct. at 2275 (quoting J.E.B. v. Alabama, 511 U.S. 127, 152 (1994) (Kennedy, J., concurring)).

¹² Patterson 1983:4

¹³ History of Mathematics, abstracted from the Grolier Encyclopedia. On-line at http://pratt.edu/~arch543p/help/history_of_mathematics.html#4.1. For an exhaustive examination of French mathematics around this time, see the 500 pages of Ivor Grattan-Guinness' *Convolutions in French Mathematics, 1800-1840*. New York: Springer-Verlag, 1990.

leaders of the Analytical Society¹⁴.

For this period before her second marriage, young Mary was encouraged especially by Edinburgh intellectuals, including the leading figure in mathematics, Prof. John Playfair, and his protégé, self-made mathematician William Wallace; both men strongly encouraged her to persevere in familiarizing herself with Laplace's *Mécanique céleste*, which she had recently discovered. As listed in Somerville's autobiography, her "small, splendid library" of recent mathematical works, mostly French, included a remarkable assortment that is testimony to her singular will and the serious guidance of her mentors. The library included

Francoeur's pure mathematics and his elements of Mechanics, La Croix's algebra and his large work on the Differential and Integral Calculus together with his work on finite differences and series, Biot's analytical geometry and astronomy, Poisson's Treatise on Mechanics, Lagrange's theory of analytical functions, Euler's algebra, Euler's isoperimetrical Problems (in Latin), Clairault's figure of the earth, Monge's application of analysis to geometry, Callet's logarithms, LaPlace's *Mécanique céleste* and his analytical theory of probabilities &c. &c.¹⁵

In addition to her own drive for knowledge, the political sympathies that bound Scotland and France against the English meant, too, a readier exchange of intellectual developments¹⁶ from France to such centers as Edinburgh, where Mary had returned after her first husband's death; so it was that her access as a Scot to the French approach to

¹⁴ Readers will recognize Babbage from the discussion of English science reform first mentioned in Backdrop Two; all these men – Babbage, Herschel, and Peacock, played key roles not only in Mary Somerville's life, but also in that of Ada Lovelace, who appears next, in Portrait Four.

¹⁵ Patterson 1983:9. All these books, together with Lagrange's *Traité de la résolution des équations* (1808) and Legendre's *Eléments de géométrie* (1809) are among the books belonging to Mrs. Somerville presented by her daughters after her death to the new ladies college at Hitchin (now Girton College, Cambridge).

¹⁶ The political and mathematical affinities around this time between the Scottish and the French have been noted as extending, for example, to other sciences ("Scottish and French psychologies of the eighteenth century; British associationism". In: E. G. Boring, *History of experimental psychology* (pp. 203-233). New York: Appleton-Century-Crofts), as well as generally to their periods of Enlightenment, with transfer into the American sphere via such men as Thomas Jefferson "at the intersection of the Scottish and French Enlightenments", in Iain McLean's "The Political Economy of the French and American and Enlightenments: Jefferson in Paris 1785-9". (Oxford and Yale Universities). On-line at <http://web.mit.edu/polisci/polecon/www/enlightenment.pdf>.

math, and her later access to London scientific circles (through her second husband's postings) would eventually see her recognized as one of "not more than 5 men [sic] in Great Britain capable to have written [the translation of *Mechanism of the Heavens*]"¹⁷.

Her interests established, Mary now married a second time. Dr. William Somerville¹⁸, a cosmopolitan and rather liberal-minded Scot, had recently returned from Canada as inspector-general of hospitals and comptroller general of the customs in Quebec when he married Mary in 1812, 5 years into her widowhood. The two cousins had seen little of each other since childhood, but discovered to their mutual satisfaction that they "had much in common. Both were liberal and tolerant, interested in intellectual matters, ambitious and open-minded," a fortunate combination of character traits that encouraged Mary in her efforts to pursue a scientific life of the mind¹⁹. With him, Mary would have 3 more children²⁰.

In 1816, the new Somervilles left Edinburgh for London; William had been appointed one of two Principal Inspectors of the Army Medical Board. This second trip for Mary was her first opportunity to flourish in the city's social, political, and scientific setting; except for tours to the scientific communities abroad in 1817/18, and 1832/3, she and William essentially would spend their lives in London, until his ill-health forced their retirement to Italy in 1838. Her dedication to a solid base of scientific knowledge meant Somerville came to the city well-prepared. Once described as a "charmingly shy, petite and beautiful young woman"²¹ Mary had, with time and the liberal encouragement of men such as

¹⁷ Mathematician Henry Warburton quoted in Patterson 1983:83.

¹⁸ (1771-1860), MD, U. of Aberdeen 1800.

¹⁹ Patterson 1983:6.

²⁰ In this point, too, Somerville differs from her predecessors Behn and Carter. That she could accomplish as much as she did while caring for several children speaks to her focus.

²¹ Patterson 1983:2. Like Carter before her, Somerville benefited from a positive external response to her combination of learned interests and modest charm. This is in contrast to Behn, whose behaviour was considered less modest, calling into question the role of public women generally; at the other end, Somerville was followed by Ada Lovelace, who was considered a particularly volatile and outspoken character. This was excused in part for being her father's (Lord Byron's) daughter, and in part by a certain growth in the acceptability of women in science since the earlier days of Behn, whose translation, as it so happens, was one text that set into motion new, more

Portrait Three: Mary Fairfax Somerville

husband William and mentor Wallace, proved a “distinct asset, a congenial and useful helpmeet who, through her accomplishments, could assist [William’s] rise in London as she had done in Edinburgh”²². This support was mutual and soon shifted in her favor - the fact that William’s “own talents in mathematics did not rise to any level of mastery” in no way prevented his ambitious and congenial support of his spouse.

During this period, Mary could capitalize on the long investments to knowledge she had begun as a widow (Edinburgh 1807-1812), producing the first of her own scientific papers in 1825 (at age 45), “On the magnetizing power of the more refrangible rays”. As Toth and Toth point out²³, in an interesting reversal of roles, [William became to her]

a wife - that is, a supportive and loving companion, defender, helpmate, and friend. ... When Mary began to write scientific works, her husband read proofs, compiled bibliographies, recopied manuscripts, corrected grammar, and corresponded with publishers and other scientists when it would have been unseemly for his wife to do so.

The Somervilles’ interests ranged across the board from astronomy and microscopy²⁴ to the newly popular crystallography, geology, and botany, and the couple was in regular contact with such key figures as astronomer John Herschel and his aunt Caroline²⁵, Thomas Young (a physicist, physician, and one of her concurrent translators), Charles Darwin, Jane Marcet (a highly popular writer on chemistry and botany²⁶), and Ada Lovelace and Charles Babbage (see Portrait Four). Their society memberships were equally impressive, from the Royal Institution to the Geological Society, to the Linnaean

positive, ways of considering learned women

²² Patterson 1983:11.

²³ Toth and Toth 1978:26.

²⁴ The Somervilles would become among the very first two in England to own a superior and desirable Amici microscope, ordered especially for them directly from their scientist friend Giovanni Battista Amici of Modena. They also acquired a fashionable mineral cabinet.

²⁵ Somerville and Caroline Herschel were the very first two women to be formally recognized by the Royal Astronomical Society, by a unanimous decision.

²⁶ Marcet’s 1806 *Conversations on Chemistry* became a long-running standard textbook for young **men** in Great Britain and the US, for example. As mentioned in Portrait One (Behn), Marcet’s work was another example of how popular the dialogue format used by Fontenelle to explain science was to become.

Portrait Three: Mary Fairfax Somerville

Society to the Royal Society. While, as a woman, Mary could not hold formal membership, she was nonetheless openly welcomed into the otherwise congenial company of many of these scientists.

We see, then, that the climate for women in science, though not without obstacles, nor without future backtracking, had changed considerably from the time of Aphra Behn and Elizabeth Carter, affecting Mary Somerville in at least two major aspects. First, Somerville was able to acquire primary training in the maths and sciences, and this at the hands of some of the most important scientists of her day. Second, her abilities were openly welcomed by the larger family of such influential and forward-thinking scientists, who themselves, like Laplace, had come to occupy positions of political influence in the increasing overlap between State and Science that accompanied the institutionalization of science. And while, after the time of Somerville (and of Ada Lovelace, one of her protégés, Portrait Four) there was a backlash against women's incursions into the sciences as they came to be seen as competitors for official positions, the importance of their progress in setting a course for the eventual continued progress of women in science can not be underestimated.

In fact, as foreshadowed in Portrait Two (Carter), Mary Somerville's case represents a peak of visibility and influence for a woman in science. There can be no doubt as to Mary's standing, nor to the status this standing lent her upcoming translation: from the time of their arrival in 1815 until the couple relinquished their residence for Italy in 1840 (nine years after the *Mechanism of the Heavens* appeared), Mary

was at the heart of the London scientific community, actively engaged in study, experimentation, and [original scientific] writing both there and in Paris. She was on familiar terms with the leading scientific men of her own country and of Europe, all of whom regarded her as a cherished colleague.²⁷

²⁷ Patterson 1983:x.

In this visibility and influence, Somerville is also the first of the portrayed women to hold a scientific stature akin to that of her source text author, to whom I now turn.

2. The Source-Text Author: Pierre-Simon Laplace (1749-1827)

As mentioned in portraits one and two (Behn and Carter), the thread of Newton's work runs especially through the first three portraits of five in this dissertation. By the time of this portrait, some 145 years after Newton first published the *Principia*, there was still much work to be done mining the riches of that original text²⁸. Where Newton's great achievement had been to synthesize a vast body of work on astronomy that had preceded him, scientists who followed him would spend many years breaking down this synthesis into its component parts for yet further analysis.

This analytical bent was particularly pronounced in French mathematics, which had begun to rise to prominence around 1740²⁹, as England lagged somewhat behind on the island for a number of reasons, including any number of political conflicts between France and England³⁰, and the long-term effects of the Newton-Leibniz calculus controversy (see Backdrop Two). Wars made texts harder to come by, for example, and the Leibnizian notation for calculus preferred by Continental mathematicians meant, ironically, that the

²⁸ As to the continued relevance of this work, I note here that, as recently as 1999, a modern translation and discussion was published of the *Principia*, by historian of science I. Bernard Cohen (*emeritus*, Harvard).

²⁹ As Arago (1786-1853) explains, this was due in large part to two major advances, "the experimental determination of the spheroidal figure of the Earth, and the discovery of the variation of gravity upon the surface of [the Earth]". Dominique Francois Jean Arago. *Biographies of distinguished scientific men*. Translated by W. H. Smyth, Baden Powell and Robert Grant. Freeport, N.Y.:Books for Libraries Press,1972 Reprint of 1859 edition, p.309.

³⁰ As one example of the turbulence felt in England, David Ross summarizes the effects of the Napoleonic Wars thus: "In England, contrary to expectation the end of the Napoleonic Wars brought economic disaster, depression, and mass unemployment. The Corn Law of 1815 excluded foreign grain temporarily, which had the effect of driving up prices. Agitation for social reform grew. The government's response to the agitation was repression, and in 1819 at Peterloo, near Manchester, protests were answered by armed force, resulting in several dead and hundreds injured. This "Peterloo Massacre" was followed by the repressive Six Acts, aimed at squashing dissent. One result of these government moves was the "Cato Street Conspiracy", a rather far-fetched plot to assassinate the whole cabinet, occupy the Bank of England, and establish a new government". On-line at http://www.britainexpress.com/History/George_III.htm.

Newtonians fell rather to the margins of the inner circle of activity and discussion on the extended implications of their country's own greatest mathematician.

Among the chief proponents of French mathematical analysis was Pierre-Simon Laplace, who was eager to see his English colleagues rediscover certain aspects of Newton by shifting their focus to an analysis of the *Principia*. As he expressed it in an 1824 letter to Somerville³¹,

Plus j'ai étudié cet ouvrage plus il m'a paru admirable, en me transportant surtout à l'Époque où il a été publié. Mais en même temps que j'ai senti l'élégance de la méthode analytique suivant laquelle Newton a présenté ses découvertes, j'ai reconnu l'indispensable nécessité de l'analyse pour approfondir les questions bien difficiles qu'il n'a pu qu'effleurer par la synthèse. ...

Esteemed as one of France's greatest mathematicians³² for his original thought in several branches of mathematics, for his founding influence in scientific societies, for the education of the first generation of mathematical physicists, and for the reach of his publications, Laplace would - fittingly - come to be called "The Newton of France"³³.

Born in Normandy in 1729 to a parish magistrate and his wife, Laplace was schooled by Benedictines from the age of 7 to 16. Though his father intended a vocation for this son, Laplace next left the University of Caen after two years, heading on to Paris without a degree but with a letter of introduction to a prominent mathematician, Jean Le Rond D'Alembert. As the story goes, D'Alembert was so impressed by Laplace's solution to a mathematical problem, that he was promptly installed as an instructor at the *École Militaire*.

³¹ Cited in Patterson 1983:49.

³² Laplace is often described in conjunction with Legendre and Lagrange as one of 'the three Ls' of French mathematics.

³³ See footnote 3, page 190.

This association with government institutions was to be a feature of Laplace's career and links him to the growing institutionalization of science discussed in Backdrop One. As Gillispie³⁴ notes (emphasis mine), "The key to institutionalization ... was the systematic need that **authority**, in the form of the modern state, and **knowledge**, in the form of modern science, were just then [around 1800] beginning to develop for each other in practical fact".

From the *École Militaire* Laplace proceeded to examiner of cadets at the Royal Artillery, and even to a position as Senator under Napoleon (in 1799). Later, Napoleon (who as a younger man was one of Laplace's military cadets) was to reminisce about the perceived inapplicability of Laplace's skills in mathematics to politics, claiming that, in government, Laplace could never:

get a grasp on any question in its true significance; he sought everywhere for subtleties, had only problematic ideas, and in short carried the spirit of the infinitesimal into administration³⁵.

This irritation notwithstanding, Laplace nonetheless remained for many years a powerful (and well-paid) ornament of Napoleon's state; his real influence would fall not in politicking, but where it mattered most, in actual science policy, and ranged from the founding of scientific societies to curriculum reform, to the mentoring of a whole generation of younger mathematicians - including Poisson³⁶, Biot, and Arago - to the general mathematization of science³⁷ that came to mark his period.

³⁴ Gillispie 1997:278. See also footnote 3, p.188, on Gillispie's importance as Laplace scholar and, hence, as a major source in this portrait.

³⁵ Boyer 1968:536. Boyer, C. B. *A History of Mathematics*, 2nd ed. New York: Wiley, 1968.

³⁶ Poisson would extend Laplace's research to acoustics and to electrostatics and magnetism; as would Biot to optics (Biot was a liberal-minded husband, and his wife was a scientific translator in her own right (Patterson 1983:21)). The interest in optics is a continuation of ideas seen in Carter's translation of Algarotti, Portrait Two; the interest in electromagnetism features in Sabine's translations, Portrait Five. Note also that Somerville herself was quite interested in electromagnetism, and conducted experiments and wrote papers on the topic. Arago is famous, among other reasons, for his bio-bibliographical notices on prominent scientists; these works later included a eulogy on Laplace. In this function, Arago recalls the biographical contributions of Fontenelle, Chapter One.

³⁷ For further information see for example Dijksterhuis, E. J. *The Mechanization of the World Picture*. Trans. C. Dikshoorn. Oxford 1961, which examines the development of physical science

By 1773, young Laplace had been elected to the *Académie des Sciences*; in time, he would also become an active and influential member of the most prestigious affiliation, the *Institut de France*, as well as two other Republican foundations, the *Ecole Polytechnique* and the *Bureau des Longitudes*. These memberships, together with his encyclopedic mathematical knowledge, his voluminous output of discoveries, and his high-placed government sponsorship, put Laplace at the very heart of scientific influence.

Together with his wife³⁸, he made their home a meeting place for young mathematicians, nurturing their talents just as D'Alembert had helped pave his way in Paris. As Biot himself expressed it, "He looked after us so actively, that we did not have to think of it ourselves"³⁹.

This mentoring of up-and-coming scholars recalls the importance of scientific communications networks (Backdrop Two) in the personal and professional development not only of young men, but also – and especially in the context of this dissertation - of young women. Through such affiliations, on-going interest in others' scientific publications was stimulated, a point of particular interest when considering the dissemination of scientific ideas through translation, as in Somerville's case.

Laplace's mentoring tendencies continued even later in life (1814-1827), when he would find himself somewhat isolated from the scientific community for his deep-set loyalty to the Bourbon monarchy⁴⁰, despite the status granted him in part through Napoleonic affiliation. Still, this late isolation was hardly absolute, and Laplace (together with neighbor and fellow

from antiquity to Newton, arguing that the mechanization of nature led to mathematization of science. This mathematization of science is echoed later in the drive for mass accumulation of data associated with the geomagnetic and global exploratory activities around 1850 – see the Sabine portrait.

³⁸ Laplace's wife also moved in high circles, and was in 1807/08 named a lady-in waiting to the court of Napoleon's sister, Elisa (Gillispie 1997:176).

³⁹ In Gillispie 1997:178.

⁴⁰ With the restoration of the Bourbon monarchy in 1817, Laplace's loyalty was rewarded by Louis XVIII with a peerage as Marquis.

scientist Berthollet, a favorite of Napoleon) went on to establish the informal salon *Société d'Arcueil* as a forum for exchange with like-minded researchers and disciples⁴¹, who continued to spread his methods long after his death. This salon, like the salon the Somervilles made of their own home, was an important part of the communications network⁴² for scientists, a place where ideas could be formed, tested, and circulated, and where interest in one another's publications – originals, translations, and explications alike – was generated as well.

It was in fact at the *Arcueil* salon⁴³ that Mary Somerville first met her future subject, Laplace, in person. As she later recalled in her memoirs⁴⁴,

Dined at Arcueil with M. LaPlace. party M & Mme Arago, M & Mme Berthollet and several Gentⁿ entertainment very handsome. ... I complemented him on the System [*sic*] du Monde as a work displaying at once depth of science and elegance of composition.

Nor could this more subdued final phase of life detract from the influence of Laplace's lifetime production in several branches of mathematics⁴⁵, including probability and

⁴¹ Gillispie 1997:243.

⁴² The growth of these informal and formal networks is first discussed in connection with Cohen, in Backdrop Two; growth continues throughout the time period of the dissertation. One especially prolific example is Alexander von Humboldt, to whom any number of exhibits for the general public of today have been devoted, including at the *Kunst- und Ausstellungshalle der Bundesrepublik Deutschland*. As their materials for the exhibit on The Humboldt Network note, "Humboldt was a communicator like no other. The names of those with whom he was in contact could fill telephone books. He wrote more letters than Goethe. One estimates their number to be about 50,000. Humboldt's influence in science is still felt today".

<http://www2.kah-bonn.de/ausstellungen/humboldt/0e.htm>

⁴³ The Bibliothèque de l'Ecole polytechnique in Palaiseau posts some specifics about the working habits of the Arcueil circle: "Berthollet et Laplace habitaient à Arcueil, au sud-est de Paris. Ils attirèrent de jeunes savants désireux d'échanger leurs idées. Ainsi naquit spontanément la Société d'Arcueil, sorte d'Académie des Sciences en miniature. Simple réunion d'amis au début, - " on arrivait vers 1 heure, on travaillait jusqu'à 4 h.1/2, on jouait aux barres dans le jardin, on dînait et, à 9 heures, tout le monde était parti " - elle fut constituée en société semi-officielle en 1805, sous la protection de l'Empereur, avec des statuts, des séances régulières deux fois par mois, le jeudi après-midi ou le dimanche, présidées alternativement par Berthollet et par Laplace. A Arcueil on trouvait aussi un laboratoire, mais le plus important c'était l'échange d'informations scientifiques et l'examen critique des travaux : on rodait un mémoire devant les habitués du dimanche, avant de le présenter le lendemain à l'Institut."

<http://www.bibliotheque.polytechnique.fr/associations/gaylussac/pages/ArcueilGL.html>

⁴⁴ Notes for 5 August 1817, reprinted in Patterson 1983:24.

celestial mechanics, which feature in his two major works, the *Théorie analytique des probabilités* (1812), and the *Mécanique céleste* (1799-1825). Both appeared during the zenith phase of Laplace's career, when, especially as a result of the Directory (1795-1799), a feeling of intense civic consciousness rewarded his efforts as a founding member of the *Institut de France*, as an educator and reformer for the *Ecole Polytechnique*, and as a dedicated author in a new style that favored the general treatise over the academic memoir. This style, among other affinities, would soon link him to his translator-explicator, Mary Fairfax Somerville, whose version of *Mechanism of the Heavens* demonstrates a pronounced didactic project.

In sum, several traits converged to make Laplace a particularly influential source text author, and his *Mécanique céleste* a particularly visible source text. First, his abilities were recognized by contemporaries as of a stature equal to English predecessor Newton. Second, Laplace was one agent at the forefront of the new French analysis while England lagged somewhat behind. Third, Laplace held considerable political influence as a mathematician, working to reform educational curricula and foster future generations of scholars. Fourth, this interest in fellow mathematicians extended to his many informal networks as well, in the salons he held and visited. Fifth, Laplace expressed his concern for communication with students in his considerable output of scholarly writings, of which even the massive *Mécanique céleste* (ca. 1500 pages) was only one part⁴⁶. Finally, the personal connection and respect between Laplace and the Somervilles could only have

⁴⁵ Laplace's research focussed for many years on the relationship of the law of gravity to the Earth. Via a later intermediary (Poisson), this work connects Laplace to the eventual revolutionary work done by Maxwell, Faraday, and Hertz on electromagnetism. The results of this link are reflected in the Sabine translations, Portrait Five.

⁴⁶ Nearly all surviving works of Laplace have been collected in the 14-volume (!) edition of *Oeuvres complètes de Laplace*. This was published under the auspices of the Academy of Sciences of Paris by Gauthier-Villars between 1878 and 1912. Page images from these volumes are available on-line through Gallica. Their contents are T. 1-5 *Traité de mécanique céleste*; T. 6 *Exposition du système du monde*; T. 7 *Théorie analytique des probabilités*; T. 8-12 *Mémoires extraits des recueils de l'Académie des sciences de Paris et de la classe des sciences mathématiques et physiques de l'Institut de France*; T. 13-14 *Mémoires divers*. For an overview of Laplace's works, see Robert J. Pulskamp at <http://cerebro.xu.edu/math/Sources/Laplace/index.html>

strengthened the cachet accorded her translation-explication, the 1831 release of which Laplace (1749-1827) regrettably did not live to see.

The next sections shift to the source text and its place in the progress of French and English maths, and lead into a discussion of Somerville's translation. The translation section (**Translation Commentary and Samples**) includes a discussion of concurrent translators and aspects of translation as branding, as well as comparative samples of Laplace, Somerville, and (concurrent translator) Bowditch.

3. The Source Text: The *Mécanique Céleste* (1799-1825)

• Exposition as Civic Contribution

The *Mécanique céleste* is a massive work. Composed of some 1500 pages over 5 volumes, it appeared over the course of several years. The bulk, i.e., volumes 1 through most of 4, appeared between 1799 and 1805, and the last parts of volume four together with volume five appeared as installments twenty years later, from 1823 to 1825.

As Gillispie summarizes, "Though called a treatise, the *Traité de Mécanique céleste* (1799-1805) is a composite work. It has aspects of a textbook, a collection of research papers, a reference book, and an almanac, and contains both theoretical and applied science"^{47, 48}. The work (the proof sheets of which were read by Biot) is divided first into Volumes, then further subdivided into Books and Chapters, covering a full range of mathematical astronomy. Laplace himself explains⁴⁹ the history, impetus, and structure of

⁴⁷ Gillispie 1997:184.

⁴⁸ An updated version of Laplace's work, the identically titled *Traité de mécanique céleste* (1889-96) by French astronomer Francois-Felix Tisserand (1845-96) is still used today as a sourcebook by authors on celestial mechanics. Reported at [www.brittanica.com], biographical entry on Tisserand.

⁴⁹ From the 1967 facsimile reprint, pp. 1-2.

his work thus:

Newton publia, vers la fin du dernier siècle, la découverte de la pesanteur universelle. Depuis cette époque, les Géomètres sont parvenus à ramener à cette grande loi de la nature, tous les phénomènes connus du système du monde, et à donner ainsi aux théories et aux tables astronomiques, une précision inespérée.

Je me propose de présenter sous un même point de vue, ces théories éparses dans un grand nombre d'ouvrages, et dont l'ensemble embrassant tous les résultats de la gravitation universelle, sur l'équilibre et sur les mouvemens des corps solides et fluides qui composent le système solaire et les systèmes semblables répandus dans l'immensité des cieux, forme la *Mécanique céleste*.

... Il sera divisé en deux parties. Dans la première, je donnerai les méthodes et les formules ... Dans la seconde partie, j'appliquerai les formules trouvées dans la première, aux planètes, aux satellites et aux comètes.

Meanwhile, the drama of the political backdrop can be seen in certain paratextual features of Volume III, which is dated Year 11 (of the French Revolutionary calendar⁵⁰, i.e., 1802), and in Laplace's dedication – not to Louis XIV, who had been beheaded on 21 January 1793⁵¹, but to Emperor Napoleon⁵².

À BONAPARTE, de l'Institut National. Citoyen Premier Consul, Vous m'avez permis de vous dédier cet ouvrage. ... Puisse cet ouvrage consacré a la plus sublime des sciences naturelles, être un monument durable de la reconnaissance que votre accueil et les bienfaits du Gouvernement inspirent à ceux qui les cultivent! ... Salut et respect, LAPLACE.

Like his earlier *Exposition du Système du Monde* and his subsequent *Théorie analytique des probabilités*, the *Mécanique céleste* was written in the French tradition of *haute vulgarization* (or, effective presentation of a difficult subject to a general audience); as part

⁵⁰ For specifics on this calendar, refer to Crane Brinton's *A Decade of Revolution 1789-1799*. New York/Evanston/London:Harper & Row, 1934. Also available on-line at <http://windhorst.org/calendar/#monthnames>

⁵¹ Extra information on this calendar can be found for example at http://www.mtholyoke.edu/courses/rschwartz/hist255/kat_anna/execution.html

⁵² As Gillispie clarifies Laplace's place in the politics of his time, "Although [such] apostrophes to power have incurred Laplace much odium since 1815 and have been taken by his detractors to epitomize a willingness to serve every set of masters in the state quite without principle...Fairness requires the observation that his political conduct was no different than that of the scientific community as a whole. ... Fairness also requires recalling that the government [whether of Napoleon or] of the restored monarchy showed no scruple in associating his reputation with its own ... attempt at prestige" (Gillispie 1997: 277).

of this tradition, Laplace took care to include verbal paraphrase addressed to an educated public. This influence, combined with the sense of a general treatise as civic duty, as well as Laplace's direct experience as educator, can be seen in his attempt to bridge French and English maths as an expositor⁵³ and elaborator of Newton, even if his source text, the *Mécanique céleste*, ultimately was found to be quite difficult to understand⁵⁴.

For as it turns out, Laplace's mathematical deductions, motivated in large part by the goal of explicating Newton, left considerable room for clarification of their own. On the one hand, Laplace was of nearly unrivalled importance in analyzing Newton and repatriating his ideas to the English through the renewed impetus of French analysis (seen for example in the incorporation of Laplace's own vast original research on Newtonian maths into the *Mécanique céleste*).

On the other hand, Laplace's strength as a thinker often only came across in the *general* form of a mathematical argument. This meant the details of a given mathematical progression might not figure explicitly in his written explanations, however impressive and

⁵³ See A.C. Aitken. "The Case Against Decimalisation", 1962, p.1. Article on-line at <http://www.dsgh.orbix.co.uk/pdfs/aitken.pdf>

⁵⁴ As the 1911 Encyclopedia entry on Laplace notes, the *Mécanique céleste* is, even to those most conversant with analytical methods, by no means easy reading. Laplace's contemporary J. B. Biot, who assisted in the correction of its proof sheets, remarked that it would have extended, had the demonstrations been fully developed, to eight or ten instead of five volumes; and he saw at times the author himself obliged to devote an hour's labour to recovering the dropped links in the chain of reasoning covered by the recurring formula "Il est aisé à voir".

For more on Laplace by his contemporaries, see Arago, D.F., Joseph Louis Gay-Lussac (1786-1853). Among Arago's many key functions in French science was his production of biographies of great scientists, including such contemporaries as Laplace. See his collection of *Éloges*, which appeared in English as *Biographies of distinguished scientific men*. By François Arago ... Translated by Admiral W.H. Smyth ... the Rev. Baden Powell ... and Robert Grant ... London, Longman, Brown, Green, Longmans, & Roberts, 1857. Arago forms yet another link, this time to von Humboldt (visit <http://www.uh.edu/engines/epi704.htm>); the two met, argued, reconciled, and formed a life-long collaboration through the Arceuil society, another part of the communications network, and founded by Babbage and others – see Portrait Four, Lovelace. For modern commentary, see for example *The Golden Age of Science: Thirty Portraits of the Giants of 19th-Century Science by Their Scientific Contemporaries*. (Bessie Zaban Jones, ed.), New York: Simon and Schuster, 1966, pp. 187-216. (The Arago biographies of Volta, Laplace, and Herschel in this same volume do much to explain Arago's important place as a scientific observer; in this function he is like Bernard de Fontenelle before him.)

'self-evident' his conclusions, leaving even a highly skilled reader confused; as renowned American astronomer (and concurrent translator) Nathaniel Bowditch once put it, "I never come across one of Laplace's 'Thus it plainly appears' without feeling sure that I have hours of hard work before me to fill up the chasm and find out how it plainly appears' "⁵⁵ .

Yet in the end, because the genius of his ideas was so compelling, Laplace's elliptical mathematical style had the positive effect of inspiring many to explicate, popularize, and translate his continuation of Newton's ideas. So it was that his status and that of his source text led to a favourable conjunction with a number of well-wishers in this regard. As we shall see next, for the time frame of Mary Somerville, Laplace's *Mécanique céleste* was translated by no fewer than six people.

4. A Discussion of Concurrent Translations of Laplace (Toplis, Young, Harte, Bowditch, and Peirce)

Concurrent translation marks Portraits 1, 3, and 5 especially (Behn, Somerville, and Sabine). Because the phenomenon is so pronounced in Somerville's portrait, it lends itself to a brief separate discussion here, before I proceed to additional translation commentary and samples. Simply put, the presence of five translators in addition to Mary Somerville within a time span of only 20-odd years raises questions about the source text, the role of the translator, and translation as branding; these three points are now discussed.

Source text issues

As explained above, Laplace's abbreviated style of representing his thought process created a need for explicators. In addition to this factor, the *Mécanique céleste* is a highly generative source text. That is, the combination of Newton's ideas and Laplace's original

⁵⁵ Nathaniel Bowditch cited in Boyce, W. E. and DiPrima, R. C. *Elementary Differential Equations and Boundary Value Problems*, 4th ed. New York: Wiley, 1986.

analysis kept professional readers, themselves active mathematicians, ever revising and refining the work of these two great authors in an effort to incorporate the very latest developments in the field⁵⁶.

Galloway stresses this point in the *Edinburgh Review* (1832):

Although the *Mécanique céleste* must ever continue – what it was described by its author to be – a monument to the genius of the age in which it was composed, it is already in some respects behind the actual state of science⁵⁷.

In France, for example, this ongoing process created a rolling market for revisions of Laplace's work (such as Tisserand's; see footnote 59, page 15). Meanwhile, *outside* France, the mutual curiosity of French and English researchers helped create a parallel market for revised and expanded translations, such as the additional five (Toplis, Young, Harte, Bowditch, and Peirce) noted here⁵⁸.

Herschel explains the English demand for knowledge and, hence, materials thus (emphasis mine):

One of the immediate consequences of the increased demand for a knowledge *of the continental analysis* ... was a rapid and abundant supply of elementary works⁵⁹.

Relating concurrent translation and the role of the translator

That several individuals - many of whom were familiar with the others through the extended scientific community of their day⁶⁰ - felt compelled to translate Laplace within

⁵⁶ Note, too, that *modern* reprints (such as the 1967 facsimile reprint used in my research) of Laplace and several of his translators are available - the implications of Newtonian science reach right to our day.

⁵⁷ Thomas Galloway in the *Edinburgh Review* Vol. LV, No. CIX, April 1832, pp. 1-25.

⁵⁸ This trend continued after this portrait, as well, with Victorian explications of Laplace by Grant (1852) and Todhunter (1873). For more, see Gillispie 1997:308.

⁵⁹ John Herschel in the *Quarterly Review*, Vol. XLVII, No. XCIV, July 1832, pp. 537-559.

⁶⁰ As noted earlier, Laplace knew the Somervilles directly; the Somervilles in turn knew Bowditch directly (as recorded in Bowditch's memoirs, which precede his translation of the *Mechanism of the*

just years of one another speaks not only to the concrete need to maintain an accurate and current account of celestial mechanics, so important to seafaring nations both commercially and militarily, but also to a more abstract sense of the translator's own sense of purpose, to their individual translation projects, as summarized next.

English scientist-translators John Toplis and Henry Hickman Harte, and American Nathaniel Bowditch, for example, are known to have vigorously urged the incorporation of French mathematical insight in England and in the new America, and saw this translation project as a vehicle to communicate not only the fact of these ideas but also their personal commitment to these Continental methods for the progress of mathematics and its applications⁶¹.

Meanwhile, Thomas Young and Joseph Lovering, in their capacities as secretary to the Royal Society and the American Association for the Advancement of Science, respectively, served a concrete and vital purpose as conduits for information from all member countries. Translating and disseminating the work of such fellow scientists as Laplace (who himself belonged to the Royal Societies of London and Göttingen, and the

Heavens, Nathaniel's son was a warmly welcomed guest of the Somervilles when he travelled to Great Britain). For the connections between Lovering, Bowditch and Peirce, see the "scientific genealogy" below (from Michigan State U. [<http://www.cem.msu.edu/geneal/PID536.html>]), which shows the line of influence from Bowditch, through Peirce, to Lovering; this influence soon extended to also include Wallace Clement Sabine, a relative to famed English explorer Sir Edward Sabine, whose wife, Elizabeth, features in Portrait Five.

Nathaniel Bowditch (1773-1838) (MA(Hon) 1802, Harvard)

|
+Benjamin Peirce (1829-1880) (AB - Math 1829, Harvard)

|
+Joseph Lovering (1813-1892) (AB - Math 1833, Harvard)

|
+John Trowbridge (1843-1923) (SD - Physics 1873, Harvard)

|
+Wallace Clement Sabine (1868-1919) (DSc - Physics 1907, Brown)

⁶¹ As explained in the *Gazetteer* of the **British Society for the History of Mathematics**, "Toplis was an enthusiast for Leibnizian calculus and continental mathematics and had translated the first book of Laplace's *Mécanique Céleste* and published it himself in Nottingham in 1814. *The Gazetteer*. Entry "Nottingham, Nottinghamshire – George Green". Written by David Singmaster. Last updated on 28th February 2003. At <http://www.dcs.warwick.ac.uk/bshm/zingaz/N.html>

Academies of Science of Russia, Denmark, and Italy, among others) was a considerable part of their professional mission⁶².

Benjamin Peirce meanwhile, like Laplace, was a driving force behind science curriculum reform⁶³. An American educator as well as scientist, Peirce would have been well aware of the potential influence of a Laplace translation in the universities of the New World, graduates of which would take these ideas and methods rippling with them into larger intellectual circles.

So we see that, from the common inspiration found in Laplace's treatment of Newton, several key figures in Anglo-American mathematics derived *personalized* understandings of how their translations could fit into larger frameworks, whether for national naval strength, for the strategic advantages to be incurred by consciously incorporating Continental maths, for international scientific communication at the professional level, or for inclusion in science curricula. These individualized interests, and the audiences whose needs they met, can be said to have thus overridden any secondary concerns about competing with other translators for readership.

⁶² In this interest in translating personally for comprehension and dissemination, scientists in history differ considerably from their modern counterparts. In a recent report on the "Designing for Dissemination" conference in Washington, D.C., Jessie Gruman describes the preliminary results of their Concept Mapping: "...researchers generally did not feel that translation and dissemination of research findings are their responsibility: they are not trained to do this, their grants generally do not pay for it, and their interests and strengths lie elsewhere. Similarly, practitioners – whether clinicians or public health professionals – generally felt that it is their job to act on findings, but the translation, i.e., responsibility for the synthesis and dissemination of research results lies elsewhere. A third rather heterogeneous group was also present at the meeting. ... This group was more likely to describe translation and dissemination as actions for which they could provide leadership, but were adamant that researchers and practitioners play vitally important roles as well". Gruman, "Designing for Dissemination: It takes a small city". SRNT Newsletter, Oct/Nov 2002, p.7.

⁶³ Like Laplace in France before him, Peirce played several prominent roles, including as researcher, author, educator, and reformer in the development of science curricula, in his case at Harvard, where he became University Professor of Mathematics and Natural Philosophy (1836-7), and Head of the Dept. of Physics. See for example, Benjamin Peirce: "Father of Pure Mathematics" in America, (I. Bernard Cohen, ed.), New York: Arno Press, and Peterson, S. R. 1955. 'Benjamin Peirce: mathematician and philosopher', *Journal of the history of ideas*, 16, 89-112.

In the case of Mary Somerville, for example, it was fellow scientist John Herschel who tipped her off to the appearance of a concurrent translation (Bowditch's), from as far away as America. Herschel, another major figure in English science, was in fact personally acquainted with at least two of the concurrent translators, Thomas Young, and Nathaniel Bowditch. In later years, Bowditch and his son would even direct many Harvard scientists and intellectuals to the Somerville salon on visits to London. It so happens that, while Mary was preparing her own translation, Herschel received the first volume of *Bowditch's* translation and immediately notified her. Yet Somerville was not alarmed, as she felt their purposes, their translation projects⁶⁴, differed enough to allow room for both texts to thrive peacefully. As she explains in a letter to Herschel (emphasis mine):

Nothing can be kinder than your early communication of the *Mec. cel.* I have gone through the commentary as far as the time has permitted, and excellent as the notes are, *I confess I am not dismayed as I rather wish to state principles clearly, and to arrive at results by as easy methods as possible, than to enter into all the mathematical details* [i.e., as did Bowditch]. I daresay you think me very bold, but I do feel inclined to proceed and get it into the press as soon as possible⁶⁵.

In the conviction of her approach, Somerville must also have been secured by the knowledge of Laplace's admiration for her intellectual abilities. As early as 1824 (7 years before her *Mechanism of the Heavens*),

the French physiologist Francois Megendie⁶⁶, Laplace's physician, was in London and saw the Somervilles. He carried back to Paris a letter from Mary Somerville to the great philosopher, who sent her a flattering reply and a copy of the fifth edition of his *Système du Monde*. In his letter Laplace observed that **he had few readers and judges so enlightened as she**. He had just finished the two books of the fifth volume of his *Mécanique céleste*⁶⁷.

⁶⁴ The idea of a "translation project" is posited by Berman (1995:76-77) as determined by a combination of the *goal of the translation* and the *demands imposed by the source text*. As Berman puts it, translation is nothing but the realization of the project.

⁶⁵ March 1830 Letter to Herschel, cited in Patterson 1983:75.

⁶⁶ Megendie (1783-1855).

⁶⁷ Patterson 1983:49, emphasis mine.

Translation as branding

Still the question remains: why *so many* different translations? Were it simply a question of bringing each edition up to date with the latest mathematical information, a single translator or the publisher could have seen to such a task, by making (or arranging for) the necessary adjustments to a baseline translation. Perhaps the busy schedules of each of the five translators here meant they wound up serving in rotation, as it were, one stepping up to the plate to revise another's translation as the need arose.

Certainly, though, there was also the matter of personal interpretation; each translator would have interpreted, organized, and explicated Laplace's material in a slightly different way, wanting to make an individual mark in the field, and in the process coming to appeal to a certain contingent of all possible readers. This range of interpretations can only have helped Laplace become well known and understood in the English-language market; no teacher is equally intelligible to all students.

Not to forget, too, that difficulties of transportation, exacerbated by political conflict (whether in France, England, or America) would at times have made it difficult for a given book, whether source text or original, to make the voyage from London to the British provinces, across the Channel to England, and across the Atlantic to America.

To these considerations came also the still personalized character of research laboratories, salons, and mentorship; though institutionalization was on the rise, there remained nonetheless a good deal of research and instruction done under the tutelage of specific scientists - the *Société d'Arcueil* salon held by Laplace and Berthollet was one example of many. Thus, whenever an important translation was to be done, adherents of a particular scientist's circle would have advance notice of the translation, and - in a type of "niche marketing" - perhaps a preference to access the source text through their lead scientist's particular translation and interpretation over any other, with the option of insight into competing or complementary scientific points of view through the corresponding

scientists' translations. I call this idea "translation as branding," whereby the reader is offered a range of choices with no attempt (or need) to conceal the existence of the other texts (as seen above in Somerville's own reaction to the Bowditch text).

Finally, this notion of translation as branding suggests a different concept of the *reader* as well, as one who is capable of and/or expected to choose the text best suited to his/her needs based on content, form, and affiliation with a particular school. That a range of smaller presses and private publishing ventures⁶⁸ seems to have existed with intellectual and financial patronage would only have served to support this range of choice over any monolithic approach to a source text.

One example of such an independent venture was that of Henry Brougham, who commissioned Somerville's translation of Laplace.

Somerville's translation: Commission and reception

In previous sections we have seen evidence of the visibility and influence of Laplace and Somerville as independent figures, and of the interest they each nurtured in bridging the gap between English and French maths, both in their individual programs of study, and as agents of a larger scientific circle. I now briefly address the circumstances surrounding the translation, including a reminder on the scientific climate in England at the time (into which Somerville's translation fed) and the related route by which the translation was commissioned.

The State of English Science

As explained in part in Backdrop Two, the climate in organized English science around 1830 was particularly agitated. This was a time of great struggle between more

⁶⁸ See footnote 76, p.216, on the John Dunton Homepage, for example.

conservative elements in the academies and societies and their reformist opponents. Among the most vocal of the reform-minded scientists were Charles Babbage⁶⁹ and John Herschel, both of whom were within the inner Somerville circle.

When, in May 1830, Babbage produced his polemical work⁷⁰, “Reflections on the Decline of Science in England and on Some of its Causes”, the conflict over whether and how to modernize English science - a conflict theretofore kept largely in Royal Society council - “spilled over into the public press”, alerting “the scientific world and a good part of the seriously literate public” to a “possible decline in British science almost a year before Somerville’s translation [was to appear]”⁷¹. These developments were even reported in the foreign press, not just in Europe (Moll’s pamphlet, Utrecht) but also in America (*American Journal of Science and the Arts*).

Here, in a longer citation, John Herschel (1832) expresses⁷² one of the reformers’ major concerns, the gap in English maths and the need for shared knowledge – in both directions - with foreign countries:

Whatever might be the causes however, it will hardly be denied by any one versed in this kind of reading, that the last twenty years of the eighteenth century were not more remarkable for the triumphs of both the pure and applied mathematics abroad than for their decline, and, indeed, all but total extinction at home.

It was with the commencement of the present century that a sense of our deficiencies, and of the astonishing and disreputable distance to which we had fallen behind the general progress of mathematical knowledge in all its branches, began to make itself felt; but to remedy the evil was more difficult than to discover its existence. Great bodies move slowly. It requires time, where national tastes and habits are concerned, to turn the current of thought out of its smooth-worn track into

⁶⁹ See also Portrait Four, Lovelace/Babbage. Both were personally known to the Somervilles, and Mary Somerville became a scientific mentor to young Ada Lovelace, Babbage’s translator.

⁷⁰ Recall that this essay urged adoption of new French methods in mathematical analysis, as well as the “innovative use of scientific theory and findings (as in [Babbage’s] calculating engine), increased state support and recognition of the scientific enterprise, reforms in the functions and management of scientific bodies, and, above all, professionalization of science” (Patterson 1983:55).

⁷¹ Patterson 1983:57.

⁷² John Herschel, “Critical Reviews of Mechanism of the Heavens”, pp. 756-757, reprint edition available on-line through Malaspina, at <<http://www.mala.bc.ca/~mcneil/somerville/>>

untried and, at first, abrupt channels; and, the means were wanting. A total deficiency of all elementary books in our own language in which the modern improvements could be studied, precluded beginners from obtaining any glimpse beyond the narrow circle in which their teachers had revolved⁷³. The student is guided in his early choice of books by sanction and by usage. He may not, without hazard, venture to chalk out for himself a course of reading unusual and remote; and, rejecting the writers of his own country, choose foreigners for his instructors. To come to such a resolution presupposes a discrimination and a preference which is incompatible with entire unacquaintance with his subjects. It was only, therefore, when, although well instructed and perfect in the usual routine, he found himself arrested at the very first page of any of the elaborate works of the foreign geometers which chance might throw into his hands, that he could acquire the painful but necessary conviction of having all to begin afresh – much even to unlearn; – to forget habits – to change notations – to abandon points of view which had grown familiar – and, in short, put himself once more to school.

The late Professor Woodhouse seems to have been among our first countrymen who experienced this inward conviction, with its natural concomitant, the desire to propagate forward to other minds the rising impulse of our own.

From these comments, Herschel's support of shared knowledge is clear; and so, what a first glance might seem a paradox, Somerville's introduction of a French masterpiece into England at a time when English insecurities were running high, served in fact to bolster her compatriots' confidence in a desired image of English science as aware and forward-thinking: both because it welcomed input from a Frenchman of great stature working with Continental methods, and because his methods were based, ultimately, on English inspiration in the form of Newton's celestial mechanics.

The need for a translation of Laplace is affirmed by contemporary Buller⁷⁴ (1832) thus:

We have universities, a considerable portion of whose vast revenues is annually paid for the support of *men* of science, and a further portion annually set apart for the printing of *books* on science. How is it that no English edition of the *Mécanique céleste* has hitherto appeared under the sanction of a learned body and a respectable editor? If other evidence of the decline of science in this country were wanting, a strong case of suspicion might be grounded upon this one fact.

...we have long considered an English translation of Laplace the great desideratum in our science.

⁷³ This point echoes the aspect of mentor/group affiliation I discuss in connection with concurrent translation as branding (Backdrop Two).

⁷⁴ Charles Buller. In: *The Athenaeum* 221 (1832) January, pp.43-44. Available on-line through Malaspina at <<http://www.mala.bc.ca/~mcneil/somerville/>>

The stage was clearly set for a commission.

The Commission – Henry Brougham

Among those reformists who hoped to bring English mathematics to its full potential was Henry Brougham, whose sister had been Mary's childhood companion. Brougham, whose family Mary had occasionally met in Edinburgh during her widowhood (1807-12) was now a radical leader in Parliament and, of particular interest to this portrait, founder of the *Society for the Diffusion of Useful Knowledge*, which proposed to bring sound literature and self-improvement within the reach of all by publishing affordable and worthy treatises.

Brougham was interested in two difficult tasks: publishing an account of Newton's *Principia*, perhaps by someone at Cambridge, as well as an account of the *Mécanique céleste*, which Brougham believed only Mary capable of - otherwise, "it must be left undone"⁷⁵.

Brougham's publication interests in popular materials can be seen as a continuation of the impetus triggered by previous Englishmen as John Dunton (see Backdrop Two; Portrait Two, Carter), who, in an earlier parallel, worked to elevate papers and journals⁷⁶ away from political gossip to include intelligent and entertaining content from a range of fields, including science, and science for women.

By now, as Gingras notes, such related publications as *The Gentleman's Magazine* (in England) and the *Journal des savants*, the *Mercure de France* and the *Bibliothèque universelle* (in France) were "expressly targeted at a large audience of learned people

⁷⁵ Patterson 1983:49.

⁷⁶ Dunton's *Athenian Gazette/Mercury* ran 1691-1697). For more on Dunton and the wild world of 17th-18th-century publishing and bookselling, see the John Dunton Homepage, maintained by Kathy Larsen of George Washington U., at <http://home.gwu.edu/~klarsen/dunton.html>.

interested in literary and scientific matters pursued as an interesting discussion"⁷⁷. In their own way, then, both Brougham and Somerville became part of an English tradition of science exposition for a wider audience.

Meanwhile, Brougham quickly realized that Somerville's manuscript translation was in fact far too long for the sixpence series he was planning for the *Society*. He therefore passed the manuscript on to John Herschel, who thereafter, together with William Somerville, became the principal movers behind the project. Herschel saw enormous value in the text to not only remedy the gap between English and French maths, but also to serve as evidence of what English science could actually produce, even under the shortcomings he and Babbage saw there.

Pre-Printing

In advance of release for printing, Somerville requested critiques from a number of colleagues, including Herschel, Babbage, and even Laplace's assistant Bouvard in France. The publisher, John Murray (a neighbour, and friend of William Somerville's brother Samuel) was impressed by such assessments, and promptly made arrangements for printing, as his own words explain:

Mr. Herschells [sic] opinion of the excellence of Mrs. Somerville's MSS is a better one than any one that I could have obtained and I am perfectly satisfied with it ... I will if you please print one Edition, consisting of 1,500 Copies at my own Cost and risque and in case of their selling I will give the author Two Thirds of the Profits -- and after the Sale of these 1500 copies her Copyright shall be the entire Sole property of the Author -- to dispose in any way hereafter that may appear best for her advantage⁷⁸.

Note in this passage, too, how Murray refers to Somerville as "the Author"; as we shall see in the samples, her 'translation' was in fact rather a substantially reworked, explicated version of Laplace with considerable cohesive material interpolated textually throughout,

⁷⁷ Yves Gingras, "What did mathematics do to physics?". In : *Cahiers d'épistémologie* 274 (2000-01), pp. 3-41.

⁷⁸ Cited in Patterson 1983:75.

as well as a 70-page, paratextual, "preliminary dissertation" in the preface.

Critical Reviews

When *Mechanism of the Heavens* finally appeared in November 1831 - in a handsome, 703-page volume priced at £1.10s and dedicated to Lord Brougham - the critical reviews⁷⁹ were, with few exceptions from the conservative, less woman-friendly set⁸⁰, resoundingly laudatory, both in England and in France.

Several important quarterlies⁸¹, including the *Edinburgh Review*, the *Quarterly Review*, and the *Literary Gazette*, responded positively⁸², as in this example:

...Mrs. Somerville, already known in the annals of science, must henceforth be associated [with the illustrious names of science], on account of her great proficiency in the most sublime and difficult applications of mathematical analysis, evinced by this compend of the *Mécanique céleste* of Laplace⁸³.

Thus, the translation, which was highly anticipated based on standing as a woman of science, in turn solidified her reputation in England, Paris, and the rest of Europe, and led to a round of celebrations and high-level introductions through Laplace's former assistant Bouvard when next the Somervilles visited Europe (1832/3). As I commented on this dynamic in Backdrop One, on invisibility and the directionality of cachet, this was a case of the translator (first) lending a cachet to the text, not the other way around.

⁷⁹ Through the efforts of Russell McNeil, the *Mechanism of the Heavens*, including an appendix of the historical critical reviews, is available as an e-text and CD-ROM as part of the Malaspina Great Books Project. For details, visit <http://www.malaspina.com/etext/heavens.htm>.

⁸⁰ See, for example, Charles Buller's scathing comments on Somerville as *female* translator in *The Athenaeum* 221 (1832) January, pp.43-44. Such contemporary, gender-based criticism underscores the obstacles to women as translators of science. Available on-line through Malaspina at <<http://www.mala.bc.ca/~mcneil/somerville/>

⁸¹ In Paris, meanwhile, Biot prepared a long and admiring account for the *Journal des sçavans*. As author of the earlier *Analyse de la mécanique céleste de M. Laplace* (1801), and having proofread Laplace's original, Biot was well-placed to review Somerville.

⁸² Of interest, and in a manner reminiscent of the inspirational effects Behn and Carter had on women around them, Somerville was also praised by many *women* of standing; Lady Herschel herself wrote: "You must allow us [to] congratulate you ... I propose that we poor women, whom you have left so far in the background, shall raise a monument also, to shew our Sincere love for you" (cited in Patterson 1983:90).

⁸³ Thomas Galloway in the *Edinburgh Review* Vol. LV, No. CIX, April 1832, pp. 1-25.

Critical success notwithstanding, it is important to note that there was for a time some difficulty selling the book, in part due to the civil unrest around parliamentary reform and a cholera outbreak in parts of England. As fate would have it, though, well-placed Cambridge mathematicians George Peacock and William Whewell soon designated Somerville's *Mechanism* a textbook for all their advanced mathematics students, guaranteeing steady sales. Somerville later recalled that she considered this "the highest honour I have ever received, ... and [I] was most grateful"⁸⁴. Just as Somerville represents a peak of science education for women, and a peak of visibility as a doyenne of science, her target text achieved a peak of visibility through the network of mathematicians with which she was affiliated, as predicated on their respect for her undertakings in science.

After the Translation

In response to the *Mechanism of the Heavens*, Somerville was accorded a variety of honours, including a bust in the Royal Society and honorary membership in several British and European societies. She rose to the expectations of continued success⁸⁵, going on to author *On the Connexion of the Physical Science* (1834 etc.), *Physical Geography* (1848), and *On Molecular and Microscopic Science* (1869) as well as a number of scientific papers, right up until the day before her death in 1872. At the peak of success she was recognized in 1835 with a place on the Civil List⁸⁶, which granted her a

⁸⁴ Cited in Patterson 1983:89.

⁸⁵ In another indication of her own work's appeal, Somerville was herself translated into various languages, including *On the Connexion...* by a Frenchwoman, Mme. Meulien. Patterson reports that this translation was neither well done nor well received (*De la connexion des sciences physiques ... Traduit de L'anglais sous l'auspices de M. Arago, par Mme T. Meulien*, Paris:1839, (Patterson 1983:163, 221).

⁸⁶ This English term designates the account in which are contained all the expenses immediately applicable to the support of the British sovereign's household and the honour and dignity of the crown. An annual sum is settled by the British parliament at the beginning of the reign on the sovereign, and is charged on the consolidated fund. But it is only from the reign of William IV (1830-37) that the sum thus voted has been restricted solely to the personal expenses of the crown. Before his accession, many charges properly belonging to the ordinary expenses of government had been placed on the civil list.

modest lifetime pension of £300/annum for her efforts. Ultimately, though, it is she who best expresses the importance of the *Mechanism of the Heavens* to her legacy: "All my other books will soon be forgotten, by this my name will alone be remembered..."⁸⁷.

5. Translation Samples & Commentary (Somerville & Bowditch)

The purpose of this section is to demonstrate the particular translation project of Mary Somerville, namely as (highly visible) expositor of Laplace. In a move well beyond any strict understanding of the translator's role, Somerville included not only a 70-page preliminary dissertation to the *Mechanism of the Heavens*, but also rearranged the structure of the original to allow for the incorporation of extensive notes, running commentary, and illustrations, all of her own making.

In doing so, Somerville is an exemplar of the three threads running through the dissertation, and contrary to initial expectations about the treble disadvantage of female translators of scientific materials. As for the first two threads, on *women* and *science*, it is clear that Somerville enjoyed a solid reputation, occupying a highly public position and thus generating interest in her publications as a product of this respected intellect. In the words of the contemporary *Literary Gazette*,

We opened this book [The Mechanism of the Heavens] with no inconsiderable apprehensions for the reputation – we mean the scientific and literary reputation – of the fair author; for although Mrs. Somerville has long been considered, by persons acquainted with such subjects, as one of the most accomplished and most highly informed mathematicians of the day, no public evidence, antecedent to the appearance of this work, has been afforded of the correctness of this very high praise. We felt, therefore, the deepest interest in the result of this gigantic experiment our countrywoman undertook to perform, which was no less than to give the world a succinct, profound, but, at the same time, as popular a view as possible of the great Laplace's *Mécanique céleste*⁸⁸.

As for the third thread, on (visibility in) translation, Somerville's text provides the most

⁸⁷ Dep c.355,22, MSAU-2: p.57, *Mary Somerville Autobiography* (first draft), Mary Somerville Collection, Bodleian Library, Oxford University.

⁸⁸ *Literary Gazette* 778, December 1831, pp. 806-807.

striking example - of all five portraits – of a translator's clear visibility vis-à-vis a source text. This is true both for her paratextual and her textual behaviour.

To demonstrate this point is quite straightforward. To do so, I provide samples of Laplace's original and Somerville's translation, as well as comparative samples from Nathaniel Bowditch's American translation. I choose Bowditch for several reasons. First, together with Somerville herself, he was the only other of the concurrent translators to have also translated the *entire* Laplacian text, rather than just the first book or the first volumes; this continuity gives Bowditch, like Somerville, a different - more global, more contextual -relationship to the source text than translators who were involved with only portions of that text.

Second, Bowditch's is considered the premiere translation for the *exclusively* mathematical audience, as Somerville's is considered the premiere exposition for a *broad*er audience, while still including mathematicians (to which the acceptance of her text within the Cambridge curriculum testifies). The *Literary Gazette* makes the distinction thus (emphasis mine)⁸⁹:

...we may remark, by the way, that the distinguished American mathematician, Bowditch, has already given to the world a portion of a translation, illustrated by copious notes, which cannot fail to be of the highest value *to the student in those intricate pursuits*.

Mrs. Somerville's object, however, was of a different order ... She saw that Laplace's book was sealed to all who were *not in familiar possession* of that marvelous language in which the history of the heavens is exclusively written, and without which familiar acquaintance, the study became one of almost hopeless labour.

⁸⁹ *The Literary Gazette* 778, December 1831, pp. 806-807. At the time of this review, Bowditch's complete translation had not yet reached England. As Herschel notes on this delay: "The first volume only has as yet reached us; and when we consider the great difficulty of printing works of this nature, to say nothing of the heavy and probably unremunerated expense, we are not surprised at the delay of the second". John Herschel in the *Quarterly Review*, Vol. XLVII, No. XCIV, July 1832, pp. 537-559.

Somerville and Bowditch – Two Different Approaches to Exposition

The samples in this section are taken from Book 2, Chapter One, Volume I. In Laplace's own words⁹⁰, the purpose of Book 2 was thus (emphasis mine):

Après avoir développé [in Book 1] les loix du mouvement ; nous allons en partant de ces loix, et de celles des mouvemens célestes, présentées avec détail dans l'ouvrage intitulé : *Exposition du système du monde*, nous élever à la loi générale de ces mouvemens. Celui de tous ces phénomènes, qui semble le plus propre à la faire découvrir, **est le mouvement elliptique des planètes et des comètes autour du soleil** ; voyons ce qu'il donne sur cet objet.

I chose this particular book as a sample source based on Bowditch's own suggestions to his readers, as explained in the *Introduction* to his translation (emphasis mine)⁹¹ :

It may be advisable for a young person, in reading this volume for the first time, to pass over the eighth chapter of the first book, which treats of the motion of fluids, being rather more difficult than the rest of this volume; he may also pass over the fourth and sixth chapter of the same book. After reading **the second book, which contains all the most interesting principles of the motions of the heavenly bodies**, he can return with additional force, to these chapters, before entering on the calculation of the figures of the heavenly bodies in the second volume [Books 3/4/5].

While both translators had students of maths in mind as their target audience, each realized this didactic objective with markedly different approaches. I will discuss Bowditch first, in order to then present Somerville's work.

BOWDITCH

Paratextually, Bowditch's format followed the structure of Laplace's original, down to the ordering of the hundreds of mathematical formulae. Where Bowditch adds commentary (substantial commentary, it must be said), it is done paratextually as well, and is thus clearly distinguishable from the source text.

⁹⁰ Laplace, 1967 reprint p.111, emphasis mine.

⁹¹ Bowditch 1829-1839:vii, emphasis mine.

In the following sample, which is representative of Bowditch's approach throughout, we see how he echoes Laplace's entire structure -

from the conclusion to Book One (Il ne s'agit plus maintenant, pour déterminer ... = To determine the oscillations of the sea and the atmosphere, it is now only necessary to ...) ...

— Il ne s'agit plus maintenant, pour déterminer les oscillations de la mer et de l'atmosphère, que de connoître les forces qui agitent ces deux masses fluides, et d'intégrer les équations différentielles, précédentes; c'est ce que nous ferons dans la suite de cet ouvrage.

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MOTION OF FLUIDS.

[Méc. Céle.

are therefore similar, at all elevations above the sea, and proportional to the heights of the barometer.

To determine the oscillations of the sea and the atmosphere, it is now only necessary to know the forces which act upon these two fluid masses, and to integrate the preceding differential equations; which will be done in the course of this work.

to the entry into the Second Book (Livre II, De la Loi de La Pesanteur Universelle... = On The Law of Universal Gravitation ...) (SEE FOLLOWING PAGE)

LIVRE II.

DE LA LOI DE LA PESANTEUR UNIVERSELLE, ET DU
MOUVEMENT DES CENTRES DE GRAVITÉ DES
CORPS CÉLESTES.

CHAPITRE PREMIER.

De la loi de la pesanteur universelle, tirée des phénomènes.

1. Après avoir développé les loix du mouvement; nous allons en partir de ces loix, et de celles des mouvemens célestes, présentées avec détail dans l'ouvrage intitulé : *Exposition du système du monde*, nous élèver à la loi générale de ces mouvemens. Celui de tous les phénomènes, qui semble le plus propre à la faire découvrir, est le mouvement elliptique des planètes et des comètes autour du soleil; voyons ce qu'il donne sur cet objet. Pour cela, nommons x et y , les coordonnées rectangulaires d'une planète, dans le plan de son orbite, et fixons leur origine, au centre du soleil; nommons de plus, P et Q les forces dont cette planète est animée dans son mouvement relatif autour du soleil, parallèlement aux axes des x et des y , et supposons que ces forces tendent vers l'origine des coordonnées; enfin, soit dt l'élément du temps que nous regarderons comme constant; on aura, par le Chapitre II du premier Livre,

$$0 = \frac{ddx}{dt^2} + P; \quad (1)$$

$$0 = \frac{ddy}{dt^2} + Q. \quad (2)$$

SECOND BOOK.

ON THE LAW OF UNIVERSAL GRAVITATION, AND THE MOTIONS OF THE CENTRES OF GRAVITY OF THE HEAVENLY BODIES.

CHAPTER I.

ON THE LAW OF UNIVERSAL GRAVITATION, DEDUCED FROM OBSERVATION.

1. HAVING explained the laws of motion; we shall now proceed to deduce from these laws, and from the phenomena of the motions of the heavenly bodies, given in detail in the work entitled, "*Exposition du Système du Monde*," the general law regulating the motions of those bodies. Of all these phenomena, the elliptical motion of the planets and comets about the sun, seems the best adapted to this investigation; we shall therefore use it for this object, and shall suppose x and y to be the rectangular co-ordinates of a planet in the plane of its orbit; the origin of these co-ordinates being in the centre of the sun. Let P and Q be the forces acting on the planet, parallel to the axes of x and y , in its relative motion about the sun, *these forces being supposed to tend towards the origin of the co-ordinates*. Lastly, let dt be the element of the time, which we shall suppose to be constant. We shall have, by Chapter II of the first book,*

$$0 = \frac{ddx}{dt^2} + P; \quad (1)$$

$$0 = \frac{ddy}{dt^2} + Q; \quad (2)$$

* (264) From [36] we have $\frac{ddx}{dt^2} = J'$, $\frac{ddy}{dt^2} = Q$; but in the computation [34th], the forces P , Q , were supposed to tend to increase the co-ordinates; whereas in the present case, [36th], these forces tend to decrease the co-ordinates; we must therefore put P and Q

On this page from the Second Book, we see how Bowditch offers a close yet highly

readable translation, and how he retains the layout suggested by the source text, adding 2 paratextual features: his own system of index numerals along the right column, designed to refer readers to his own appended index of 'easy-reference' mathematical formulae; and in the footer, a didactic note⁹² explaining the intermediary steps implied but not made explicit in Laplace's mathematical process. It was these same omissions that earlier so frustrated Bowditch in his own first approach to the *Mécanique céleste*.

In Gillispie's estimation, it is precisely the singular worth of such paratextual explication that characterizes the "splendid" effort of Bowditch, which "entirely superseded" the previous translations by Toplis, Young, and Harte:

Bowditch's commentary in the footnotes is an indispensable *vade mecum* for the study of Laplace, explaining and filling out the demonstrations, and containing a great body of historical as well as mathematical and astronomical elucidation⁹³.

SOMERVILLE

Somerville's version, meanwhile, is valuable, too, for its exposition, which although quite different from Bowditch's, makes it the "most helpful by far" - again in Gillispie's estimation: "Her exposition is somewhat more elementary than Bowditch's commentary, to which it makes a valuable supplement"⁹⁴. This comment confirms the idea discussed above of translation as branding, within which each translator fills a certain audience niche, and also within which several translations can peacefully co-exist in complement.

Somerville's translation is a revealing counterpart in format to the choices made by Bowditch. Where Bowditch largely retains the format and numbering of Laplace's mathematical arguments, albeit with considerable footnoted material, Somerville inserts

⁹² Delineated from the source text as they are, Bowditch's notes are considered allographic commentary. The term "allographic" is used by Gérard Genette and Jacqueline Henry to designate notes added by the translator or editor of a text, as opposed to "autographic" notes, which are additional information added by the author in a place detached from the main text. See "De l'érudition à l'échec : la note du traducteur". 2000 :229.

⁹³ Gillispie 1997:283

⁹⁴ Gillispie 1997:308.

whole passages of cohesive material, from introductions, to summaries to conclusions, to illustrations, much of which is directly interwoven into the source text. As a consequence, her layout in parts differs noticeably in organizational structure from Laplace's original, as seen here in the following examples. Notice the clear interference with the source text content and layout.

First, Somerville expands the Conclusion to Book One from Laplace's *one* paragraph to fully 4 times that length (and shifts her direct translation of Laplace's conclusion) to a later point, as we shall see in a subsequent sample)

— Il ne s'agit plus maintenant, pour déterminer les oscillations de la mer et de l'atmosphère, que de connoître les forces qui agitent ces deux masses fluides, et d'intégrer les équations différentielles, précédentes; c'est ce que nous ferons dans la suite de cet ouvrage.

The oscillations of the mercury are therefore similar at all heights above the level of the sea, and proportional in their extent to the height of the barometer.



Conclusion.

307. The account of the first book of the *Mécanique Céleste* is thus brought to a conclusion. Arduous as the study of it may seem, the approach in every science, necessarily consisting in elementary principles, must be tedious: but let it not be forgotten, that many important truths, coeval with the existence of matter itself, have already been developed; and that the subsequent application of the principles which have been established, will lead to the contemplation of the most sublime works of the Creator. The general equation of motion has been formed according to the primordial laws of matter; and the universal application of this one equation, to the motion of matter in every form of which it is susceptible, whether solid or fluid, to a single particle, or to a system of bodies, displays the essential nature of analysis, which comprehends every case that can result from a given law. It is not, indeed, surprising that our limited faculties do not enable us to derive general values of the unknown quantities from this equation: it has been accomplished, it is true, in a few cases, but we must be satisfied with approximate values in by much the greater number of instances. Several circumstances in the solar system materially facilitate the approximations; these Laplace has selected with profound judgment, and employed with the greatest dexterity.

Second, she interrupts the beginning of Laplace's *Livre II* to insert her own, 7-page, section entitled "Progress of Astronomy" (see interrupted sample here from beginning and end thereof), at the end of which she offers the direct translation (see scored paragraph, right column) of Laplace's concluding paragraph to Chapter One:

Having endeavoured in the first book to explain the laws by which force acts upon matter, we shall now compare those laws with the actual motions of the heavenly bodies, in order to arrive by analytical reasoning, entirely independent of hypothesis, at the principle of that force which animates the solar system. The laws of mechanics may be traced with greater precision in celestial space than on earth, where the results are so complicated, that it is difficult to unravel, and still more so to subject them to calculation: whereas the bodies of the solar system, separated by vast distances, and acted upon by a force, the effects of which may be readily estimated, are only disturbed in their respective movements by such small forces, that the general equations comprehend all the changes which ages have produced, or may hereafter produce in the system; and in explaining the phenomena it is not necessary to have recourse to vague or imaginary causes, for the law of universal gravitation may be reduced to calcu-

BOOK II.

CHAPTER I.

* PROGRESS OF ASTRONOMY.

308. THE science of astronomy was cultivated very early, and many important observations and discoveries were made, yet no accurate inferences leading to the true system of the world were drawn from them, until a much later period. It is not surprising, that men deceived by appearances, occasioned by the rotation of the earth, should have been slow to believe the diurnal motion of the heavens to be an illusion; but the absurd consequence which the contrary hypothesis involves, convinced minds of a higher order, that the apparent could not be the true system of nature.

Many of the ancients were aware of the double motion of the earth; a system which Copernicus adopted, and confirmed by the comparison of a series of observations, that had been accumulating for ages; from these he inferred that the precession of the equinoxes might be attributed to a motion in the earth's axis. He ascertained the revolution of the planets round the sun, and determined the dimensions of their orbits, till then unknown. Although he proved these truths by evidence which has ultimately dissipated the erroneous theories resulting from the illusions of the senses, and overcame the objections which were opposed to them by ignorance of the laws of mechanics, this great philosopher, constrained by the prejudices of the times, only dared to publish the truths he had discovered, under the less objectionable name of hypotheses.

In the seventeenth century, Galileo, assisted by the discovery of the telescope, was the first who saw the magnificent system of Jupiter's satellites, which furnished a new analogy between the planets and the earth: he discovered the phases of Venus, by which he removed all doubts of the revolution of that planet round the sun. The bright spots which he saw in the moon beyond the line which separates the enlightened from the obscure part, showed the existence and height

After this interruption of the source text organization, Somerville proceeds on to translate Laplace's original *Chapitre Premier*, which she now needs to rename *Chapter Two* in the translation, since her "Progress of Astronomy" has become her own *Chapter One*.

L I V R E I I.

DE LA LOI DE LA PESANTEUR UNIVERSELLE, ET DU
MOUVEMENT DES CENTRES DE GRAVITÉ DES
CORPS CÉLESTES.

CHAPITRE PREMIER.

De la loi de la pesanteur universelle, tirée des phénomènes.

[Book II.]

CHAPTER II.

ON THE LAW OF UNIVERSAL GRAVITATION, DEDUCED
FROM OBSERVATION.

309. THE three laws of Kepler furnish the data from, which the principle of gravitation is established, namely:—

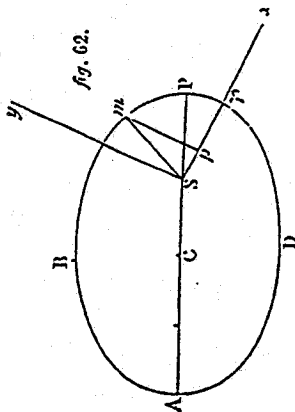
- i. That the radii vectores of the planets and comets describe areas proportional to the time.
- ii. That the orbits of the planets and comets are conic sections, having the sun in one of their foci.
- iii. That the squares of the periodic times of the planets are proportional to the cubes of their mean distances from the sun.

Once in Somerville's Chapter II (= Laplace's Chapitre Premier) we see that Somerville again inserts over a page of additional material, including her own illustration – one of many especially created for the work (figure 62, Somerville's page 152), ...

310. It has been shown, that if the law of the force which acts on a moving body be known, the curve in which it moves may be found; or, if the curve in which the body moves be given, the law of the force may be ascertained. In the general equation of the motion of a body in article 144, both the force and the path of the body are indeterminate; therefore in applying that equation to the motion of the planets and comets, it is necessary to know the orbits in which they move, in order to ascertain the nature of the force that acts on them.

311. In the general equation of the motion of a body, the forces acting on it are resolved into three component forces, in the direction of three rectangular axes; but as the paths of the planets, satellites, and comets, are proved by the observations of Kepler to be conic sections, they always move in the same plane: therefore the component force in the direction perpendicular to that plane is zero, and the other two component forces are in the plane of the orbit.

312. Let AmP , fig. 62, be the elliptical orbit of a planet m , having the centre of the sun in the focus S , which is also assumed as the origin of the co-ordinates. The imaginary line Sm joining the centre of the sun and the centre of the planet is the radius vector. Suppose the two



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component forces to be in the direction of the axes Sx , Sy , then the component force Z is zero; and as the body is free to move in every direction, the virtual velocities δx , δy are zero, which divides the general equation of motion in article 144 into

$$\frac{d^2x}{dt^2} = X; \quad \frac{d^2y}{dt^2} = Y;$$

1. *Après avoir développé les loix du mouvement; nous allons en partant de ces loix, et de celles des mouvemens célestes, présentées avec détail dans l'ouvrage intitulé: Exposition du système du monde, nous élever à la loi générale de ces mouvemens. Celui de tous les phénomènes, qui semble le plus propre à la faire découvrir, est le mouvement elliptique des planètes et des comètes autour du soleil; voyons ce qu'il donne sur cet objet. Pour cela, nommons x et y , les coordonnées rectangulaires d'une planète, dans le plan de son orbite, et fixons leur origine, au centre du soleil; nommons de plus, P et Q les forces dont cette planète est animée dans son mouvement relatif autour du soleil, parallèlement aux axes des x et des y , et supposons que ces forces tendent vers l'origine des coordonnées; enfin, soit dt l'élément du temps que nous regarderons comme constant; on aura, par le Chapitre II du premier Livre,*

$$0 = \frac{ddx}{dt^2} + P; \quad (1)$$

$$0 = \frac{ddy}{dt^2} + Q. \quad (2)$$

... before arriving at the equation to article 144 (see the first equation on Somerville's page 153) that corresponds to Laplace's first equation in the original (bottom of Chapitre Premier, equation 1).

All of which may amount to a sincere and, in other ways, effective intention to clarify the content of the text, yet has the additional and unfortunate effect of nearly thoroughly distracting any reader who wishes to refer to the source text as a bi-text, or who wishes to compare the various translations. If the form is the message, or at least a considerable part of it, then Bowditch's adherence to the source text format while nonetheless imparting vast amounts of historical and mathematical context makes his effort seem more desirable at that level.

And yet, Somerville did win accolades for having attained the twofold purpose of her text, which was to *explicate*⁹⁵ and to *disseminate*. In her own words on this latter point, Somerville expressed (from her confinement at Royal Hospital, Chelsea) that to "concur with [Brougham's Society] in the diffusion of useful knowledge, would be the highest ambition of the Author"⁹⁶.

On the former point, of explication, Somerville's concern, like Bowditch's, was to "explain the methods by which [Laplace's] results are deduced from one general equation of the motion of matter"⁹⁷. To do so, she not only interpolates textual material throughout the translation, as seen in the above samples, she also prefixes her own 70-page, paratextual

⁹⁵ Though non-mathematician readers will likely not recognize it, Somerville's concern with an accessible, communicative, forward-looking text is seen also in her use of the Continental style of mathematical notation, which was derived from Leibniz, perceived to be clearer, ultimately won out over the English style, and is still used today. See: her inclusion of all steps in mathematical demonstrations, her carefully defined symbols, her comparison of her own approach and Newton's to the same material, and her mention of more recent investigative findings, including for example the work of Pontécoulant, Poisson, Delambre, and Bouvard.

⁹⁶ First Edition Dedication by Mary Somerville (July 21st, 1831) p. iii.

⁹⁷ Somerville 1831:3.

Preliminary Dissertation on physical astronomy,

the science which compares and identifies the laws of motion observed on earth with the motions that take place in the heavens. ... [Therefore, i]n order to convey some idea of the object of this work, it may be useful to offer a few preliminary observations on the nature of [physical astronomy], and of the means that have already been adopted with so much success to bring within the reach of our faculties, those truths which might seem to be placed so far beyond them (*Preliminary Dissertation*, vi).

Far from being perceived as immodest or otherwise inappropriate (which type of comment was more prevalent in Behn or Carter's day), this *Preliminary Dissertation* was well received, and calls were made for Somerville to publish it as a separate text entirely, as here⁹⁸:

Is it asking too much of Mrs. Somerville to express a hope that she will allow this beautiful preliminary dissertation to be printed separately, for the delight and instruction of thousands of readers, young and old, who cannot understand, or who are too indolent to apply themselves to the elaborate parts of the work? If she will do this, we hereby promise to exert our best endeavours to make its merits known.

To refer to a point discussed in Backdrop One, this combination of authorship *and* translation activity in Somerville (combined with the high regard in which the source text and its author were held both in France and in England) served in part to elevate both the translator and her text to heights of visibility and influence in the dissemination of scientific thought.

6. Portrait Conclusion

The existence of Mary Somerville has been previously noted in the history of science, and, more recently, in the history of women in science. Yet Somerville also holds a rightful place in the history of translation, a field to which her accomplishments add considerable prestige. Recognized as one of only a handful of scholars who could understand,

⁹⁸ *Literary Gazette* 778, December 1831, pp. 806-807.

translate, and explain Laplace's Newton-inspired work to an English audience, Mary Somerville confirmed the heights to which science enthusiasts - even women - could rise, if encouraged.

Yet it is also valuable, at this midpoint of the dissertation, to wonder, for every Somerville, how many other female translators of scientific materials from her time remained unformed, unpublished, or unrecognized? Somerville's success was in part the culmination of a fortunate set of circumstances that put her gifts in the right place and time in history. After all, this was a time of great growth and dispute in science, when the field was still open to the passionate amateur, especially one who was able to help calm fears surrounding society membership and French superiority. Somerville's function as a bridge between the worlds of amateur and professional science, between male and female science, and between French and English science, echoes the communicative function of the translator she was, in addition to her own scientific presence and publications.

Yet while her gender may have created an opening for acceptance as the exceptional woman that proves the rule, it might easily have eliminated as many opportunities, had Mary not been born into an established family line, had she not doggedly pursued an early education in French analysis, had she not had an open-minded father and second husband, had she not been attractive and charming and fittingly modest, had she not lived at a moment when English science was prepared to welcome and nurture most any sincere apprentice - whether male or female, had she not, above and beyond the dissemination of science through translation and the publication of her own original scientific texts, also fulfilled all the wifely and motherly obligations considered appropriate to her era. Mary Somerville knew full well she was not a "discoverer", so prized at the time in English science. Ultimately, this mattered little to her, and little to her reputation, for it left her free to pursue her well realized calling as an expositor of science, at home and abroad, for the duration of her long and fruitful life.

Portrait Three: Mary Fairfax Somerville

The very existence of such esteemed translators as Somerville lends hope that future scholarship can indeed uncover other examples of skilled translators of scientific materials. Even if less illustrious, these women (and men) and their translations can then be rightfully included among the disseminating influences in the history of scientific thought.

From the heights attained by Mary Somerville I shift in focus now slightly to consider the case of one of her protégées, Ada Lovelace (Lord Byron's daughter), who translated an account (via Italy) of Charles Babbage's monumental efforts at devising a calculating machine, the precursor to the modern computer. Though somewhat less visible a figure in science because of her short life and frustrated ambitions to pursue a life of the mind, Lovelace nonetheless like Somerville before her became successful for her independent explication of a scientific text. The Lovelace portrait recalls the close intellectual links between England and Italy, and shows the personal connections between Babbage, and Somerville, and Lovelace, as well as a shift in subject matter away from Newton to the applied mathematical sciences at which the English so excelled.

Portrait Four: [Augusta] Ada [Gordon Byron, Countess of] Lovelace, (1815-1852)

0. Introduction

On 10 December 1980 a group of government employees and officials gathered at the US Department of Defense. Their purpose that day was to inaugurate a new computer programming language, named ADA. With this newly-christened language, these modern researchers commemorated the accomplishments of English translator-expositor Ada Lovelace, born 125 years to the day before, and who, for the translation, extrapolation, dissemination, and championing of the work of fellow English scientist Charles Babbage is today recognized as the first computer programmer¹.

Of the five portraits considered here, the case of Ada Lovelace is striking in particular for the *durability* of the translator's visibility and influence. Where Aphra Behn (1640-1689) and Elizabeth Carter (1717-1806) made early strides for female translators of scientific materials through their primary visibility as (literary) writers and intellectual figures, and Mary Somerville (1780-1782) next established a prominent, but regrettably only temporary, place for the *doyenne* of science, it will be seen in *this* portrait how, through her prescient insight into the applied relevance of the ideas she translated, Ada Lovelace left a mark in the history of science that more recognizably extends through to today in its immediate and

¹ This language, known during development as DoD-1, was named ADA in May 1979, at the suggestion of Jack Cooper, Navy Material Command. The first reference manual, *Military Standard 1815* (Augusta Ada [Gordon] Byron was born in 1815), was published in July 1980, and final approval came on 10 December 1980. Though the *Ada Joint Program Office* began being phased out by the US gov't in September 1998, ADA remains today a NATO standard, and is still pervasive in the public sector, especially for air transport and subway systems, such as Boeing 777s, the Space Station, and the Paris Metro. An updated reference manual was published as recently as 1995. All authorized software packages include a watermark of Ada Lovelace's face as a security feature. For more, see for example [www.adaic.org] or [www.adahome.org].

practical applications, despite her own fears of fading into obscurity: "And pray do not quite forget me, for I think there seems some danger of it"².

This legacy is even more remarkable when considered against the intellectual and financial turmoil of Lovelace's short life (36 years), the strains of which bound her in a Venutian simpatico³ with her subject, Charles Babbage, himself called the "father of computer science". The two shared a close and lasting intellectual bond⁴, and, in a tribute that foreshadowed the title later accorded to Ada's mentor, Mary Somerville (in the London Post's obituary), Babbage pronounced his translator the "Enchantress of Numbers"⁵.

As for the originality of this portrait, it is reminiscent of the case of Aphra Behn, who, while prominent in modern scholarship, has come to be remembered today primarily for reasons

² Ada to Babbage, in June or July 1841. Cited by Kathryn Elliot, University of Calgary, November 2002. At <http://pages.cpsc.ucalgary.ca/~elliottk/Ada/Bio.html>

³ Also of note on this point of translator-scientist overlap, Babbage himself acted as translator, together with John Herschel, of Lacroix's *Differential and Integral Calculus* from the French. Lacroix, together with Lagrange and Laplace (source text author, this portrait, is often referred to as one of the "three L's: of French mathematics of his day (1765-1843). In another connection to *Lagrange* and to the notation controversy of the day (see also Backdrop Two on the calculus), Green points out that, "A point often glossed over is that the revolution Babbage instigated in mathematical notation was grounded in a Lagrangian approach to the foundations calculus, under which "evanescent" quantities, such as Newton's "fluxions," Leibniz's "infinitesimals," and D'Alembert's "limits," were replaced by the less controversial polynomial approximations of continuous functions made possible by Taylor's Theorem -- precisely what the Difference Engine used for its computations. Thus, Babbage's first calculating machine and his earlier work on calculus were closely connected conceptually". Christopher D. Green, *Charles Babbage, the Analytical Engine, and the Possibility of a 19th-Century Cognitive Science*. First published in Green, C.D., Shore, M., & Teo, T. (Eds.) (2001). *The Transformation of Psychology: Influences of 19th-Century Philosophy, Technology, and Natural Science* (pp. 133-152). Washington, DC: American Psychological Association.] On-line at <http://www.yorku.ca/christo/papers/Babbage-CogSci.htm>

⁴ As Ada's husband describes it: "Her mind was invigorated by the society of the intellectual men whom she entertained as guests. ... She mastered the mathematical side of a question in all its minuteness ... her power of generalization was indeed most remarkable, coupled as it was with that of minute and intricate analysis. *Babbage* was a constant intellectual companion and she ever found in him a match for her powerful understanding, their constant philosophical discussions begetting only an increased esteem and mutual liking". Cited in Moore, 1977.

⁵ "Forget this world and all its troubles and if possible its multitudinous Charlatans-- everything in short but the Enchantress of Numbers". Letter from Babbage to Lovelace, cited at <http://pages.cpsc.ucalgary.ca/~elliottk/Ada/Charles.html>

outside her (other) role as translator of a scientific text. That is, Ada Lovelace is well represented in the history of computer science, and as a curious historical character generally (as her father's - i.e., Lord Byron's - emotionally volatile daughter). But little work has focused on connecting Lovelace to her direct importance in the history of scientific translation, much less to other women in this profession. Therefore, this portrait calls attention to the text that stands as Lovelace's major contribution to the history of scientific translation, her 1842 translation and exposition on Babbage's Analytical Engine, the importance of which machine was first indicated in Backdrop Two.

In line with the main threads that run through the dissertation - on women, science, and translation - this portrait is intended to strengthen the argument familiar to readers from Backdrop One, as from the preceding three portraits, namely that female translators of scientific materials could be visible and influential, particularly when science education featured prominently in their formation, and when authorship (here, as in Lovelace's extensive original interpretive notes to the translation) featured among their scholarly activities. In Lovelace's case, the combined peaks of visibility and influence for a woman in science thus form an extension of the position attained by her predecessor, friend, and mentor, Mary Somerville's, before the final portrait (on Elizabeth Sabine) illustrates the waning of favour towards such women.

As well, the asserted presence of the translator appears not only in Lovelace's *text*, but also in her political and financial championing, and re-invigoration, of scientist Babbage's stalled Engines project; this effect falls under the notion of translation as repatriation, forms of which can be found in each of the first four portraits (Behn, Carter, Somerville, and Lovelace). Finally, no known concurrent translators exist for this text.

1. The Translator: Ada Lovelace (1815-1852)

Education as Precept

The strange personal circumstances of the life of [Augusta] Ada [Gordon Byron, Countess of] Lovelace⁶, Lord Byron's daughter, are perhaps best introduced by her modern biographer, Doris Langley Moore⁷:

The drama of Byron's marriage did not end with his death in Greece but continued and culminated in the life of his daughter Ada...

The dominating shadow of [Ada's mother] Lady Byron, never relinquishing her role of wronged wife and injured widow, fell across Ada's childhood; and the rigorous disciplines imposed on Ada, presumably to offset any taint inherited from her father, checked and stifled a naturally high-spirited temperament. The girl was not only very attractive but was endowed with high mathematical and scientific ability, yet her whole life was inexorably thwarted by her obsessive mother, from whom not even her marriage at nineteen to the devoted Lord King, later first Earl of Lovelace, could entirely free her.

Ada was born on 10 December 1815 at Piccadilly Terrace (London) to Lady Byron (née Anna Isabella Milbanke), who was determined to raise the child in fear and loathing of her father's intemperate nature, and especially of the many wrongs Lady Byron felt she had suffered at his hands. Ada's strict education now became the tool through which her authoritarian and narcissistic mother would visit the sins of the father upon the child.

Here we see how the still ambivalent feelings surrounding girls' education (which was not formalized in Britain until Girton College⁸ in 1869) are especially pronounced, and the strongest example yet that perhaps the most harmful resistance could come not from

⁶ Ada was born Augusta Ada Gordon, and is sometimes named by her father's title, Lord Byron, but more commonly by the title she acquired through her marriage to William King, 1st Earl of Lovelace. Here throughout she will be called Ada Lovelace.

⁷ Moore 1977, dust cover. Moore's is the first major modern biography, and as such a major source in this portrait. Also available are: Benjamin Woolley's *The Bride of Science: Romance, Reason, and Byron's Daughter*. McGraw-Hill/ Macmillan, 1999, and *Ada, The Enchantress of Numbers*, by Betty Alexandra Toole, Strawberry Press.

⁸ The Girton College homepage is at <http://www.girton.cam.ac.uk/about/>

without, but from within the family, among whose various roles it was to keep its members in line with predominant expectations. Yet despite this tension between learning and gender, Lovelace was to have considerable influence, even if only as one of a small number of such women. Considered together with the other four women in this dissertation, Ada illustrates “the exception” proves not the *rule*, but rather the *possibility* – of contributing to the history of women, of science, and of translation.

On strict orders from her mother, young Ada’s routine was to revolve exclusively around duty in the home and in society. Though the full study schedule arranged for Ada emphasized music and arithmetic, her favourite subject was geography, according to Miss Lamont, her erstwhile tutor. In *The Calculating Passion of Ada Byron*, Ada’s routine is described as turning on

rewards and punishments, the latter including solitary confinement, lying still, and written apology. Lessons ranged, with breaks, from morning until after dinner, but study might be extended if lessons were not done ‘with alacrity and docility’. Miss Lamont reported, for example, that little Ada had the ability to add up ‘sums of five or six rows of figures, with accuracy’ and was usually ‘deliberate and correct,’ but when she got tired and sloppy, Miss Lamont officially recorded, Ada had to make amends by doing everything again...⁹

So we see that, in Ada’s case, it was not a liberal father figure who led her to a life of science, but rather her mother, who as a young woman had herself excelled at maths, and whom Lord Byron once nicknamed the “Princess of Parallelograms”¹⁰. There was a cost to pay, however. Ultimately, this pressure to excel exerted by an emotionally forbidding mother who tolerated no attempts to supersede her own authority and abilities left Ada with a

⁹ Baum 1977:10. Baum, Joan. *The Calculating Passion of Ada Lovelace Byron*. Hamden, Connecticut: Archon Books, 1986.

¹⁰ Despite his great affection for his daughter, and though he was personally drawn to women who were well read, Byron regularly ridiculed clever women –by now also more generally called bluestockings, from the Bluestocking Circle - in his journals and in print. See Myers’ “Epilogue” in *The Bluestocking Circle*, 1990.

difficult relationship, at best, to the life of the mind she early on decided to pursue. On this point, Lovelace marks the first of the translators portrayed to have encountered such deliberate psychological obstacles to her progress in science and math, in contrast to the far more enthusiastic environments surrounding Behn, Carter, and Somerville before her. This stifling of Lovelace's natural abilities and inclinations, which she experienced as a particularly cruel twist in her mother's educational plans, is one reason, in addition to her short life, that Ada's scientific output was so limited, though still remarkably effective. It was not always the dominant, external, male environment, then, that hindered women in their pursuit of knowledge.

Yet there were some benefits to life in the Byron household. Lady Byron's educational zeal¹¹ and social striving meant Ada's regimen would soon also include not just tutoring in the home, but travel abroad, presentation at court, and formal introductions to a number of important society and intellectual figures, some of whom could serve as her mentors where her mother would not.

Mentors in math and science

Beginning at a young age, Ada was affected by a number of childhood illnesses that left her physically quite inactive. This inactivity came to be sharply contrasted by a particular mental vigour, her mind "sharp and eager to devote to study the hours that most girls of her class

¹¹ Among Lady Byron's calculated pet projects were the support of Unitarian tutors, the Co-Operative Society, American mission societies and their representatives, and the Ealing Grove venture, which was designed to "educat[e] the working classes and elevat[e] their morals". Related ideas for preparing 'new settlers for [the American] colonies' through a combination of book learning and manual labour, and plans for bringing in more privileged day students for good influence were, it seems, never realized. Interestingly, the idea for such a school was suggested to Lady Byron by Henry Brougham (of the *Society for the Diffusion of Useful Knowledge*, mentioned in connection with Mary Somerville, Portrait 3), who hoped the ideas of Swiss education reformer Johann Heinrich Pestalozzi (1746 - 1827), themselves based on Rousseau's ideas, might be successful in England. At 20, Ada herself seems to have been recruited as an unpaid math instructor at Ealing Grove (Moore 1977: 56-8).

and age were spending on preparations for entering the *beau monde*. [By the age of 14] she had started on astronomy, among other mathematical sciences..."¹².

By now, Ada's abilities in math were being cultivated not by simple tutors, but largely by two far more important men: William Frend¹³, a Cambridge don who had once tutored the young Miss Milbanke in astronomy, algebra and geometry, and his future son-in-law, Augustus de Morgan, the first professor of mathematics at the newly founded University of London.

With both, she pursued a program of correspondence and problem-solving. During this period, Ada also sought out correspondence with other potential mentors, including Mary Somerville, whom she greatly admired. Somerville responded warmly to Ada, and was to have a lasting intellectual and personal¹⁴ influence on the young woman she outlived by 20 years. In her autobiography¹⁵ Somerville recalled that

Ada was much attached to me, and often came to stay with me. It was by my advice that she studied mathematics. She always wrote to me for an explanation when she met with any difficulty. Among my papers I lately found many of her notes, asking mathematical questions.

This personal initiative and preparedness, and Ada's contact with influential tutors, was further enhanced during her first official London season, when she was presented to the court of King William IV and Queen Adelaide at St. James' Palace on 10 May 1833. As

¹² Moore 1977: 29.

¹³ Frend, now in his sixties, had caused "a tremendous scandal at Cambridge in his youth by renouncing Holy Orders to embrace Unitarianism and writing a subversive pamphlet, thus sacrificing his academic prospects, [though] he was still, in all his expositions of natural law, weighing religious pros and cons" Moore 1977: 46.

¹⁴ In addition to acting as a role model to Ada of women in science, Somerville wound up introducing Ada to her future husband through her own son, Woronzow Greig.

¹⁵ Dep c.355.22 MSAU-2: *Mary Somerville Autobiography* (first draft), Mary Somerville Collection, Bodleian Library, Oxford University.

Moore explains, this was “the fourth and most crowded Drawing Room of the season, and a very brilliant one because two continental princes [the Duke of Orleans and the Duke of Brunswick] were making their first formal appearance”¹⁶. Though Lady Byron hoped that this exposure to the formalities of society, at this venue and in general, might temper¹⁷ what she and her coterie perceived in Ada to be an unacceptably ‘forcible’ manner and a tendency toward ‘conversational litigation’, the most important effects of this season were hardly so trivial; for it was as a result of these introductions that Ada now met Charles Babbage, in many ways a kindred spirit with whom she was to forge a permanent working relationship.

Lovelace and Babbage meet

At a party on 5 June 1833 organized as it so happens by Mary Somerville, 17-year-old Ada met English mathematician and scientist Charles Babbage, 41, “who made an immediately delightful impression on her” as they discussed mathematics. By this point in his career, the widely read, productive, and influential Babbage was, not unlike his future collaborator, acquiring a reputation as something of an odd personality, by turns charming and irascible, ever prone to the distractions of a curious, expansive mind.

Though he is known today almost exclusively as “the father of computer science”, Babbage was at the forefront of many areas of concern, both technical and professional (his central role in the Royal Society debates on English scientific reform are discussed in Backdrop

¹⁶ Moore 1977:39.

¹⁷ Here we see how codes for social conduct could affect learned and assertive women. While Behn was as criticized for her sexual libertinism as for her independent career as playwright, Carter was able to escape scorn through her choice of a chaste lifestyle, and Somerville was known as much for her charming social nature as much as for her intellect; Ada, though, spoke her mind and did not suffer fools gladly, rousing the ire of more traditional observers, including her own mother. It is fortunate that Ada channelled her desire for communication into the notes to her translation, for they stand as a permanent reminder of her intellect, thus subverting the short-sighted codes imposed upon her in history.

Two). In applied research Babbage left a lasting impact through various projects relating to transport - both ground and sea - areas of major import to an expanding empire such as Britain's.

Among the many pressing research concerns of the day was the compilation of large, accurate data tables, such as astronomical tables for use in navigation, and statistical tables for use in the actuary and insurance trades. So, among his many projects, Babbage set out around 1822 to design and construct the first operative calculating machines¹⁸, the *Difference Engine* and the *Analytical Engine*. Though they eventually found success in England, and, more recently, led to the development of computers as we know them today, the pursuit of these inventions would, over time, change Babbage from a gregarious and enthusiastic member of the scientific community to an increasingly embittered researcher who nonetheless found support in Italy's scientific community and in the form of Ada and her husband. As we will see, this is another instance of translation as repatriation.

**2. Source Text Content in Context:
Charles Babbage (1791-1871), English Science, and "The Engines"**

If much of what biographers and contemporaries have described as Ada's vacillating enthusiasm and despondency toward intellectual pursuits can be attributed to a manipulative family environment and the inadequate medical treatment of what was later discovered to be an aggressive cervical cancer, Babbage's personality shift meanwhile stemmed clearly from the frustrations surrounding two major projects, the *Difference Engine* and the *Analytical Engine*, which were begun around 1822, when Babbage was in his thirties.

¹⁸ For photos of constructed models of these engines, visit for example the London Science Museum on-line at <http://www.sciencemuseum.org.uk/on-line/babbage/index.asp>.

As he would later remark¹⁹ on the singular lack of vision shown by the politicians he hoped would continue to fund the long years of research necessary for such a massive project (emphasis mine):

On two occasions I have been asked [by members of Parliament], 'Pray, Mr. Babbage, if you put into the machine **wrong** figures, will the **right** answers come out?' I am not able rightly to apprehend the kind of confusion of ideas that could provoke such a question.

Though it was his particular misfortune to have been a man far ahead of his time, Babbage ultimately triumphed, being recognized today for his pioneering work in not one, but three areas of research, of which he is best remembered for having enunciated

[1] the principles on which all modern computing machines are based.

Unquestioned pioneer in the field of large-scale mathematical machines, Babbage was, in a sense, the unheralded prophet of the [2] even newer field now known as operational research, foreshadowed in his book *Economy of Manufactures and Machinery*. This study of scientific manufacturing processes of all kinds, written as a by-product of his interest in mathematical machines, was in fact the only major undertaking he actually completed.

He was ahead of his contemporaries in still a [3] third way: he made a determined campaign for Government subsidy of scientific research at a time when research was still, to a large extent, a gentleman's hobby²⁰.

Passionately fond of mathematics as a young man, Babbage received private tutoring because of poor health, then entered Trinity College at Cambridge in 1810 (at 18), where he cultivated a great number of friendships, and taught himself higher mathematics, for lack of sufficiently advanced tutors. His closest mathematical friends were John Herschel and George Peacock, whom readers will recognize from Backdrop Two and the Somerville portrait, and with whom Babbage entered into a pact to "do their best to leave the world

¹⁹ Cited by Kathryn Elliot for Computer Science 509, University of Calgary, November 2002. At <http://pages.cpsc.ucalgary.ca/~elliottk/Ada/Charles.html>

²⁰ B.V. Bowden summarized in Morrison and Morrison: xi. See also Bowden's *Faster than Thought*. New York: Pitman, 1971.

wiser than they found it"; all three men would soon hold notable places in English learned society. As both Babbage and Lovelace would later discover, they shared these interests in self-instruction and the improvement of the *status quo*.

At his essence, Babbage was a social and gregarious man with a considerable sense of humour; his famous evening parties delighted such figures as Charles Darwin, and were not unlike the salon culture embraced by Elizabeth Carter, the Somervilles, and the older Ada Lovelace herself. The interest in and audience for such materials as scientific translations would be quite high in these arenas. Well-travelled, Babbage was a clear part of the extended communications network as well, over time visiting many notable mathematicians of the time, including Laplace, Alexander von Humboldt²¹, Poisson, Fourier, and Biot, who appear in the Somerville and Sabine portraits that bookmark this Lovelace portrait.

Finally, recall that Babbage, an "enthusiastic conference man," was instrumental in founding the Analytical Society (1812 at Trinity), the Astronomical Society (1820), the British Association for the Advancement of Science (BAAS, 1831) and the Statistical Society of London (1834). It was through the Analytical Society that Babbage, Herschel and Peacock fought, against considerable opposition, "to put English mathematicians on an equal basis with their Continental rivals' and actually had a profound effect on the future development of English mathematics"²². The status and reach of Charles Babbage within English and international scientific circles are beyond dispute, and, we can surmise, added to his

²¹ Especially within the multiple context of this dissertation, the von Humboldt brothers are interesting – among many other reasons – for their overlapping pursuit of *science* and *language*. Where Alexander (1769-1859) is known for major contributions as a naturalist and explorer (see also Portrait Five, on Elizabeth Sabine, who translated several of his works), Wilhelm (1767-1835) is known for seminal German contributions to the study of language ('das bildende Organ des Gedankens', the shaping organ of thought), including translation theory. See, for example, Miguel Vega's "Wilhelm von Humboldt, Translator and Translation Theorist". In: *Meta* XXXV, 3, 1990, 489-493.

²² Morrison and Morrison 1961: xii.

translator's own visibility, as well as the cachet associated with her translation. Further, that Lovelace's translation and explicatory notes appeared in the prestigious Taylor's *Scientific Memoirs*²³ as well as *the Ladies Diary*²⁴ is both a *sign of* and a *means to* the status and circulation of her target text.

As for Babbage's own publications, from 1813-1821 he remained in a prolific state of research and writing on *pure* mathematics,

producing three books, two unpublished books, three papers of considerable length, fourteen other papers, [and] two long encyclopaedia articles...

[Then,] for the remaining fifty years of his life Babbage worked hard on the construction of his engines. He also published work on magnetism, astronomy, life assurance, geology, biology, economics, religion, politics, ciphering, submarines, ophthalmoscopes, and machinery, but never anything else on pure mathematics.²⁵

Although – or perhaps precisely because - this extensive and varied output had won Babbage the acclaim of fellow scientists in England and abroad, from 1822 onward his interests turned to a rather more *applied* mathematical curiosity, including the long years of work on his calculating machines, which were to become the topic of Ada Lovelace's dogged interest.

²³ Vol. 3, September 1843.

²⁴ As cited from Baum (p.35), the *Ladies Diary* forms yet another link between Lovelace and mentor Somerville: "There were indeed women in mid-century England who signed their names to mathematical articles in popular journals, and there were influential periodicals, such as the *Edinburgh Review*, that lent intellectual women psychological support.... Although the *Ladies Diary* ... , the most popular of the mathematical periodicals, encouraged women to join wit with beauty, it attracted serious amateurs of both sexes... [it] was a respectable place to pose mathematical problems and sustain debate... since there were few science periodicals in England until the 1830s, technical articles often appeared in general periodicals like the *Ladies Diary*. It may have been something similar that originally sparked Mrs. Somerville's interest in mathematics. At a tea party one afternoon, she recalled years later, young Mary Fairfax had been given a ladies' fashion magazine that contained a puzzle, the answer to which was given in strange symbols. These symbols turned out to be algebra. And that magazine became her introduction to the world of Euclidean geometry and number."

²⁵ Dubbey 1978:221.

The Engines

After 1821, Babbage's focus shifted to mathematical machines, forms of which had existed "since Pascal for carrying out single arithmetical operations, but [which] afforded little saving of time or security against mistakes"²⁶.

Though it is essential to bear in mind that Babbage was indeed to have a profound and lasting affect on many other areas of applied mathematics right up until his death, the idea that would preoccupy a considerable part of his energies for the next 50 years was of designing and constructing a fully-operational calculating machine.

The desire for such a machine was not new, but Babbage's remarkable creative efforts can be seen as a reformer's response to two of various weaknesses within English science. Babbage was, after all, the author of two "stinging tracts" against the Government's mismanagement of science, *Reflections on the Decline of Science in England, and on some of its Causes* (1830), and *The Exposition of 1851; or Views of the Industry, the Science and the Government of England* (1851). In fact, it was John Herschel, one of Babbage's brothers-in-arms in these efforts, who in 1822 made the chance remark to Babbage that the calculation of large quantities of data (a central scientific interest of the day, as will also be seen in Portrait 5) could be done by steam, rather than by human 'computers' (as such workers were then called). It was thus that Herschel set into motion Babbage's 50 years of research and development.

²⁶ Morrison and Morrison 1977: xiv.

Reinvigorating the Engines

By 1834, Babbage's *Difference Engine* project had taken on vast and unforeseen proportions, requiring in effect extraordinary refinements in tool and die-making and mechanical drawing, as well as the entire reworking of manufacturing processes. This stimulated Babbage to take stock with plans for an updated machine, the *Analytical Engine*. By this point however, the government agencies that had been funding him for over 10 years decided to cut their losses, leaving Babbage to his own means for the long remainder of his research in this area. Disillusioned at what he perceived to be a bureaucratic refusal to consider the pursuit of knowledge as inherently valuable, Babbage was in serious need of outside support on the intellectual and financial levels. The first now came from Italy, the second from closer to home.

3. The Source Text – Luigi Menabrea's report on Babbage's Engines

Support: Italy and Menabrea – Then back to England and the Lovelaces

For a time, Babbage turned to his many other on-going projects, before being invited to lecture on his machines in Turin in 1840. As Babbage later recalled in his memoirs:

In 1840 I received from my friend M. Plana a letter pressing me to visit Turin at the then approaching meeting of Italian philosophers. ... We met at Turin at the appointed time, and as soon as the first bustle of the meeting had a little abated, I had the great pleasure of receiving at my own apartments, for several mornings, Messrs. Plana, Menabrea, Mossotti, MacCullagh, Plantamour, and others of the most eminent geometers and engineers of Italy.

...

These discussions were of great value to me in several ways. I was thus obliged to put into language the various views I had taken, and I observed the effect of my explanations on different minds. My own ideas became clearer, and I profited by many of the remarks made by my highly-gifted friends.²⁷

²⁷ Charles Babbage, "Life of a Philosopher". Reprinted in Morrison and Morrison 1961: 63-64.

As seen in the Carter and Somerville portraits, intellectual exchange existed between England and Italy; Italian assessments of English science, as in the Carter portrait and here, were bound to filter back into England, stimulating renewed discussion.

For, as Simon Schaffer explains²⁸, Babbage's work on the Engines fit in with his larger projects on the social aspects of the British economy of manufacture, and placed him also at the heart of similar concerns being vigorously debated in Italy at the time:

Babbage's publications on the political and domestic economy of the factory were exactly contemporary with the project to build the calculating engines.

In the late 1820s Babbage took the Lucasian chair of mathematics in Cambridge and, in a series of lectures he planned to deliver in the university, he composed a thorough survey of British manufactures, first released as a contribution on the mechanical arts in the popular *Encyclopaedia Metropolitana* (1829), then published in 1832 as *On the Economy of Machinery and Manufactures*. This remarkable exercise in the political economy of machinery reached a fourth edition by 1835 and was, by then, already in print in German, French, Italian, Spanish, Swedish and Russian. In Britain it was published by the ... Society for the Diffusion of Useful Knowledge [begun by Brougham – see Somerville Portrait]. ...

In the context of British and Piedmontese debates about industrialisation and social change, this [the image of the engines as having 'intelligence'] was a powerful if questionable image. [Italians] Menabrea and Plana worked hard to link their algebraic analyses of moving forces with urgent practical demands of military and civil engineering and thus to reform the labour force of the new state.

Fortunately for Babbage, among the distinguished audience at his public presentation was the above-mentioned Luigi Menabrea, a mathematician and engineer who went on to become Prime Minister of Italy from 1867-1869, just six years after the Kingdom of Italy was first proclaimed in 1861. Menabrea was so intrigued by Babbage's ideas that he resolved to write a paper summarizing especially the mathematical basis for the machines.

²⁸ "Babbage's Intelligence" by Simon Schaffer. Sections: "Calculating Engines and Intelligence" and "The Economy of Machinery". Available through The Hypermedia Research Centre, Westminster University, on-line at <http://www.hrc.wmin.ac.uk/theory-babbagesintelligence.html>

4. Back to England: Ada's Translation – Commission, Commentary and Samples

Next, English scientist Charles Wheatstone²⁹ heard of Menabrea's account, the French original of which appeared through the Bibliothèque Universelle de Genève³⁰, and encouraged Ada to translate it. It was a fortunate coincidence that, moving in the hallways of science, as it were, Wheatstone, like Babbage and Lovelace largely an autodidact, and with a wide range of applied scientific interests, should also have happened to be a family friend of the Byrons.

This translation was undertaken with Babbage's knowledge, and he and Ada consulted regularly and vigorously on the project; in fact it was he who asked that she write the explanatory and interpretive notes for which she won such acclaim³¹, and in part through which renewed interest was raised in support of Babbage's stalled Engines research:

²⁹ Sir Charles Wheatstone, (1802-1875). Trained as a musician and instrument maker into his early thirties, Wheatstone then pursued a career as an academic and scientist for the rest of his life. His early experiments in acoustics, optics, and electricity won him recognition in the scientific community while his work with the telegraph made his name a household word. In 1834 Wheatstone was appointed professor of experimental physics at King's College, in 1836 he became a fellow of the Royal Society, and in 1868 he was Knighted. As well, the French made Wheatstone a foreign associate of the Paris Academy of Sciences in 1873.

³⁰ As summarized in the *Historisches Lexicon der Schweiz*, the Bibliothèque universelle was a monthly literary and scientific journal based in Geneva, ran from 1816-1861, then merged with the *Revue Suisse*, which became one of the best-selling French periodicals in Switzerland. Upheld a liberal scientific policy, a conservative social, political, and aesthetic policy, and a proletarian ethic. <http://www.sn1.ch/dhs/externe/protect/textes/D24583.html>

³¹ It must be noted that opinion ranges to both extremes on the issue of whether or not Lovelace authored these notes, or whether she actually even understood Babbage's research. Remarkably, in spite of Babbage's *own* contemporary assessment of Ada's competence, as above, and despite correspondence between Lovelace and Babbage underscoring her authorship of the notes, modern detractors persist, such as Bruce Collier (Former Assistant Dean Harvard College, and Babbage Historian). Where, for example, Dale, Weems, and McCormick cite Ada's annoyance at Babbage in the following letter: I am much annoyed at your having altered my Note. You know I am always willing to make any required alterations myself, but that I cannot endure another person to meddle with my sentences", Collier expresses irritation at the central importance attributed to Lovelace thus: "There is one subject ancillary to Babbage on which far too much has been written, and that is the contributions of Ada Lovelace. It would be only a slight exaggeration to say that Babbage wrote the "Notes" to Menabrea's paper, but for reasons of his own encouraged the illusion in the minds of Ada

Some time after the appearance of [Menabrea's] memoir on the subject in the "Bibliothèque Universelle de Genève", the late Countess of Lovelace informed me that she had translated the memoir of Menabrea. I asked why she had not herself written an original paper on a subject with which she was so intimately acquainted?

To this Lady Lovelace replied that the thought had not occurred to her. I then suggested that she should add some notes to Menabrea's memoir; an idea which was immediately adopted.

We discussed together the various illustrations that might be introduced: I suggested several, but the selection was entirely her own. So also was the algebraic working out of the different problems, except, indeed, that relating to the numbers of Bernoulli, which I had offered to do to save Lady Lovelace the trouble. This she sent back to me for an amendment, having detected a grave mistake which I had made in the process.

The notes of the Countess of Lovelace extend to about three times the length of the original memoir. Their author [i.e., Lovelace] has entered fully into almost all the very difficult and abstract questions connected with the subject.

and the public that they were authored by her. It is no exaggeration to say that she was a manic depressive with the most amazing delusions about her own talents, and a rather shallow understanding of both Charles Babbage and the Analytical Engine... To me, this familiar material [Ada's correspondence with Babbage] seems to make obvious once again that Ada was as mad as a hatter, and contributed little more to the "Notes" than trouble... I will retain an open mind on whether Ada was crazy because of her substance abuse... or despite it. I hope nobody feels compelled to write another book on the subject. But, then, I guess someone has to be the most overrated figure in the history of computing". (In: Doron Swade's *The Difference Engine: Charles Babbage and the quest to build the first computer*. Dale et al. reprinted with permission from "Programming and Problem Solving with Ada" by N. Dale, D. Weems, and J. McCormick. Jones and Bartlett, 1997. On-line at: "Happy Birthday Ada", John McCormick, http://www.adahome.com/articles/1997-12/al_birthday.html)

By contrast to Collier, there exists quite simply an entire collection of literature devoted to the importance of Ada Lovelace in the history of computer programming, as even a cursory library or Internet search reveals, and to which Collier voices such pronounced objection. As recently as the September 1999 issue of *Scientific American*, for example, dedicated an article to "Ada and the First Computer" (Eugene Eric Kim and Betty Alexandra Toole), which generated a number of reader responses, including comments on the foresight of her work ("What a delight to actually trace through Ada's code. To have so few flaws in an untested program this complex is remarkable". Any mistakes (writes developer Miguel Munoz) would have been spotted upon running the program on an engine. ... It is important to remember that "Ada and Charles Babbage had a working engine only in their minds".) and on the existence of errors in the translation (some of which are more typographical and originate from the French and English printers, and some of which are *mathematical* in nature, but were also not caught by Charles Babbage or Charles Wheatstone, both of whom reviewed her pre-press translation). Finally, as to Collier's description of Lovelace as a "substance abuser", her treatment with considerable doses of laudanum was among the only, ultimately hopeless, palliative possibilities her doctors could have provided for the cancer that wracked her body. That she could have written at all under the influence stands for praise, not criticism.

These two memoirs taken together furnish, to those who are capable of understanding the reasoning, a complete demonstration - That the whole of the developments and operations of analysis are now capable of being executed by machinery.³²

In this passage we see so much of what is striking about the Lovelace portrait: First, as suggested in all of the foregoing, the closest known association of translator and "author" of all 5 portraits, as expressed in terms of correspondence, contact, and *simpatico* between two highly intelligent and public, yet frustrated characters – Babbage in his pursuit of the Engines, Ada in her pursuit of a life of the mind. As Ada's husband recalled³³ the last months of Ada's dying,

Babbage was a constant intellectual companion and she ever found in him a match for her powerful understanding, their constant philosophical discussions begetting only an increased esteem and mutual liking.

Here I interrupt to comment on the notion of Babbage as *author* of the source text. For, while it was *indeed* Luigi Menabrea who wrote the source text³⁴, *Notions sur la Machine Analytique de M. Charles Babbage*, it must be noted that this was a *compte rendu* of Babbage's own presentation to the Turin audience, a report it seems Babbage assisted Menabrea with³⁵, for October 1842 publication in the *Bibliothèque Universelle de Genève*.

³² Charles Babbage, *Passages from the Life of a Philosopher* (London, 1864).

³³ Morrow and Perl 131. Morrow, Charlene and Teri Perl, eds. "Lovelace Augusta Byron Lovelace." *Notable Women in Mathematics : A Biographical Dictionary*. 1998 ed.

³⁴ On the point of authorship, Green notes that, "Indeed, the French translator of the speech for the journal *Cosmos* rendered the passage such that Babbage himself had written it under the pseudonym of "Menabrea." Menabrea (1855/1989) himself felt compelled to respond insisting that he was, in fact, the true author". Christopher D. Green, *Charles Babbage, the Analytical Engine, and the Possibility of a 19th-Century Cognitive Science*. First published in Green, C.D., Shore, M., & Teo, T. (Eds.) (2001). *The Transformation of Psychology: Influences of 19th-Century Philosophy, Technology, and Natural Science* (pp. 133-152). Washington, DC: American Psychological Association.] On-line at <http://www.yorku.ca/christo/papers/Babbage-CogSci.htm>

³⁵ Christopher D. Green (York University). "Introduction to Ada Lovelace's Translation of, and Notes to, Luigi F. Menabrea's "Sketch of the analytical engine invented by Charles Babbage, Esq." (1842/1843)", 2000. On-line as part of Classics in the History of Psychology

It was then (at Wheatstone's urging) that Lovelace prepared an English translation³⁶ for Richard Taylor's *Scientific Memoirs*, a journal that specialized in English translations of foreign scientific papers, and reports from foreign scientific meetings. During this process it was not Menabrea and Babbage, nor Menabrea and Lovelace, who had continued intellectual contact while Lovelace prepared some 40+ (!) pages of 6 notes³⁷ (labelled A through F) to Menabrea's original text of 20 pages; rather, it was Babbage (as author of the generative *ideas*) and Lovelace (as translator – expositor – extrapolator thereof) who saw to the English version.

It is in this latter function - of *extrapolator*, of creative interpreter of the potential of Babbage's own ideas, that Lovelace's case is distinguished from the other portraits, as Babbage himself realized³⁸:

[regarding] your admirable & philosophic 'Note A.' Pray do not alter it . . . All this was impossible for you to know by intuition and the more I read your notes the more surprised I am at them and regret not having earlier explored so rich a vein of the noblest metal.

<http://psychclassics.yorku.ca/Lovelace/intro.htm>

³⁶ In: *Scientific Memoirs, Selections from The Transactions of Foreign Academies and Learned Societies and from Foreign Journals*, edited by Richard Taylor, F.S.A., Vol III London: 1843, Article XXIX. "Sketch of the Analytical Engine invented by Charles Babbage Esq. By L. F. Menabrea, of Turin, Officer of the Military Engineers". [From the Bibliothèque Universelle de Genève, No. 82 October 1842].

³⁷ In these notes, Lovelace discussed in fine detail such points as the striking, and utterly new, importance of the machine's ability to choose its own course of computations depending on what it had just computed. (The related issues of machine intelligence, and of an anthropomorphized vocabulary in Menabrea's notes on Babbage, which Babbage found suitable and which Ada retains in the translation, are two topics discussed by Schaffer, of The Hypermedia Research Centre, Westminster University. On-line at <http://www.hrc.wmin.ac.uk/theory-babbagesintelligence.html>) Lovelace's notes also include a discussion of punch-cards, another revolutionary feature of Babbage's machines, as well as her own calculation of algebraic formulae only hinted at in Menabrea's account.

In particular, she stressed the "iterative" ability of the Analytical Engine to reverse its operation cards and repeat a loop of operations again and again, until a certain limit was met-precisely the ability added to computers after the Second World War.

³⁸ Cited in *Ada: The Enchantress of Numbers*, Betty Alexandra Toole. On-line at <http://www.well.com/user/adatoole/bio.htm>

Having argued in favour of considering Babbage as author of the ideas which Ada then developed in her notes to the English translation of Menabrea (and in no way intending to diminish from the central importance of Menabrea in documenting Babbage's ideas in Italy, then spreading them even farther through publication in Geneva), I return, here, to the distinctive features of the Babbage-Lovelace collaboration, all of which hinge on the *transcreation* inherent in Lovelace's exploration of Babbage's ideas, as suggested by the very nature of the author-translator working relationship in their case.

Beyond the first feature, the *simpatico* first mentioned earlier, I propose as second feature the author's (i.e., Babbage's) direct request that the translator act **independently** in the service of the text and the ideas contained within it³⁹:

I asked why she had not herself written an original paper on a subject with which she was so intimately acquainted? ... I then suggested that she should add some notes to Menabrea's memoir; an idea which was immediately adopted.

The notes of the Countess of Lovelace extend to about three times the length of the original memoir. ... These two memoirs taken together furnish, to those who are capable of understanding the reasoning, a complete demonstration.

Third, the author (Babbage) explicitly **transfers** power to the translator as textual and intellectual equal, even authority, in all matters related to the translation and exposition; note here especially Babbage's designation of Lovelace as "author" of the text⁴⁰ (emphasis mine):

Their **author** [i.e., Lovelace] has entered fully into almost all the very difficult and abstract questions connected with the subject.

³⁹ From Babbage's memoirs, *Life of A Philosopher*, modern reprint in Morrison and Morrison.

⁴⁰ From Babbage's memoirs, *Life of A Philosopher*, modern reprint in Morrison and Morrison.

Fourth, the author's understanding of the translator's contribution as **above and beyond** the more limited scope of the source text, exceeding, by his own grateful admission, his own imagination for the full potential of the original research (see third previous quote above, "[regarding]..."); in Ada's extrapolation of this future potential, Babbage must have found renewed hope that his once stagnant project, in an expanded form, even, could be revived and disseminated to an audience beyond England and, perhaps, as was eventually the case, back again⁴¹.

Samples

Lovelace as explicator – Samples of Notes A through F

Before proceeding to samples of Lovelace's textual and paratextual work as *translator proper* of Menabrea's report, I insert here excerpts from her original notes A through F, simply so that the reader may have some sense of Somerville's writing as *explicator*. An assessment of the importance of her notes follows these samples.

⁴¹ Morrison and Morrison do note that, eventually, a version of the machines was constructed by the English government for a competitive exhibition; Babbage's plans seem to have been of some use to them after all.

NOTES BY THE TRANSLATOR

Note A

THE PARTICULAR function whose integral the Difference Engine was constructed to tabulate, is

$$\Delta^7 u_z = 0.$$

The purpose which that engine has been specially intended and adapted to fulfil, is the computation of nautical and astronomical tables. The integral of

$$\Delta^7 u_z = 0$$

being

$$u_z = a + bx + cx^2 + dx^3 + ex^4 + fx^5 + gx^6,$$

the constants $a, b, c, \&c.$ are represented on the seven columns of discs, of which the engine consists. It can therefore tabulate *accurately* and to an *unlimited extent*, all series whose general term is comprised in the above formula; and it can also tabulate *approximately* between intervals of *greater or less extent*, all other series which are capable of tabulation by the Method of Differences.

The Analytical Engine, on the contrary, is not merely adapted for *tabulating* the results of one particular function and of no other, but for *developing and tabulating* any function whatever. In fact the engine may be described as being the material expression of any indefinite function of any degree of generality and complexity, such as for instance,

$$F(x, y, z \log x, \sin y, x^p, \&c.),$$

which is, it will be observed, a function of all other possible functions of any number of quantities.

In this, which we may call the *neutral* or *zero* state of the engine, it is ready to receive at any moment, by means of cards constituting a portion of its mechanism (and applied on the principle of those used

Note B

That portion of the Analytical Engine here alluded to is called the storehouse. It contains an indefinite number of the columns of discs described by M. Menabrea. The reader may picture to himself a pile of rather large draughtsmen heaped perpendicularly one above another to a considerable height, each counter having the digits from 0 to 9 inscribed on its *edge* at equal intervals; and if he then conceives that the counters do not actually lie one upon another so as to be in contact, but are fixed at small intervals of vertical distance on a common axis which passes perpendicularly through their centres, and around which each disc can *revolve horizontally* so that any required digit amongst those inscribed on its margin can be brought into view, he will have a good idea of one of these columns. The *lowest* of the discs on any column belongs to the units, the next above to the tens, the next above this to the hundreds, and so on. Thus, if we wished to inscribe 1345 on a column of the engine, it would stand thus:—

1
3
4
5

Note E

This example has evidently been chosen on account of its brevity and simplicity, with a view merely to explain the *manner* in which the engine would proceed in the case of an *analytical calculation containing variables*, rather than to illustrate the *extent of its powers* to solve cases of a difficult and complex nature. The equations of page 234 are in fact a more complicated problem than the present one.

We have not subjoined any diagram of its development for this new example, as we did for the former one, because this is unnecessary after the full application already made of those diagrams to the illustration of M. Menabrea's excellent tables.

It may be remarked that a slight discrepancy exists between the formulæ

$$(a + bx^1)$$

$$(A + B \cos^1 x)$$

Though the notes themselves have elsewhere been the subject of study (admiring and derisive both) by mathematicians and computer scientists⁴², suffice it here to summarize and underscore for the *translation* readership the importance of Lovelace's contributions thus:

Countess Lovelace's notes on Menabrea's description of the Analytical Engine stand as one of the first thorough studies of the nature and power of digital computers, written a hundred years before any working computer existed.⁴³

In an additional, and in some ways no less vital measure of support, Ada, with the support and devotion of her husband, who was well-connected politically and enamoured of his wife's intellect, worked in tireless support of raising funds for Babbage's engine workshop. Though she and Babbage eventually became involved in a scheme to apply the principles of the engines to gambling on horses, with considerable loss of fortune to Ada⁴⁴, the combined financial and intellectual efforts of Ada and Luigi Menabrea kept Babbage's ideas alive where once they threatened to stall out entirely for lack of support. As a direct result of her translation and notes, then, Ada Lovelace returned to England the foundational ideas for

⁴² See also footnote 27.

⁴³ Ceruzzi, Paul E. *Reckoners. The Prehistory of the Digital Computer, from relays to the stored program concept, 1935-1945*. "Chapter 3: Bessie -The Automatic Sequence Controlled Calculator". Series: *Contributions to the study of computer science*, 1993, p.43. Available on-line at [<http://ed-thelen.org/comp-hist/Reckoners-ch-3.html#T-3.1>].

⁴⁴ In a return to her earlier days with Mary Somerville, Ada found herself the grateful recipient of financial support from Somerville's son, Woronzow Greig, against her mounting debts, which were the bane of the Byron family. Still, it must be noted here that by this point, near the end of her life, Lovelace was racked with pain from cancer, and under the influence of copious amounts of sherry and laudanum, all that science could offer her in the late stages of disease. This altered state would only have been aggravated by such practices as bloodletting and cupping. Her better judgment can hardly have been unaffected by these medical interventions. How fortunate, then, that her translation and notes were completed in a phase of determined lucidity, even if modern scholarship has not failed to question the distinctly metaphysical slant that colours certain of her passages. Perhaps the expansion of consciousness Lovelace experienced while medicated is to be welcomed as one source for her futuristic interpretations (i.e., as in the Notes) of Babbage's more pragmatic ideas about the Engines.

what would, albeit years later, become the fields of computer programming and computer science. To the lay reader, perhaps no other single portrait can be so appreciated for its lasting effects on human activity.

Samples

Lovelace as *translator* – Textual samples

The samples in the following pages primarily demonstrate her straightforward approach to translation and the fluent, communicative result. As the reader will note, Lovelace generally follows the source text closely, and little is required in the way of stylistic change to arrive at a satisfying result in the target text. (SEE FOLLOWING PAGE.)

NOTIONS SUR LA MACHINE ANALYTIQUE DE M. CHARLES
BABBAGE, par Mr. L.-F. MENABREA, capitaine du génie
militaire.

Les travaux qui appartiennent à plusieurs branches des sciences mathématiques, quoique paraissant, au premier abord, être uniquement du ressort de l'esprit, peuvent néanmoins se diviser en deux parties distinctes : l'une qu'on peut appeler mécanique, parce qu'elle est sujette à des lois précises et invariables, susceptibles d'être traduites physiquement, tandis que l'autre qui exige l'intervention du raisonnement, est plus spécialement du domaine de la pensée. Dès lors on pourra se proposer de faire exécuter par le moyen de machines la partie mécanique du travail, et réserver à la seule intelligence celle qui dépend de la faculté de raisonner. Ainsi la rigueur à laquelle sont soumises les règles du calcul numérique a dû, depuis longtemps, faire songer à employer des instruments matériels, soit pour exécuter entièrement des calculs, soit pour les abréger. De là sont nées plusieurs inventions dirigées vers ce but, mais qui ne l'atteignent, en général, qu'imparfaitement. Ainsi la machine de Pascal, tant vantée, n'est maintenant qu'un simple objet de curiosité qui, tout en prouvant une grande force d'intelligence dans son inventeur, présente elle-même peu d'utilité. Elle n'exécute que les quatre premières opérations de

SKETCH OF THE ANALYTICAL ENGINE
INVENTED BY CHARLES BABBAGE

By L. F. MENABREA
of Turin, *Officer of the Military Engineers*

from the *Bibliothèque Universelle de Genève*, October, 1842, No. 82

With notes upon the Memoir by the Translator
ADA AUGUSTA, COUNTESS OF LOVELACE

Those labours which belong to the various branches of the mathematical sciences, although on first consideration they seem to be the exclusive province of intellect, may, nevertheless, be divided into two distinct sections; one of which may be called the mechanical, because it is subjected to precise and invariable laws, that are capable of being expressed by means of the operations of matter; while the other, demanding the intervention of reasoning, belongs more specially to the domain of the understanding. This admitted, we may propose to execute, by means of machinery, the mechanical branch of these labours, reserving for pure intellect that which depends on the reasoning faculties. Thus the rigid exactness of those laws which regulate numerical calculations must frequently have suggested the employment of material instruments, either for executing the whole of such calculations or for abridging them; and thence have arisen several inventions having this object in view, but which have in general but partially attained it. For instance, the much-admired machine of Pascal is now simply an object of curiosity, which, whilst it displays the powerful intellect of its inventor, is yet of little utility in itself. Its powers extended no further than the execution of the first four*

* This remark seems to require further comment, since it is in some degree calculated to strike the mind as being at variance with the subsequent passage (page 231), where it is explained that *an engine which can effect these four operations can in fact effect every species of calculation*. The apparent discrepancy is stronger too in the translation than in the original, owing to its being impossible to render precisely into the English tongue all the niceties of distinction which the French idiom happens to admit of in the phrases used for the two passages we refer to. The explanation lies in this: that in the one case the execution of these four operations is the *fundamental starting-point*, and the object proposed for attainment by the machine is the *subsequent combination*

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To this straightforward translation, however, Lovelace adds not only the notes sampled above, but more information as well, which I discuss next.

Lovelace as *translator* – paratextual features

In addition to Lovelace's notes, discussed above, in her role as translator she also made a number of contributions to Menabrea's main text. These additions are designated "Notes by Translator" in supplement to the main body of the text, as is seen in the following Samples from the beginning and the conclusion of Menabrea's original French report and Lovelace's English version. Throughout, Lovelace's keen interest in the source text ideas, and in communicating their import to what she must have hoped would be a wide scientific audience, comes clearly across.

The first note (p.260, "...of these in every possible variety...") guides the reader along a didactic, and, Ada must have hoped, persuasive, course through the four basic mathematical operations the machine can perform – addition, subtraction, multiplication, and division. The second note ("The idea that...") is striking for Lovelace's defence of Babbage against those who would criticize his innovative ideas.

The third note (p.261, "This sentence has been...") demonstrates Lovelace's choice for *clarity* and *cohesion* in translating content, and the fourth and final note sampled here ("The notation here alluded to...") links Lovelace and Babbage neatly to the cries for and against Continental notation in mathematics, which was described earlier in Backdrop Two and in connection with Laplace (Portrait Three – Somerville).

Struck with similar reflections, Mr. Babbage has devoted some years to the realization of a gigantic idea. He proposed to himself nothing less than the construction of a machine capable of executing not merely arithmetical calculations, but even all those of analysis, if their laws are known. The imagination is at first astounded at the idea of such an undertaking; but the more calm reflection we bestow on it, the less impossible does success appear, and it is felt that it may depend on the discovery of some principle so general, that, if applied to machinery, the latter may be capable of mechanically translating the operations which may be indicated to it by algebraical notation. The illustrious inventor having been kind enough to communicate to me some of his views on this subject during a visit he made at Turin, I have, with his approbation, thrown together the impressions they have left on my mind. But the reader must not expect to find a description of Mr. Babbage's engine; the comprehension of this would entail studies of much length; and I shall endeavour merely to give an insight into the end proposed, and to develop the principles on which its attainment depends.

I must first premise that this engine is entirely different from that of which there is a notice in the 'Treatise on the Economy of Machinery,' by the same author. But as the latter gave rise to the idea of

of these in every possible variety; whereas in the other case the execution of some one of these four operations, selected at pleasure, is the *ultimatum*, the sole and utmost result that can be proposed for attainment by the machine referred to, and which result it cannot any further combine or work upon. The one *begins* where the other ends. Should this distinction not now appear perfectly clear, it will become so on perusing the rest of the Memoir, and the Notes that are appended to it.—NOTE BY TRANSLATOR.

† The idea that the one engine is the offspring and has grown out of the other, is an exceedingly natural and plausible supposition, until reflection reminds us that no necessary sequence and connexion need exist between two such inventions, and that they may be wholly independent. M. Menabrea has shared this idea in common with persons who have not his profound and accurate insight into the nature of either engine. In Note A. (see the Notes at the end of the Memoir) it will be found sufficiently explained, however, that this supposition is unfounded. M. Menabrea's opportunities were by no means such as could be adequate to afford him information on a point like this, which would be naturally and almost unconsciously assumed, and would scarcely suggest any inquiry with reference to it.—NOTE BY TRANSLATOR.

Frappé de ces réflexions, Mr. Charles Babbage a consacré plusieurs années à réaliser une pensée gigantesque. Il ne s'est proposé rien moins que de construire une machine capable d'exécuter, non-seulement les calculs arithmétiques; mais encore les calculs analytiques, dont les lois seraient connues. L'imagination est d'abord effrayée d'une telle entreprise, mais à mesure que l'on y réfléchit avec plus de calme, le succès en paraît moins impossible, et l'on sent qu'il peut dépendre de la découverte de quelque principe, assez général pour que, si on l'applique à la machine, celle-ci soit capable de traduire mécaniquement les opérations qui lui seraient indiquées par l'écriture algébrique. L'illustre inventeur, lors d'un voyage qu'il fit à Turin, ayant bien voulu me communiquer quelques-unes de ses considérations à cet égard, je viens, avec son consentement, rendre compte des impressions qu'elles ont produites dans mon esprit. On ne doit point s'attendre à trouver ici une description de la machine de Mr. Babbage: elle exigerait de longues études pour être comprise; mais je tâcherai d'en faire saisir le but et d'exposer les principes sur lesquels est fondée son exécution.

D'abord je dois prévenir qu'elle est entièrement différente de celle dont on trouve un aperçu dans le traité de l'Economie des machines du même auteur. Mais, comme cette dernière fait naître la pensée de la machine en question,

Ainsi la machine pourra être considérée comme une vraie ^{manufacture} manufacture de chiffres, qui prêterait son secours aux ^{sciences} sciences et aux arts utiles qui s'appuient sur les nombres. Or, qui pourrait prévoir les conséquences d'une telle invention? En effet, combien d'observations précieuses restent ^{inutiles} inutilisées aux ^{professeurs} professeurs des sciences, parce qu'il n'y a pas de forces suffisantes pour en calculer les résultats! ^{On ne décourage point la perspective} d'un long et aride calcul ne jette-t-elle pas dans l'âme de l'homme de génie qui ne demande que du temps pour méditer et qui se voit ravi par le matériel des opérations! Et pourtant c'est par la voie laborieuse de l'analyse qu'il doit arriver à la vérité; mais il ne peut la suivre sans être guidé par des nombres, car sans les nombres il n'est pas donné de pouvoir soulever le voile qui couvre les mystères de la nature. Ainsi la pensée de former un ^{instrument} instrument capable d'aider la faiblesse de l'homme dans de telles recherches, est une conception qui, venant à se réaliser, marquerait une époque glorieuse dans l'histoire des sciences. Toutes les pièces, tous les rouages qui composent cet immense appareil ont été combinés, leur action a été étudiée, mais ils n'ont pu être encore assemblés. La confiance que doit inspirer le génie de Mr. Babbage rend légitime l'espoir que cette entreprise sera couronnée de succès; en rendant hommage à l'intelligence qui la dirige, faisons des vœux pour qu'une telle œuvre s'accomplisse.

Thus the engine may be considered as a real manufactory of figures, which will lend its aid to those many useful sciences and arts that depend on numbers. Again, who can foresee the consequences of such an invention? In truth, how many precious observations remain practically barren for the progress of the sciences, because there are not powers sufficient for computing the results! And what discouragement does the perspective of a long and arid computation cast into the mind of a man of genius, who demands time exclusively for meditation, and who beholds it snatched from him by the material routine of operations! Yet it is by the laborious route of analysis that he must reach truth; but he cannot pursue this unless guided by numbers; for without numbers it is not given us to raise the veil which envelopes the mysteries of nature. Thus the idea of constructing an apparatus capable of aiding human weakness in such researches, is a conception which, being realized, would mark a glorious epoch in the history of the sciences. The plans have been arranged for all the various parts, and for all the wheel-work, which compose this immense apparatus, and their action studied; but these have not yet been fully combined together in the drawings* and mechanical notation†. The

* This sentence has been slightly altered in the translation in order to express more exactly the present state of the engine.—NOTE BY TRANSLATOR.

† The notation here alluded to is a most interesting and important subject, and would have well deserved a separate and detailed Note upon it amongst those appended to the Memoir. It has, however, been impossible, within the space allotted, even to touch upon so wide a field.—NOTE BY TRANSLATOR.

confidence which the genius of Mr. Babbage must inspire, affords legitimate ground for hope that this enterprise will be crowned with success; and while we render homage to the intelligence which directs it, let us breathe aspirations for the accomplishment of such an undertaking.

5. Conclusion

The similarities between Ada Lovelace and her driving scientific interest, Charles Babbage, suggest their mutual affinity was no mere coincidence. Each had known a sickly childhood yet a passionate interest in matters of the mind; each moved within circles of political Liberalism; each had pursued, against English resistance, the knowledge offered in the new French system of mathematics; each had to struggle with the dissipation of mental energies by internal and external conflict; each had a vision of the enormous potential of mathematical machines; and each – while certainly appreciated by many contemporaries – came to be understood fully only by modern scientists as having instigated the pursuit of calculating machines on an entirely new level of understanding, right through to their modern incarnation, the computer.

Perhaps few others but Ada Lovelace would have so endeavoured not only to learn from Babbage's mathematically prescient engine projects, but also to promote his ideas in the stalled environment into which they had temporarily fallen. In these ways, I find that Ada Lovelace's portrait represents a particularly strong Roscommean⁴⁵ link between the author and his translator-author.

The question of visibility (of *translator* as well as *text*) is well answered in this portrait; Lovelace insisted on full recognition for her contribution to the Menabrea source text, and

⁴⁵ Wentworth Dillon, Earl of Roscommon. "Essay on Translated Verse," 1684: lines 89-100.
"Each Poet, with a different Talent writes, One Praises, One Instructs, Another Bites.
Horace did ne're aspire to Epick Bays, Nor lofty Maro stoop to Lyrick Lays.
Examine how your Humour is inclin'd, And which the Ruling Passion of your Mind;
Then, seek a Poet who your way do's bend..."

Babbage was more than willing to oblige his insightful collaborator. Their correspondence documents how these two characters felt equal measures of affinity, admiration, and frustration for each other, but the benefit of their long and forthright scientific dialogue is evident in the result it enabled Lovelace to create. Here, as in no other portrait except perhaps Somerville's, is the status of the **female translator** as **scientific author** emphatically clear, *despite* Lovelace's short life and limited output; her personal status, combined with Babbage's highly visible presence in several arenas of English science, and his audience in Italy (among other European countries), not to mention Ada's recognition factor as Byron's daughter, converged to enhance the influence of Ada's work in dissemination and repatriation. These effects are enhanced by the prestige of the publishing organ (Taylor's), and by the visibility of the actual source text author, future Italian Prime Minister Menabrea.

Here, the portrait is less a function of, say, translation currents in Lovelace's day, than of the strength of the connection between author and translator, and the strength of the scientific communications network within which scientists not only translated as part of their various activities, but also, and more importantly, within which the avenues of personal contact and professional publication meant that such women as Ada Lovelace could achieve visibility and influence through the translation of scientific material.

In the next and final portrait, on Elizabeth Sabine, there is a shift in focus to the input of German scientists in what became at the time several highly desirable fields of scientific endeavour, including mathematization and global data collection, geomagnetism, and large-scale, government-sponsored expeditions. The links between German and English science are seen as within a spirit of healthy competition, into which six major translations (more than by any other translator portrayed) by Elizabeth Sabine were welcomed as at the

Portrait Four: Ada Lovelace

forefront of information on international developments by fellow scientists. Also, and fittingly, in the Sabine portrait, the influence of such German thinkers on translation as Wilhelm von Humboldt is considered.

Portrait Five, An Epilogue: Elizabeth Juliana Leeves Sabine (1807-1879)

0. Introduction

Throughout the previous four portraits, the relationship between gender, translation, visibility, and influence – hence “the ‘cachet’ of the ‘invisible’ translator” referred to in the title – has been seen to take highly variable, and individual, forms. Aphra Behn and Elizabeth Carter, repatriators of Newtonian ideas to England, both achieved a high public profile, and audience for publications, through their primary activities in literature. Mary Somerville was the first of the five women portrayed to make a name for herself as primarily a woman of science, and her exposition of Laplace was hailed as a shining contribution to English discourse on Newton’s (repatriated) calculus. Similarly, Ada Lovelace, who knew Somerville and perceived her as a strong role model, performed a comparably important function in translating and extrapolating future potential from the ideas of compatriot Charles Babbage. As befits their status in history, all four women generally stand recorded for yet further research in years to come.

By the time of Elizabeth Sabine, however, the relationship between translator and text shifts noticeably, with the translated text recalling the (“invisible”) translator, rather than the other way round; this is despite Sabine’s long record of service to science at the side of her famous explorer husband, Sir Edward Sabine. This shift can be interpreted as reflecting a changing scientific (and social) backdrop, which, like much of history indeed, was not linear in its progress.

In this portrait, we will see a focus on Germany (and German)¹ as a source of authoritative scientific materials, as well as a heightened, general European interest in earth-based sciences, including geomagnetism, physical geography, and large-scale exploratory expeditions. Perhaps most importantly, we will see a singular lack of biographical material on the female scientist-as-translator, who is now subsumed under the husband's status.

In this way, the Sabine portrait represents a waning epilogue in the progression of female translators of scientific materials; this is despite the fact that her portrait includes the greatest *number* of scientific translations by the widest *range* of eminent source-text authors. Recalling a distinction first made in Background One, the distinction between translated text (as more visible) and the person of the translator (as less visible) is perhaps most pronounced in this (pre-Victorian) portrait², which in part reflects changing attitudes towards the proper place of the amateur scientist (i.e., increasingly outside the burgeoning formal institutions where professionalization was taking hold), and of the (educated) woman in society. As Shteir³ notes on women and science at this time:

Historical work has shown that women were an important part of the cultural map of Victorian science, as audience, readers, writers, cultivators of science, investigators, and helpmates. During the same period, however, institutional and social changes led to more exclusionary relations between women and science culture. Over the course of the Victorian decades, professionalizing directions led to bifurcations in science practices, and women were pushed to the periphery, relegated to arenas of "amateur" and "popular" science.

¹ Henrion, Claudia. *Women in mathematics: the addition of difference*. Bloomington: Indiana U. Press, 1997: 51.

² Queen Victoria reigned from 1837-1901.

³ In Lightman 1997:236.

In fact, it is the Sabine portrait that marks the beginning of the trend first anticipated in research for the dissertation, that female translators of scientific materials must have been invisible.

As for the two additional patterns addressed in the dissertation, the need for *translation as repatriation* is far less present in the Sabine portrait (across all five source texts listed here) since – as was introduced in Backdrop Two - the ideas being treated (global exploration, geomagnetism, data collection) were recognized across several countries as of great interest and importance at a national level. Meanwhile, the issue of *concurrent translation* carries in this case the particular nuance of a fellow female translator (Elise C. Otté) as concurrently invisible today, though both may have been more visible than this in their own day⁴.

Because one main point of this epilogue portrait is to underscore the power of the translated texts even in the face of a lack of modern information on the *person* of the translator, the format of this (briefer) portrait differs somewhat from the preceding four. First, Sabine's status is not independently visible; rather, it is established through the surrogacy of her husband, under whose "superintendence" several of her translation titles are listed. Second, and adding to Sabine's importance in the dissemination of developments at the very forefront of the geological sciences, the importance and interconnectedness of all five source-text authors is stressed. The presence of a concurrent translator for two translations (also a woman, and also invisible to the modern eye) is then noted.

⁴ Indeed, one of the purposes of the Sabine portrait is to stimulate research into primary sources on this rather obscure figure in the history of scientific translation, so that such questions as contemporaneous visibility might be addressed.

Readers will note that this portrait differs in not including translation commentary or samples; this is for a number of reasons: first, the main focus of the portrait is to establish the presence and importance of the translator, Elizabeth Sabine, in the history of translation where, according to my inquiries, she remains utterly unaccounted for (she hardly fares better in the history of science, for that matter). Second, the concurrent translator, Otté, also a woman, is even less visible and as such, not yet fully available for comparison with Sabine, either biographically or in terms of translation praxis. Third and finally, I propose that, for better contextualization, samples and commentary be used as part of a larger, future investigation into the person of Elizabeth Sabine⁵.

1. The Translator: Elizabeth Juliana Leeves Sabine

Establishing the Status of the Translator – Biographical Information

As in previous portraits, one major criterion by which the visibility and influence of a translator can be appreciated is the status of the source text and the source text author.

This relationship is bi-directional, with the prestige of the source text operating to establish and/or perpetuate a reputation for the translator, while the prior and independent visibility of the translator can itself create an advance and/or continued demand for her translation. This source text/author prestige will be clearly evident in the brief section below on Sabine's five source text authors,

Heinrich Dove (1803-1879)
Karl-Friedrich Gauss (1777-1855)
Alexander von Humboldt (1769-1859)
Jean Dominique François Arago (1786-1853)
and Ferdinand Petrovich Vrangell [von Wrangell].

⁵ Such work will also be welcome in connection with many of the additional women listed in the Appendix.

Meanwhile, though, the independent visibility and influence of Sabine is somewhat harder to establish than in the cases of the four preceding translators. As mentioned above, and in contrast to the comparative wealth of material available on all previous four translators, there is a singular lack of biographical materials on Elizabeth Sabine. References to her are made strictly in connection to her husband, who, it is fortunate, was at the very least himself a famous English scientist and explorer. In this way it is still possible to retrieve a certain sense of Elizabeth's role and her reputation. We see that the status conferred by the source text and source text author, a welcome and more neutral symbiosis, is here extended to include status conferred by the male partner as scientific chaperone of sorts, in a decided setback from the relative independence of the previous women studied here. Consider, notably, the other scientific coupling in the dissertation, that of Mary Fairfax Somerville and her husband William, in which marriage it was Mary who played the predominant scientific role, even if her success was clearly owed in part to her husband's highly social presence within the scientific community.

Mediated Status – Edward Sabine

In the most general of terms, it can be said that Edward Sabine (1788-1883) is remembered for a lifetime of commitment to English science, including research in astronomy and geodesy; participation in several Arctic expeditions; the superintendence of magnetic observatories throughout the world; a body of highly regarded data collection and medal-winning publications thereon; and a prestigious academy and society career, especially with the Royal Society, the British Association for the Advancement of Science (BAAS), and the Board of Longitude.

Lifetime Commitment to Astronomy and Geodesy

Born in Ireland, Sabine (1788-1833) received a military education and served the Empire as a military officer throughout his life, rising to the rank of Colonel in addition to many prestigious society and academy appointments. Sabine's professional duties coincided with his personal enthusiasm for astronomy, terrestrial magnetism, and ornithology, as well as with his nation's quest for expansion against a backdrop of mathematization and data accumulation that characterized his period, as was discussed earlier in Background Two.

Arctic Expeditions

Elected a fellow of the Royal Society in 1818, Sabine set off that same year on a famous arctic expedition under Commander Sir John Ross to discover a northwest passage, now that the long drawn-out struggle with France was over and ships could be used for peacetime purposes. This was followed by a second arctic expedition in 1819 under Lieutenant-Commander Sir Edward Parry. Both voyages were vital to data collection on a number of unknown scientific phenomena, such as longitudinal and latitudinal data on the true figure of the Earth. Again in Background Two, these expeditions – which also resulted in many popular accounts - are explained as part of a growing trend toward the accumulation of large volumes of more accurate data than ever before.

Sabine's particular interest in magnetism as it affects the Earth led to foundational research on the Earth's true shape and magnetic fields, including his 1852 discovery of the relationship between magnetic storms and sunspots; this connection demonstrates well both a certain continuity in the scientific process dating to the celestial concerns of Newton, as well as a new focus on more Earth-oriented branches of science, including geology and its many variations, such as geomagnetism, geophysics, physical geography, oceanography,

and meteorology. As Yost⁶ explains, this new focus can be seen in connection with the British Empire's drive to understand and influence the globe:

Throughout the eighteenth century the British traveled the globe primarily in the interest of their colonies. First and foremost they sought to build and sustain the British Empire through naval and commercial might. In addition, world exploration allowed increased opportunities for enhancing royal and national prestige, expanding geographic knowledge, and collecting a wide range of scientific information. During the second half of the eighteenth century a broad-based "quantifying spirit" took root in Europe. Investigators in Britain and elsewhere enthusiastically assigned numbers to all types of natural phenomena and human activities.

Along with this shift in topic came a shifting centre of influence, from the dominance of France and England theretofore, to German scientists, and the German language. In fact, it was Alexander von Humboldt (one of Elizabeth Sabine's subjects) who, in conversation with Sabine and other English scientists, urged the Royal Society to establish regular magnetic stations throughout the British Empire, stations similar to those von Humboldt himself had had constructed some time before in Northern Asia. We know also that von Humboldt had direct contact with *Elizabeth Sabine*, as recorded in *Women's Language and Experience, 1500-1940*: "Mrs. Sabine has just received a picture from Humboldt which represents him sitting in his study writing his *Cosmos*"⁷.

⁶ Yost, Robinson McLaughry, "Global Magnetic Collecting (c.1750-1835)". On-line dissertation, 1997, Iowa State U.

⁷ *Women's Diaries and Related Sources, Part 1: Sources from the Bedfordshire and Hertfordshire County Record Offices* 16 reels of 35mm silver-halide positive microfilm plus guide to Parts 1 & 2. As Consultant Editor Amanda Vickery (Lecturer in Modern British Women's History, Royal Holloway, University of London) explains this microfilm collection, "The local record offices of Great Britain hold staggering quantities of manuscripts written by women. Only now is this vast resource being tapped. Women's own writings facilitate the exploration of a multiplicity of themes from the construction of identity to the composition of political communities, from the intimacies of emotional life to the structure of society. The examination of women's manuscripts will enable scholars to engage critically with the categories, modes of explanation, and chronology of recent women's history. Feminist theory can be evaluated and developed by applying it to the range of empirical material offered in *Women's Language & Experience*." Visit <http://www.adam-matthew-publications.co.uk/collect/p296.htm>

Superintendence of Magnetic Observatories

This auspicious start was followed by a lifetime of data collection toward the clarification of previously unknown geological phenomena, such as the first systematic magnetic survey ever made of the British Isles, for numerous publications on all of which Sabine was awarded with such honours as the Copley Medal of the Royal Society.

The contrast between Edward's formal recognition as author-scientist and his wife Elizabeth's relative invisibility as translator is seen here, despite the fact that she did assist him throughout their lives together, including participation in arctic expeditions. Still, fortunately, her husband's status ensured she was in regular contact with top-ranking scientists from many countries. At the time, then, these scientists would have been well aware of Sabine's role in Edward's research, and of her many translations, even those which were listed under her husband's name. In other words, the person of the translator may appear to us today to be invisible, when in her own day she would have held a considerably higher profile.

Nonetheless, that her contributions are not recorded in modern scholarship with the same gusto reserved for, say, Mary Somerville, suggests the tides were turning for women in science, even in the mere 20 years since Somerville's work had appeared. This idea has been touched upon by historians of science in connection less with Victorian *mores*, which were more complex than just to exclude women from science altogether (indeed, Victorians were quite keen on science), than with the growing *professionalization* of science, within which women were excluded – more specifically – because they were perceived as a threat to the formal positions opening up for scientists at institutions. As Lightman sums up this point of professional science at the time:

By the mid-nineteenth century, popular science was becoming increasingly marginalized, and clergymen, women, artisans, and “nonprofessionals” in general were excluded by professionals. But science continued to be contested territory in the latter half of the nineteenth century. ...The number of women engaged in popularizing science in the latter half of the nineteenth century is also indicative of the continuing efforts of marginalized groups to be a part of the scientific world. ...But by the end of the century women began to lose their status as popularizers, not only because male popularizers perceived them as competitors, but also because of the introduction of natural history education into the schools, which reduced the need for science books in the home.

Royal Society Connections

In a connection to Portraits Three and Four (Somerville and Lovelace), through the Royal Society Sabine was acquainted with Sir John Herschel, with whom he worked closely, and Charles Babbage, who singled Sabine out for attack in his 1830 pamphlet “Reflections on the Decline of English Science”.

Elizabeth’s Mediated Status - Conclusion

Edward’s status, together with the respectful tone of reference made to Elizabeth in materials (see quotes below) that comment on her husband, work to suggest that she was a well-regarded and active participant in the scientific community, as far as any woman could be, especially with the influence of Victorian ideals after 1837⁸.

⁸ Vicinus comments on Victorian restrictions upon women in (1972) *Suffer and Be Still* and (1977) *A Widening Sphere*. As Erina Moriarty reviews Vicinus, “There were three roles for women in Victorian society: 1) The Ideal Mother and Wife; 2) the Prostitute; 3) the Single, Celibate Spinster”. In: *Independent Women: Work and Community for Single Women, 1850-1920*. University of Chicago Press, 1988. On-line at [http://www.worldreviews.com/BOOK0008_JAN2001.htm].

Contemporary quotes⁹ clearly demonstrate she was known as a participant in scientific activities, as in the following two examples:

[Sabine's] wife, Elizabeth Juliana Leeves, an accomplished woman whom he married in 1826, helped him in all his scientific work. Their happy partnership lasted for more than fifty years, ending with her death in 1879.

[AND]

Sabine married Elizabeth Juliana Leeves. She was an accomplished woman, who aided him for more than half a century in his scientific investigations. Her translation of Humboldt's 'Cosmos,' in four volumes, was published 1849-58. She also translated 'The Aspects of Nature' (1849, 2 vols.) by the same author, Arago's meteorological essays, and 'Narrative of an Expedition to the Polar Sea' (1840; 2nd ed. 1844). There was no issue of the marriage.

Her marriage to a prominent scientist placed Sabine in a position of (at least, if not more than) indirect visibility and influence in her day, though this fact has traveled only partially down through history to us today.

The very fact that she accompanied Edward on arctic expeditions suggests a marriage of mutual understanding and commitment to science, within which Elizabeth could play an important, if paratextually anonymous, role. She would have had access to important new scientific materials, access to translation contracts, and access to a prestigious audience to receive her translations. How she felt about her translations in relation to the sum of her work as a vital scientific companion to her husband, e.g., on prestigious arctic expeditions and in the important production of tables and charts on all observations in terrestrial magnetism to date, remains at present regrettably undocumented.

⁹ Dorothy Colville. *North Mymms - Parish and People*. Chapter 23 - The Sabine Family of Hertfordshire. 1971. On-line at [<http://www.brookmans.com/history/colville/chttwentythree.shtml>] AND *The Tidal Correspondence, Biography & Bibliography*. On-line at [<http://www.eng.livjm.ac.uk/postgradresearch/maritime/tides/home.htm>].

Establishing the Status of the Translator – The Source Texts and Authors

Though Sabine's case will be noticeable for the declining recognition of the woman as person of the translator, there can be no doubt as to the status and importance of the source texts she translated, texts that directly reflected the topical concerns of many British scientists of her day (empire, data collection, geological sciences), as well as the rise of Germany to dominance in this area. Of all the translators portrayed, Sabine also translated the greatest number (six) of scientific works, in an inverse relationship between output and lasting recognition. In this section, brief information is offered on the source text authors to add to above arguments made on the status of the translator and her translations. Note as well the change in citation over the course of her output, with attribution being shifted to her husband over time.

Carl-Friedrich Gauss

A prodigy in mental calculation, Gauss conceived most of his mathematical theories by the age of 17. By 1807, 13 years later, he was professor of mathematics and director of the observatory at Göttingen. In 1821, he was appointed to conduct a trigonometrical survey of Hanover, not unlike Sabine's own observatory work and survey of the British Isles.

Among his many accomplishments, Gauss pioneered the application of mathematics to such areas as gravitation, magnetism, and electricity, topics that link him to the period and topical focus of this portrait; this is reflected in his source text, below. In recognition of his mathematical achievement in these areas, the unit of magnetic induction is called the *gauss*.

“

TEXTS: “Allgemeine Theorie des Erdmagnetismus”. In: *Resultate aus den Beobachtungen des Magnetischen Vereins im Jahre 1838*, Gauss and Weber, (eds.). Göttingen und Leipzig. (Reprinted in *Werke*, 5, 121- 193).

= *General Theory of Terrestrial Magnetism*. Translated by Elizabeth Sabine.
[Full citation unknown.]

Alexander von Humboldt

Von Humboldt is a towering figure in German and European science, as has already been hinted at in cross-references in the Somerville and Lovelace portraits, especially on von Humboldt's central role as a prolific communicator within a network of fellow scientists¹⁰. As Berlin scientist Emil du Bois (1818-1896) later remarked : "Every hard-working academic is Humboldt's child. We are all members of his family". Early on, von Humboldt's energies were directed with extraordinary perseverance to the purpose of realizing his distinctive calling as a scientific explorer.

Von Humboldt's importance as a naturalist and explorer is rivalled only by his great presence as a voice for cooperative change in the institution of German science, which he considered mired in political manoeuvring and thus inferior to what he perceived to be the more forward-minded Parisian academics. These dual roles as explorer and science reformer recall Sabine's simultaneous efforts in England; both men also demonstrate how important networks of communication were (and are), both in driving the progression of scientific thought, and in offering an outside benchmark against which to raise national standards in science. Elizabeth Sabine's translations, of von Humboldt, as of her other subjects, were part of the inner circle of all these major activities. As cited earlier, Elizabeth and von Humboldt were in correspondence; in addition, *her* privileged status and *her translation's* potential influence are suggested by the importance von Humboldt attached to

¹⁰ For more on the central part played by von Humboldt in the communication of science, see *Networks of Knowledge* (Netzwerke des Wissens) at the Haus der Kulturen der Welt in Berlin: [<http://www.hkw.de/deutsch/kultur/1999/humboldt/humboldt.html>].

one text in particular, the *Ansichten der Natur* (Views of Nature), his "Lieblingswerk", or favourite work¹¹:

Mit ihr hat er sich und dem Publikum den Wunsch nach einer allgemeineren Schilderung der Tropen der neuen Welt erfuehlt. Ohne das Szientifische preiszugeben, wollte er leicht und verstaendlich bleiben und eine groessere Oeffentlichkeit ansprechen.

As well, the connections between von Humboldt, the Sabines, Babbage, Arago, and Gauss, to name just a few key figures in the international scientific community, suggest a considerable and prestigious audience for both the source text and the target text alike. As another respected publication of the time, Godey's Lady's [sic] Book, explained in a contemporaneous review, the translation presented

A volume of immense value to the scientific man. It gives the aspects of nature in different lands and climates, with scientific elucidations. It is translated by Mrs. Sabine. Anything from the pen of this distinguished author must be of great utility; and the present work adds greatly to his reputation.

Such citations affirm the impression of the source text and its translations as significant contributions to scientific dialogue in history, and even into the present: here, as in other cases in the dissertation, various modern reprints – simple facsimiles as well as updated and revised versions, can be found, in a testament to the lasting importance of Sabine's dissemination through translation.

TEXTS: Humboldt, Alexander von. *Ansichten der Natur*,¹². Hanno Beck (ed.). Darmstadt: Wissenschaftliche Buchgesellschaft, 1987 reprint of 1807 edition.

¹¹ [With this book, von Humboldt was responding to his own desire, as to his readers', for a more general depiction of the New World tropics. His goal was to reach a wider audience by writing a text that would be easy to read and comprehend, yet without sacrificing the scientific character of the information.] Translation mine. In: *Ansichten der Natur*, 1987 reprint (Beck):361.

¹² *Humboldt's Aspects of Nature*. Lea & Blanchard, Philadelphia. Reviewed in: Editor's Book Table to *Godey's Lady's Book*. Philadelphia, January 1850. Such citations affirm the impression of the source text and its translations as significant contributions to scientific dialogue in history, and even

= Sabine, Elizabeth. *Aspects of nature*. Translated by Mrs. Sabine. NY: AMS Press, reprint 1970.

Concurrent = Otté, Elise C. and Henry G. Bohn (trs.). Alexander von Humboldt, *Views of Nature: Or Contemplations on the Sublime Phenomena of Creation*. London: Bohn, 1850.

Humboldt, Alexander von. *Kosmos Entwurf einer Physischen Weltbeschreibung*. Stuttgart und Tübingen: JS.Gottascher, 1845.

= Sabine, [Elizabeth]. *Cosmos: sketch of a physical description of the universe*. Translated under the superintendence of Lieut.-Col. Edward Sabine. London: Longman, Brown, Green, 1846-1858.

Concurrent = Otté, Elise C. (Humboldt, Alexander von). *Cosmos: a sketch of a physical description of the Universe*. Translated from the German, by. NY: Harper & Brothers. n.d.

Jean Dominique François Arago

Born in Perpignan, French physicist and astronomer Arago began his career as a professor of analytical geometry at the age of 23. Known especially for his work in magnetism and optics (especially on the wave vs. corpuscular theory of light, and the phenomenon of polarization), as well as for his astronomical observations, Arago is in these activities a representative of his age, and akin to von Humboldt and Gauss, both in these fields of interest and in his active role in the politics of science of his day.

For many years the secretary to the Académie des Sciences, Arago worked actively for the modernization of French science. In his Academy capacity, he also came to write a monumental collection of biographies of famous scientists, much like Fontenelle (Portrait One) and Bowditch (Portrait Three) before him had served this essential function; this role has been mentioned in connection with the Lovelace portrait as well. This multiple involvement in science, politics, and naval matters puts Arago in a group with Humboldt in

into the present: here, as in other cases in the dissertation, various modern reprints – simple facsimiles as well as updated and revised versions, can be found, in a testament to the lasting importance as well of Sabine’s dissemination through translation.

Germany and Sabine in England; all three were in contact and would have influenced one another, including through such translations as Elizabeth Sabine's.

TEXTS: [This translation was assembled from various individual essays Arago had published separately, rather than from one source text.]

= *Meteorological essays*, By Francois Arago; with an introduction by Baron Alexander von Humboldt; translated under the superintendence of Colonel Sabine, London: Longmans, 1855.

Heinrich Wilhelm Dove

Like von Humboldt a prominent figure in the Berlin scientific community, German Heinrich Wilhelm Dove is remembered today for his lifetime body of work on the physical foundations of meteorology, which he established as an independent field of research. In one tribute, the English journal *Nature* memorialized Dove as "the father of meteorology" (10 April 1879).

For fifteen long years a victim of the personal squabbling von Humboldt so despised in the Berlin scientific community, Dove nonetheless achieved an international reputation for the obvious calibre of his research and publications. Eventually recognized with a professorship in Berlin, he now lectured in physics, electromagnetism, optics, and meteorology to full houses. Further, his 1852 text, *Die Verbreitung der Wärme auf der Oberfläche der Erde*, was awarded the Royal Society's most prestigious medal, the Copley¹³, in 1853, presumably in connection with Sabine's 1853 translation into English. As the Mandeville Collection stresses, "Based on this research, Dove is considered the founder of the entire

¹³ The Royal society website explains that, "This medal is the premier award of the Society. It is given annually for outstanding achievements in research in any branch of science, and alternates between the physical sciences and the biological sciences. The Copley medal was first awarded in 1731, and during its long history it has been awarded to such luminaries as Charles Darwin, Albert Einstein and Jean Foucault.

<http://www.royalsoc.ac.uk/awards/medals/CopleyMedal.htm>

superstructure of accurate climatological knowledge”¹⁴. Thus, the professional and didactic reach of this “father of meteorology”, in particular through his most important work - as translated by Sabine - seems beyond question.

In addition to his academic contributions, Dove also single-handedly ran the city’s meteorological institute, all the while leading a full life in various scientific societies and academies. In keeping with the profile of a senior statesman of science, Dove produced hundreds of publications, including no fewer than 167 for the Prussian Academy of Sciences (which he joined in 1837), and others still for the Geological Society, which elected him president 11 times. To have translated Dove’s crowning work was among Elizabeth Sabine’s many achievements as translator.

TEXT: Dove, Heinrich Wilhelm. *Die Verbreitung der Wärme auf der Oberfläche der Erde, erläutert durch Isothermen, thermische Isanormalen und Temperaturcurven*, von H.W. Dove. 2. sehr verm. Aufl. der Monatsisothermen. Berlin, D. Reimer, 1852.

= [Elizabeth Sabine] *The Distribution of heat over the surface of the globe, illustrated by isothermal, thermic isabnormal, and other curves of temperature*. London: 1853.

Baron Ferdinand Petrovich von Wrangell (Vrangle)

Von Wrangell is the final entry in this section, which demonstrates Elizabeth Sabine’s presence as translator in the forefront of geomagnetic research in Germany, France and England. Von Wrangell, a Russian, who nonetheless calls to mind the familiar set of characteristics seen in the biographies of all four scientist-authors above. Through several arctic and global expeditions, von Wrangell came to forge a particular relationship with America, becoming the first Governor of the Russian colonies in Alaska (1829-35), then

¹⁴ One of Dove’s most important meteorological writings. Dove “rendered a signal service to the observational representation of the general circulation by producing monthly maps of isotherms of the globe which are to this day the foundation of temperature maps”. Visit the *Mandeville Special Collections Library* (U. California San Diego) at <http://orpheus.ucsd.edu/speccoll/weather/15.htm>

director of the Russian-American Company (1840-49), in which latter capacity he strongly encouraged the scientific study of the wildlife and geography of North America, much as von Humboldt was pursuing such research for his *Cosmos*, which Sabine also translated.

These activities led von Wrangell to publish extensively in anthropology as well as climatology, both in keeping with some of the major scientific interests of the international community. In addition, like Parry and Ross, von Wrangell kept diaries of his seafaring journeys; such narratives, which were eagerly read by the public, recorded in von Wrangell's case such novel facts as the existence of an open navigable sea in the arctic, and information on the life and customs of the circumpolar peoples. They were translated first into German (by G. Engelhardt from the then unpublished Russian manuscript), and next into English by Elizabeth Sabine. Von Wrangell's connections to North America would have placed her English translation in demand in this new market as well.

TEXTS: [Engelhardt, Georg] *Reise des kaiserlich-russischen Flotten-Lieutenants Ferdinand V. Wrangel längs der Nordküste von Sibirien und auf dem Eismeere, in den Jahren 1820 bis 1824*. Nach den handschriftlichen Journalen und Notizen bearb. von G. Engelhardt ... ; Hrsg. nebst einem Vorwort von C. Ritter ... ; Mit Tafeln der Temperatur-Verhältnisse und einer Landkart. Berlin: Verlag der Voss'schen Buchhandlung, 1839.

[Elizabeth Sabine]. Wrangel, Ferdinand Petrovich. *Narrative of an expedition to the Polar sea, in the years 1820, 1821, 1822, and 1823*. Commanded by Lieutenant, now Admiral Ferdinand Wrangell. New York: Harper and Brothers, 1841. "The English copy, from which this is taken, was edited by Major Sabine."--Publishers' advertisement.

2. Conclusion

As explained in the introduction, this portrait represents somewhat of a departure from the previous four: it aims to demonstrate the increased output and, by association, increased importance, of the fifth translator in the series here, which textual visibility is eclipsed by the

near complete paratextual invisibility of the person of the translator, an invisibility that, in coming full circle to the General Introduction, was part of essential professional concerns about modern translator invisibility that first led me to this dissertation project.

From the preceding information, it is clear that Elizabeth Sabine was involved in translating source texts of undeniable importance, for a scientific audience of notable stature. Many of the scientists she would have had occasion for affiliation with through her husband's extensive network of associates were accomplished and prominent researchers and activists in an era of world exploration and government institutionalization of scientific research, and her translations surely served to meet an international demand – including in the New World – for the latest research in geomagnetism and arctic exploration. In their number and topical specialization, the sum of her translations can be said to represent among the most important work being published in the new geological sciences of her day.

That details on Sabine's person remain obscure in inverse proportion to the number, range, and importance of the texts she translated is perhaps the most striking feature of this portrait in Epilogue. This polarity reinforces arguments made in Background One to be mindful of the distinction between visibility of the translator and visibility of the text. Also seen in Sabine's case is more – if nuanced - evidence of the power derived by the translator from primary authorial activity; in this instance, however, the authorial status of the scientist husband is substituted, leaving the translator nearly invisible, despite her obvious contribution to the dissemination of scientific thought. This invisibility extends also to the concurrent translator, Elise C. Otté, also a woman, on whom no data was found; I consider this discovery – or lack of it – to strengthen the impression of the changing acceptability of women in science, to a position much more clearly in the background, where the four preceding portraits had attained heights of recognition for their translation contributions.

As for the notion of translation as branding, given the association with Edward Sabine and his vast circle of scientific associates and students, it stands to reason that Sabine's translations, though published nearly simultaneously with Otté's, would have been the more sought after, and certainly the most recognized, of the two translators'.

Now that research such as this has signalled the contributions made by Elizabeth Sabine, it may be possible, in future research, to work toward a more complete record of her scholarly activities, including an analysis of her collected translations.

Conclusion

The main purpose of this dissertation has been to assert the presence, contextualize the importance, and assess the influence of several female translators of scientific materials in England for the period 1650-1850, in counterpoint to expectations of invisibility for this group.

In Background One, the - modern and historical - trope of the invisible translator was explored, with particular reference to the distinction between *fluency* and *invisibility*, i.e., between (seeing the) text and (seeing the) translator, as well as to the relationship between author and translator. Additional potential for invisibility was found to exist for *scientific* translators (hierarchized below literary translators) and for *female* translators (hierarchized below males), with the tentative conclusion that female translators of scientific materials should have been particularly invisible, especially for the time period in question (1650-1850).

Nonetheless, a set of five such translators of important works, plus an appendix of twenty additional candidates, were found to have been involved in the dissemination of central scientific ideas during and in the wake of the Scientific Revolution. This suggests that certain factors must have played a part in opening windows of opportunity to these women. The fact of their existence, the importance of the texts they translated, and the cachet their personal visibility lent to their translations all work to counterbalance statements in translation studies today about the translator's seemingly inevitable invisibility.

In Background Two, a number of external factors favourable to women translating in this period were proposed, including:

the fluid boundaries of science toward amateur enthusiasts (including our translators) before the growing professionalization of science gradually excluded such participants from scientific and intellectual circles;

the sheer momentum for dissemination (including translation) generated by the force of revolutionary scientific ideas during and following the Scientific Revolution (heliocentric cosmology, optics, calculus, industrialization/applied mathematics, and data collection/analysis in connection with the geological sciences and electromagnetism);

an expansion and formalization of informal and formal scientific communications networks, as in salons and in popular and professional publications;

a desire for scientific communication in the vernacular;

the rise of London periodicals, with scientific content for the general public, including for women;

the resultant interplay of communication between the scientific and general audiences;

all added to the traditional categorization of translation as a suitable activity for women (*n.b.* Background One).

Through Backgrounds One and Two, it was shown that, for a time, before the full professionalization of science, women who were able to achieve visibility through other, “primary”, activities, such as authorship – whether literary or scientific – were actually able to achieve considerable visibility and influence in scientific translation, even in the presence of *concurrent translations*. I also proposed that this visibility resulted in *branding*, i.e., audience demand for a translation by a particular translator based on her independent, pre-existing

visibility and influence in society. Hence the “cachet of the ‘invisible’ translator” referred to in the title, and further explored in each of five translator portraits.

Among the important mediating functions served by these translators was the *repatriation* of controversial or stalled scientific ideas to the English audience via the intermediary of outside interpretation, in this case French (Behn-Fontenelle, Somerville-Laplace) and Italian (Carter-Algarotti, Lovelace-Menabrea-Babbage) commentators. This function underscores the important part played by translation as an external reference point within the growing and more formalized communications network of the period.

By the time of the final portrait (Sabine), however, the changing boundaries of science (professionalization) along with a more restrictive (pre-/early Victorian) phase in attitudes towards appropriate behaviour for (learned) women left this particular translator once again invisible as a *person*, though her translated *texts* remain visible, and - in direct relation to the importance of the source texts - indisputably important, in the history of scientific transfer between Germany, France, and England.

This set of women (five portraits, plus 20 appended names), in their roles as translators, expositors, authors, champions of science, and disseminators, and for their place in the history of translation as well as the history of scientific ideas, were found to be clearly more than an afterthought in the transmission of ideas. Rather, their textual and personal presence played a direct part in the history of science, and of women in science, by such functions as imparting the latest scientific developments to the increasingly important international communications network, and by cultivating a positive role-model image of the (amateur, female) scientific enthusiast.

In the translation samples and commentary that formed a part of each portrait, the translators were shown to have exerted varying degrees of paratextual and allographic visibility, all the while transmitting the scientific content of the source texts. In the cases of Somerville and Lovelace in particular, it was not just the translations, however important in themselves, but also the extensive explicatory and interpretive *notes* added by the translators that gained them even greater recognition as gifted, independent, forward-thinking scientific minds, with positive effects on the reception of and demand for their translations. This strategy of interpolating material while respecting the contours of the source text was one way of realizing the English tendency for “poet-cantered” translation, within which (according to Dryden, for example) the *original intervention of the translator* was prized, all the while communicating the particular, i.e., scientific/specialized nature of the source text content. Or, as Ruriko puts it, “The translation or transmission of an idea - either of truth or of beauty - could best be achieved when some subjective, original intervention of the translator herself existed” ¹.

With a view to future research - in translation studies as in the history of scientific ideas - the dissertation concludes with an *Appendix* listing an additional twenty women in scientific translation. The existence of these women - some authors, some translators, some both - confirms a largely untapped source of additional insight into the history of (women in) science and the history of (women in) scientific translation. It is to be hoped that research on their connection to the history of translation will root out yet more instances of “invisible” translators and translations.

¹ Suzuki, Ruriko. "Translation in the 1790's: a Means of Creating a Like Existence and/or Restoring the Original." *Romanticism On the Net* 2 (May 1996). [<http://users.ox.ac.uk/~scat0385/translation.html>].

In conclusion, I am reminded of Orwell's words, and coin a phrase: while translators may be invisible, some translators – even female translators of scientific materials in history - are clearly less invisible than others. May this idea hold future promise.

Appendix: Twenty Additional Women

Explanation of the Appendix

Among the goals of this dissertation was to work toward a complete and correct record of scientific translation in history, in part by communicating information on lost *translators* (in this case, especially women) or lost *translations*, and to demonstrate in doing so the importance of translators in disseminating and shaping scientific thought.

The select portraits in the earlier chapters of this dissertation were chosen *not* because they are the only instances of their kind, but because they fulfilled a certain set of research criteria (above and beyond gender, which, readers will recall, was originally applied in order to limit the size of the dissertation):

historical period approximately from 1650 to 1850;

translation *into* English as the target language;

sufficient historical materials accessible for biographical insight [commentary] and translation analysis.

Nevertheless, were this dissertation to remain limited to mention of just these five women, the reader might be left with the (false) impression that no other women operated within the important sphere of scientific dissemination. Yet female translators of scientific materials have in fact existed for various languages, at various times in history, and in various fields of scientific inquiry.

Therefore, this appendix - though clearly far from exhaustive - offers brief translation and/or publication information on 20 additional women, in the hope of stimulating continued future

research on translation and science, on these and even more - as yet unnamed - translators, men and women alike.

The twenty women are divided into three groups. Group One contains female **translators**; Group Two contains female **authors** who were translated (in some cases, by *female* translators); Group Three is a division of Group Two, and contains female **authors on midwifery** who were translated -- forming as they do fully one-third (6/20) of all the entries in the appendix, they seemed to warrant a separate category by subject. The group entries are listed and briefly explained next.

Overview of Group One: Additional Translators

The first nine additional women are female translators of scientific materials who did not meet the basic criteria for this dissertation, above (period, language, data), but whose work and impact warrants further study. These women are:

1. Maria Angela Ardinghelli, Italian (1728-1825)
2. Gabrielle-Emilie le Tonnelier de Breteuil, French (1706-1749) (Marquise/Madame du Châtelet, also Chastellet)
3. Marie-Genevieve-Charlotte Darlus Thiroux D'Arconville (also Genevieve-Catherine, also D'Arles-Thiroux), French (1720-1805)
4. Marie Lavoisier, née Marie Anne Pierrette Paulze French (1758-1836)
5. Claudine Picardet (also Pouillet, also Guyton de Morveau), French (dates unknown)
6. Clémence Augustine Royer, French (1830-1902)
7. Sofia Kovalevskaja, Polish (1850-1891)
8. Marcella O'Grady Boveri, American (1863-1950)
9. Lilian Lindsay, American (1850-1891)

From this list, Du Châtelet (2) and Royer (6) are known to translation studies, and Lavoisier (4) and Kovalevskaja (7) are known to the history of science/math; nonetheless, more research on their role in the translation and dissemination of science is needed.

Overview of Group Two: Female Authors Translated

The next 5 women form a second group: female *authors* of original scientific material whose works were deemed worthy of *dissemination through translation* by others (some of whom were, incidentally, themselves *female* translators). This group includes the following women:

10. Isabella Cortese (fl. 1560s) Italian alchemist
11. Maria Sybille Merian (1647-1717), Dutch botanist/entomologist
12. Lady Anne Finch Conway (1689-1710), English natural philosopher
13. Maria Gaetana Agnesi (1718-1799), Italian mathematician
(also Margaritha Gaetana Angiolo Maria Agnesi)
14. Jane Haldimand Marcet (1769-1858), English science expositor

Overview of Group Three: Midwives Translated

At this point, I highlight a subset of influential European midwives, whose aggregate standard works are reported¹ to have been widely translated and disseminated before orthodox medicine asserted control over the birthing process; this subset would constitute an interesting research topic of its own. Names in this group include:

15. Louise Bourgeois (also Boursier) (French, 1563-1636)
16. Justine Siegemund (German, 1636-1705)
17. Marie Louise Lachapelle (French, 1769-1821),

¹ See, for example, *Hypatia's Heritage* (Margaret Alic) and *Women in Print* (Alison Adburgham).

18. Regina Josepha (Heiland) von Siebold née Henning (German, 1771-1849, mother of #20)
19. Marie-Anne Victorine Boivin née Gillian (French, 1773-1841) (possibly also Anne-Marie)
20. Charlotte Heiland von Siebold (German, 1788-1859, daughter of #18)

Individual Entries

From this point on, the appendix contains a brief individual entry for each of these 20 women, with publication and/or translation information on their major scientific works². This information is related in a standardized format of: (1) Translator, (2) Original Author, (3) Original Title, and (4) Translation Title. In certain cases, only limited information is known, but can be used as a starting point for future research.

Group One: Female Translators

1. Maria Angela Ardinghelli --- tr. Hales

Translator: Maria Angela Ardinghelli, Italian (1728-1825)

Original Author 1: Stephen Hales, English (1677-1761)

Original Title 1: *Vegetable staticks; or, An account of some statical experiments on the sap in vegetables, being an essay towards a natural history of vegetation. Also, a specimen of an attempt to analyse the air, by a great variety of chymistatistical experiments; which were read at several meetings before the Royal Society...By Steph. Hales...London, Printed for W. and J. Innys, and T. Woodward, 1727. pp. [7], vii, [2], 376. 19 plates. 8vo.*

² This information has been compiled largely using the OCLC First Search database, the MLA database, the Medline database, Harvard's HOLLIS database, and the on-line databases of the British Library, the Bibliothèque Nationale de Paris, the Library of Congress, and the Deutsche Staatsbibliothek. Additional citations were found using the Google browser on the World Wide Web, as well as the bio-bibliographic material for the five translator portraits in this dissertation. This information is a starting point for historical research; it is as yet incomplete, and may contain inaccuracies to be corrected by future research.

Translation Title 1: (First edition) *Statica de' vegetabili, ed analisi dell'aria / opera del dottore Stefano Hales ...; tradotta dall'inglese, con varie annotazioni.* Napoli: Nella stamperia di Giuseppe Raimondi, 1756. [8], 368 p., XX folded leaves of plates (by Giuseppe Alloja): ill.; 21 cm. 8vo.

(Third edition) *Statica de' vegetabilii, ed analisi dell'aria, opera del Signor Stefano Hales ... Tradotta dall'inglese in Italiano, confrontata colla traduzione Franzese, e comentata dalla Signora D.M.A. Ardinghelli. Editione terza, accresciuta, e corretta da alcuni errori nelle antecedenti edizione trascorsi. Con figure incise in rame.* Napoli, A spese e presso Gaetano Castellano, 1776. 276 p. XX fold plates. 21 cm. 8vo.

Original Title 2: *Statical Essays containing Haemastatics; or, an Account of some Hydraulick and Hydrostatical Experiments on Stones in the Kidneys and Bladder; with an Enquiry into the Nature of those anomalous Concretions. To which is added, an Appendix, containing Observations and experiments relating to several subjects in the first Volume. ... vol. II With an Index to both Volumes.* London: Printed for W. Innys and R. Manby, at the West-End of St. Paul's; and T. Woodward. ... 1733. 8vo.

An account of some experiments and observations on Mrs. Stephen's medicines for dissolving the stone: wherein their dissolving power is inquired into, and shown. By Stephen Hales... To which is added, a supplement to a pamphlet, intituled [sic], A View of the present evidence for and against Mrs. Stephens's medicines, &c. Being a collection of some particulars relating to the discovery of these medicines, their publication, use and efficacy. By David Hartely... London, Printed for T. Woodward, printer to the Royal Society [1740]. 1 p. 1., 66 p. fold plate. 21 cm.

Translation Title 2: (See footnote³) *Esperienze ed osservazioni intorno ai calcoli della vesica, e dei reni ... Aggiuntevi dal Dottor Hartely altre osservazioni intorno allo stesso soggetto, e due mediche dissertazioni del Sig. Sauvages intorno alla teoria dell'inflamazione, e della febbre, tradotto dalla Signora Maria Angela Ardinghelli.* Naples, Giuseppe Raimondi, 1752. pp. 8, 176, 291.

**2. Gabrielle-Emilie le Tonnelier de Breteuil --- tr. Newton
(Marquise/Madame du Châtelet-Laumont, also Chastellet)**

Translator: Marquise du Châtelet, French (1706-1749)

Original Author: Sir Isaac Newton, English (1642-1727)

³ Judging from the Italian title, this second translation listed under Ardinghelli likely represents a composite source, including *Statical Essays* and the David Hartely text, both cited here.

Original Title 1: *[Principia]. [Full title:] Philosophiae naturalis principia mathematica / autore Is. Newton. Londini: Jussu Societatis Regiae ac typis Josephi Streater; prostat apud plures bibliopolas, anno 1687. [8], 510 [i.e., 494], [2] p. (p. [496] blank), [1] folded leaf of plates: ill.; 24 cm. (4to) Edited by Edmond Halley.*

Translation Title 1: *Principes mathématiques de la philosophie naturelle, par feue Madame la marquise du Chastellet. 2 vols. Vol. 1, pp. [v]-xiii: (Revue par M. Clairaut ... Avertissement de l'éditeur ... Préface historique (Voltaire).) Vol 2, separate pagination: (Exposition abrégée du Systeme du monde, et explication des principaux phénomènes astronomiques tirée des Principes de M. Newton.) Paris: Dessaint et Saillant, 1759. 2 v. tables, diagrs. on 14 fold. pl. 26 cm.*

3. Marie-Genevieve-Charlotte Darlus Thiroux D'Arconville
--- tr. Shaw, Monro

Translator: Marie-Genevieve-Charlotte Darlus Thiroux D'Arconville, (also Genevieve-Catherine, also D'Arles-Thiroux), French (1720-1805)

Original Author 1: Peter Shaw, English (1694-1763)

Original Title 1: *Chemical lectures, publickly read at London, in the years 1731, and 1732: and since at Scarborough, in 1733: for the improvement of arts, trades, and natural philosophy / by Peter Shaw. London: For J. Schuckburgh and T. Osborne, 1734. xxiv, [2], 439, [9] p.; 8vo.*

Translation Title 1: *Leçons de chymie : propres à perfectionner la physique, le commerce et les arts / par M. Pierre Shaw... ; traduites de l'anglois. Paris : Chez Jean Thomas Herissant..., 1759, [cv], 471 p. ; 27 cm.*

Original Author 2: Alexander Monro *primus*, English (1697-1767)

Original Title 2: *[Osteology: a treatise on] the anatomy of the humane [sic] bones (1st ed. 1726).*

Translation Title 2: Uncertain⁴ - concurrent? *Traité d'ostéologie, traduit de l'anglois ... Ou l'on a ajouté des planches en taille-douce, qui représentent au naturel tous les os de l'adulte & du fœtus, avec leurs explications. Par M. Eugene Sue des Ecoles Royales de Chirurgie. Paris: Guillaume Cavelier, 1759. 2 pt.: pp. xxxii, 317: pl. XXXI. fol.*

⁴ Alic cites D'Arconville as Monro's translator, but lists no citation; this attribution remains unconfirmed. Of note, both the British Library and the Bibliothèque Nationale de France list a French translation of Monro's *Osteology* under the names Jean-Joseph (or Eugene?) Sue; perhaps this was a pseudonym, or a concurrent translator.

4. Marie Lavoisier, (née Marie Anne Pierrette Paulze) --- tr. Kirwan

Translator: Marie Anne Pierrette Paulze, French (1758-1836)

Original Author 1: Richard Kirwan, Irish (1733-1812)

Original Title 1: *An essay on phlogiston, and the constitution of acids / by Richard Kirwan...* London: Printed by J. Davis, for P. Elmsly..., 1787.

Translation Title 1: *Essai sur le phlogistique et sur la constitution des acides. Traduit de l'anglois [par Madame Lavoisier], avec des notes de MM. de Morveau, Lavoisier, de la Place, Monge, Berthollet, & de Fourcroy...* Paris, 1788. [xii], 344 p. 21 cm.

**5. - Claudine Guyton de Morveau (née Picardet, also Pouillet)
--- tr. Scheele, Werner, Kirwan, Bergman**

Translator: Claudine Picardet, French (Dates unknown)

Original Author 1: Carl Wilhelm Scheele, Swedish (1742-1786)

Original Title 1: Uncertain - excerpted. See Translation Title 1.

Translation Title 1: *Mémoires de Chymie ... tirés des Mémoires de l'Académie Royale des Sciences de Stockholm, traduites du Suédois et de l'Allemand.* Dijon, 1785. 8o.

Original Author 2: Abraham Gottlob Werner (1750-1817)

Original Title 2: *Von den aeusserlichen Kennzeichen der Fossilien.* Leipzig, 1774. 8o.

Translation Title 2: *Traité des caractères extérieurs des Fossiles, traduit de l'Allemand par le traducteur des Mémoires de chimie de Scheele [Madame Guyton de Morveau].* Dijon, 1790. 12o.

Original Author 3: Richard Kirwan, English (1733-1812).

Title 3: Uncertain - attribution in Alic.

Original Author 4: Torbern Olof Bergman, Swedish (1735-84)

Original Title 4: Uncertain - perhaps *Physisk beskrifning ofver jord-klotet ...* [With plates.] 2 vol. 1773, 1774.

Translation Title 4: [Opuscula physica et chemica] *Opuscules, chymiques et physiques de T. Bergman* ... Recueillis, revus et augmentés par lui-même, traduits par M. de Morveau⁵, avec des notes. 2 vols. Dijon, 1780. 8o.

6. Clémence Augustine Royer --- tr. Darwin

Translator: Clémence Augustine Royer, French (1830-1902)

Original Author 1: Charles Robert Darwin, English (1809-1892)

Original Title 1: On the origin of the species by means of natural selection, or, The preservation of favoured races in the struggle for life / by Charles Darwin. London : John Murray, 1859.

Translation Title 1: *De l'Origine des espèces, ou Des lois du progrès chez les êtres organisés* ... Traduit ... sur la troisième édition ... par Mlle Clémence Auguste Royer. Avec une préface et des notes du traducteur. Ixiv, 712p. Paris, 1862. 8o.

7. Sofia Kovalevskaja --- tr. Brehm, Chebyshev

Translator: Sofia Kovalevskaja, Russian (1850 -1891)

Original Author 1: Pafnutiï Lvovich Chebyshev, Russian (1821-1894)

Original Title 1: [Cyrillic title]. 1885. Appendix to volume 51 of the *Annales de l'académie des sciences de St. Pétersbourg*.

Translation Title 1: *Sur la représentation des valeurs limites des intégrales par des résidus intégraux*, par P. Tchebycheff à St. Pétersbourg. Traduit du russe par Sophie Kowalevski à Stockholm. *Acta mathematica* 9. Imprimé le 16 octobre 1886.

Original Author 2: Christian Ludwig Brehm, German (1787-1864)

Original Title 2: Uncertain - attribution in Alic.

Perhaps one of the following three:

⁵ It is uncertain whether this translation was in fact by Louis Bernard, or rather by his wife, Claudine. Also, the following translation is attributed to A.Ch.M. Pouillet-Delisle. Since Claudine *Picardet* is sometimes found as Claudine *Pouillet*, this raises the question of whether this translation might have been linked to her as well:

Recherches arithmétiques [by Carl Friedrich Gauss]. ... Traduites par A. Ch. M. Pouillet-Delisle, etc. [With notes of the translator.] Paris, 1807. 4o.

Ornis, oder das Neueste und Wichtigste der Voegelkunde, in Verbindung mit mehreren Naturforschern herausgegeben von C. L. Brehm. Heft 1-3. Jena, 1824-27. 8o.

OR

Beitraege zur Voegelkunde in vollstaendigen Beschreibungen mehrerer neu entdeckten und vieler seltener, oder nicht ... beobachteter deutscher Voegel. Mit ... Kupfertafeln. (3 vols; vol 3 by C. L. Brehm and W. Schilling.) Neustadt an der Orla, 1820, 22. 8o.

OR

Handbuch der Naturgeschichte aller Voegel Deutschlands, etc. Ilmenau, 1831. 8o.

Translation Title 2: Uncertain - perhaps Cyrillic title.

8. Marcella O'Grady Boveri --- tr. Boveri

Translator: Marcella O'Grady Boveri, American (1863-1950)

Original Author 1: Theodore Boveri, German (1862-1915)

Original Title 1: *Zur Frage der Entstehung maligner Tumoren.* 1914

Translation Title 1: *The Origin of Malignant Tumors.* Translator M. Boveri. Baltimore: Williams&Wilkins, 1929. ix. 119p. (also Bailliere & Co.: London 1929. 8o.)

9. Lilian Lindsay --- tr. Fauchard

Translator: Lilian Lindsay, American (1850-1891)

Original Author 1: Pierre Fauchard, French (1678-1761)

Original Title 1: *Le Chirurgien Dentiste ou traité des dents*, etc. 2me édition corrigée et ... augmentée. Ouvrage enrichi de quarante-deux planches en taille douce. 2 tom. Paris, 1746. 8o.

Translation Title 1: *The Surgeon Dentist or Treatise on the Teeth...* translated from the second edition of 1746 by Lilian Lindsay. xvi, 184p. Butterworth & Co.: London, 1946. 8o.

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Group Two: Female Scientific Authors who were Translated

10. Isabella Cortese (fl. 1560s), Italian alchemist.

Original Title 1: *I Secreti della signora Isabella Cortese, ne' quali si contengono cose minerali, medicinali, artificiose e alchimiche.* Venetia : G. Bariletto, 1561. 8vo, pièces liminaires, 88 ff.

Translation 1: - translated into European languages

11. Maria Sybille Merian (1647-1717), Dutch botanist, entomologist.

Original Title 1: Various

Translation 1: - translated into European languages

12. Lady Anne Finch Conway (1689-1710), English natural philosopher.

Original Title 1: Lost⁶

Translation 1: [*Opuscula philosophica quibus continentur*] *Principia philosophiae antiquissimae & recentissimae de Deo, Christo & creatura, id est de spiritu & materia in genere ...* Opusculum posthumum [of Anne, Viscountess Conway]. E lingua anglicana latinitate donatum [by Henry More? or Baron Franciscus Mercurius van Helmont?], cum annotationibus ex antiqua Hebraeorum philosophia desumptis. 144p. Amstelodami, 1690. 12o.

Translation 2: *The Principles of the most Ancient and Modern Philosophy, concerning God, Christ, and the Creatures ...* Being a little treatise published since the author's death, translated out of English into Latin ... and now again made English. By J. C., Medicinae Professor. 168p. London, 1692. 8o.

13. Maria Gaetana Agnesi (1718-1799), Italian mathematician.
(also Margarita Gaetana Angiolo Maria Agnesi)

⁶ As the entries for Translation 1 and Translation 2 show, Conway's English original was translated posthumously, first from English into Latin, then later from that Latin translation back into English to replace the original, which had meanwhile been lost; this back-translation is attributed to Van Helmont, one of Conway's champions.

Original Title 1: *Instituzioni analitiche, ad uso della gioventà italiana*, di Dna Maria Gaetana Agnesi,... [Texte imprimé] Milano : nella Regia-ducal Corte, 1748. 2 vol. 4o.

Translation 1: *Analytical institutions* ... Translated ... by the Rev. John Colson [Professor of Mathematics at Cambridge] ... Now first printed ... under the inspection of the Rev. John Hellins. 2 vol. F. Wingrave; F. & C. Rivington: London, 1801. 4o.

Original Title 2: Uncertain

Translation 2: *Traité élémentaire de calcul différentiel et de calcul intégral*, traduits de l'italien de Mademoiselle Agnesi, avec des additions. (Trans. Pierre-Thomas Antelmy, Sci.ed. Abbé Charles Bossut.) [Texte imprimé]. Paris : C.-A. Jombert, 1775. 8o.

14. Jane Haldimand Marcet (1769-1858), English science expositor.

Original Title 1: *Conversations on Chemistry*. 2nd American Edition. Hartford, Conn., 1809.

Translation 1: *Conversations sur la chimie*, dans lesquelles les éléments de cette science sont exposés d'une manière simple, et éclaircis par des expériences [par Jane Marcet], traduites de l'anglais sur la dernière édition avec des notes...1809.

Original Title 2: *Conversations on Political Economy*, in which the elements of the science are familiarly explained, 1816.

Translation Title 2: *Conversations sur l'économie politique*, dans lesquelles on expose d'une manière familière les éléments de cette science, par l'auteur des *Conversations sur la chimie*, traduites de l'anglais [de Jane Marcet, par Guillaume. Prevost] 1817.

Concurrent translation? - *Notions de John Hopkins sur l'économie politique*, par Mme Marcet,... contes traduits de l'anglais, par Caroline Cherbuliez, 1834.

Original Title 3: *Conversations on Natural Philosophy*, an exposition of the first elements of science for very young children, 1819.

Translation Title 3: *Conversations sur la philosophie naturelle*... par l'auteur des *Conversations sur la chimie* et des *Conversations sur l'économie politique* [Jane Marcet], traduites de l'anglais, par Gme Prevost, 1820.

Original Title 4: *Conversations on Vegetable Physiology*, 1829.

Translation Title 4: *Conversations sur la physiologie végétale*. Paris 1830. 2 vol. 8o. Trans. J. Macaire-Princeps.

[Also, later called] *La Botanique et la physiologie végétales...en 24 conversations*, par Mme Marcet, traduites de l'anglais par J. Macaire-Princeps. 2e édition. Paris 1834. 2 vol. 8o.

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Group Three: Midwives Translated

15. Louise Bourgeois (also Boursier) (French, 1563-1636)

Original Title 1: *Observations diverses sur la sterilité, perte de fruit, foecondité, accouchements, et maladies des femmes et enfants nouveaux naiz, etc.* [With a portrait.] 2 books. A. Saugrain: Paris, 1617. 8o.

Translation 1: [Extracts from book 2 of original contained in:] *The Compleat Midwives Practice*, etc. 1656. 8o.

16. Justine Siegemund(in) (German, 1636-1705)

Original Title 1: Die Koenigl. Preussische und Chur-Brandenb. Hof-Wehe-Mutter, das ist : *Ein hoechst noethiger Unterricht von schweren und unrecht-stehenden Geburthen* von Justinen Siegemundin

Translation 1: -translated into European languages

17. Marie Louise Lachapelle (French, 1769-1821)

Original Title 1: Uncertain - attribution in Alic

Translation 1: -translated into European languages

18. Regina Josepha [Henning Heiland] von Siebold (German, 1771-1849, mother of #20)

Original Title 1: Uncertain - attribution in Alic

Translation 1: -translated into European languages

19. Marie Anne Victorine (also Victoire) Boivin née Gillian
(French, 1773-1841)

Original Title 1: *Recherches sur une des causes ... de l'avortement*; suivies d'un mémoire sur l'intro-pelvimetre ou mensurateur interne du bassin. [With a folding plate.] pp. 212. Paris, 1828. 8o.

Translation 1: Uncertain

Original Title 2: *Traité pratique des maladies de l'utérus et de ses annexes*, etc. [Boivin and Antoine Duges]. 2 vols. Paris, 1833. 8o.

Translation 2: *A Practical Treatise on the Diseases of the Uterus and its appendages*. Translated ... with copious notes, by G. O. Heming. pp. xlv. 559. Sherwood, Gilbert & Piper: London, 1834. 8o.

Original Title 3: *Atlas*. livr. 2-8.
[Boivin and Antoine Duges]. Paris, 1833. fol.

Translation 3: Uncertain

Original Title 4: *Mémorial de l'art des accouchemens, ou Principes fondés sur la pratique de l'Hospice de la Maternité de Paris ...* Suivis 1o des aphorismes de Mauriceau; 2o d'une série de gravures représentant le mécanisme de toutes les especes d'accouchemens ... Quatrième édition ... augmentée, etc. pp. xvi. 526. pl. 143. Paris, 1836. 8o.

Translation 4: Uncertain

20. Charlotte Heiland (genannt von Siebold) (1788-1859, daughter of #18)

Original Title 1: Uncertain - attribution in Alic

Translation 1: - translated into European languages

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