Journal of Literature and Science
Volume 10, No. 1 (2017)
ISSN 1754-646X
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The meanings of "literature" and the place of modern scientific nonfiction in Literature and Science

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For more than a century now, the concept of "literature" has been invoked in both very broad and very restricted meanings. In the broad sense, it means all texts; in the restricted sense, it means texts possessing a special degree of aesthetic value or artful complexity, the kinds of texts usually studied in literature courses at university. Both usages are current within Literature and Science, sometimes used by the same scholars. The precise meaning of this word is not usually seen as important, but for most readers of this journal, it frames our basic disciplinary identities, so it seems worth paying more attention to what we mean when we use it. The value of literature as a subject of study is no longer taken for granted by university managers or government education policymakers, so some clarity on this point seems desirable.

It has become a critical commonplace since the 1970s that what defines "literature" in the restricted sense depends largely on collective and personal taste and institutional canon-building, and cannot be theorized in a coherent, abstract way. Its subjectivity is clear from how the *Oxford English Dictionary* defined this sense of the word in the 1860s, when it was still a "very recent" development: "writing which has claim to consideration on the ground of beauty of form or emotional effect" (*OED*, s.v. *literature* 3a). Besides aesthetic value and the power to move or delight an audience, subsequent attempts to theorize this category have focused on linguistic complexity or strangeness, imaginative richness, semiotic openness, the capacity to endure beyond the circumstances of composition and (increasingly) narrativity, but no adequate definition seems attainable. As literary theory has long recognized, literature is something we do to texts, a special way of reading or hearing them, as much as it is something perceived as inherent in the texts themselves; it is thus no basis for constructing a static, timeless canon (for contrasting versions of this view, see Fish and Eagleton). However, it is something we persist in doing to some kinds of text (like highbrow fiction) much more than to other kinds (like lowbrow nonfiction). This, in itself, helps to stabilize the notion of a literary canon.

Several literary critics have ended up rejecting the idea of "literature", turning instead to the analysis of discourse or culture in general and assuming the role of the cultural critic or cultural historian. Nevertheless, the conventional hierarchy of "literary" versus "other" texts has remained hard to dislodge within the literary academy. A more frequent response has been to avoid using the word "literature" in an overtly judgemental way, and just to get on with studying the texts we find most rewarding using literary methods. We still casually refer to these as "literary" texts. As the literature lists of highbrow publishers and the contents of our undergraduate curricula show, our choice of texts on which to devote sustained critical attention still heavily prioritizes the traditional literary genres of fiction, poetry and drama, albeit expanding its reach to embrace more lowbrow forms and marginalized authors. The place of prose nonfiction remains precarious, especially in studies of modern literature. Apart from a few individual authors of giant cultural stature, such as Emerson and Thoreau, the only modern genres of prose nonfiction to attract a

similarly sustained intensity of literary analysis are the various genres of life-writing and travel-writing, implicitly deemed more "literary" because of their personal narrative voice (a quality which also helps sustain the place of Emerson and Thoreau at the table). Scientific nonfiction, from treatises to introductory works, is excluded almost by definition.

One might have thought that the field of Literature and Science would offer a more secure place for scientific nonfiction within the literary academy. In many ways of course it does, and there are signs of further moves in this direction. But the force of the traditional canon of literary genres remains strong in our field, partly because of our defining dyad "literature and science" which invites us unconsciously to apportion texts to each category. I have been asked not to conceal where I am coming from in this paper, so let me state at the outset that I believe there to be little point in trying to obliterate the restricted concept of "the literary" from literary scholarship; instead, we should use this concept in a more self-aware manner to further our goals and make our literary histories more generically inclusive, more historically representative and less internally inconsistent. My views have been shaped by my training and primary self-identification as a literary scholar with a special interest in the poetics of nonfiction – whether modern science writing (usually seen as un-literary) or medieval legendary narrative (usually seen as fictional) – as well as by my participation in the history of science community, especially on the history of science in public culture. My PhD was in English Literature, my first postdoctoral position was in Irish and Icelandic Literature, and when I applied for my first teaching post, an interdisciplinary lectureship in Irish and Scottish Studies, I was as surprised as my new colleagues were to find myself in a history department; my focus on nonfiction may have played a part. All this has made me acutely aware of the practical and ideological as well as theoretical constraints on the range of methods and texts deemed appropriate for work in any one discipline, especially when money starts running out and the "core mission" looms larger.

Like literary studies generally, most Literature and Science scholarship takes one of two paths, depending on whether its primary goal is a deeper understanding of culture in relation to science, or a deeper understanding of particular literary texts in relation to science. Of course, many studies engage in both pursuits; but from the choice of texts bearing the main weight of analysis, it is usually clear which goal takes the lead.

The first goal, which may be labelled "culture-oriented", is met by a very wide range of approaches including (but not limited to) cultural-theoretical accounts of modernity, histories of scientific ideas or cultural negotiations, cultural phenomenologies informed by scientific debates, studies of scientific authorship or reading, rhetorical analysis of scientific discourse aimed at revealing how knowledge is constructed in culture, and (especially in our field) studies of the work of imagination in the practice, perception and commercialization of science. These approaches to literature and science make up just over half of the full-length research articles in the last ten issues (each) of *Configurations* and *JLS*; the proportion is slightly higher in *Configurations* than in *JLS*, reflecting the distinctive profile of our field in North America and its proximity to contemporary science studies and cultural theory (Rousseau 171-2). On both sides of the Atlantic, "culture-oriented" literature and science research is pursued not only by literary scholars, but also by scholars in neighbouring fields such as cultural studies, science studies (including history of science), cultural history and medical humanities. It has given us an enhanced sense of

the differential, multi-directional and multilayered interactions between scientific knowledge-making and literary production.

Such work generally sets out to analyse texts or discourse rather than literature. Obviously, science's meanings and functions within culture play out in various arenas beyond texts conventionally denoted "literary". Among its many other potential sources, then, "culture-oriented" literature and science scholarship frequently deploys methods of literary analysis on works of scientific nonfiction, both specialist and popular. However, because of the focus of this kind of research, such nonfiction works are rarely examined in depth as literary works. Brief summaries aside, they are typically mined for short passages exemplifying imaginative tropes, rhetorical devices or ideological commitments, although the explanatory power of more sustained close readings has been demonstrated in some classic studies (Myers, *Writing Biology*; Secord, *Victorian Sensation*).

Furthermore, although the broad textual reach of "culture-oriented" research does not require it to exclude nonfiction from "literature" in the restricted sense, these scholars frequently reaffirm such exclusion anyway. Casual allusions to "scientific and literary writing", assuming the two to be distinct groups of text, are found as much among historians of science as they are among literary scholars (e.g. Cantor *et al*., xix), even when the method involves analysing literary aspects of science writing. Nor are such exclusions always casual. One of the most insightful recent discussions in this vein, Martin Willis's *Vision, Science and Literature*, demonstrates the remarkably close alignment between the imaginative tropes, authorial intentions and functions of fiction and science writing in the period 1870-1920, concluding that the division between scientific and literary practices is sometimes very thin and "sometimes entirely eroded" (Willis 229). This implicitly challenges received understandings of literature as excluding science writing by definition, yet Willis resists making that move: science writing may ape literary writing, but it can never be literature itself, because he is working within a definition of "literary" or "imaginative writing" which restricts the latter to "works of fiction" and "other forms of narrative . . . that are part of a recognizable, if broader, definition of the literary in contemporary scholarship" (Willis 236 n. 17). Even at the risk of circularity, the pressure to adhere to conventional boundaries remains strong. These habits of framing do not impair the main arguments of "culture-oriented" works like Willis's, which are not primarily concerned with questions about the literary canon. However, their cumulative effect hardens the canon in its existing form, and reinforces the persistent and unhelpful assumption (made worse by the Science Wars) that to call a text "literary" or "imaginative" somehow implies labelling it as essentially fictional. Not all literature is narrative, let alone fictional narrative.

If, on the other hand, the main goal is what I call "literature-oriented", aiming to deepen understanding of particular literary texts and their manifold relationships with scientific thought and practice—a goal prioritized in just under half of the research articles in the last ten issues of *Configurations* and *JLS* and often marked in titles or subtitles playing variations on "Literary Works X and Science Y" or "Science Y in Literary Works X" —then the resulting research tends to lavish a much greater degree of specifically literary analysis on any one text than in most "culture-oriented" work. This, then, is where we must look for more sustained and in-depth analysis of scientific nonfiction. However, as if to justify that level of attention, almost all "literature-oriented" research on modern literature focuses on texts belonging to (or authors associated with) genres conventionally acknowledged as "literary" in the

restricted sense: chiefly fiction, but also poetry, drama, life-writing and travel-writing. This work can sometimes broaden the literary canon in its own way. One recent special issue of *JLS* (volume 6.1 from 2013) features three brilliantly successful contributions towards widening the conventional boundaries of illness narratives, and thus of life-writing more generally, by devoting serious literary-critical attention to narratives composed by ordinary people.

These genres aside, modern scientific nonfiction has attracted some analysis in the "literature-oriented" tradition. But these are exceptions to a general trend, and they cluster around a few specific sciences and periods. Charles Darwin remains a key focal point, especially in the wake of Gillian Beer's celebrated *Darwin's Plots* (e.g. Levine, whose *Darwin the Writer* asserts the literary status of the *Origin of Species* most unambiguously). Helped by the cultural prestige of "public understanding of science" (PUS), recent science writing for general readers has attracted much valuable rhetorical analysis, some of which displays a specifically literary focus (e.g. Eger; Leane). Another encouraging growth area has been natural-history writing, especially that written by or for women or children (e.g. Merrill; Myers, "Fictions"; Gates; George). Yet the promise of opening up similar perspectives on other branches of science writing is somewhat dampened by the tendency of much of this scholarship to define its object of study against male or grown-up science and its textual manifestations, demarcating natural history from science proper or popularization from science.

A similar boundary problem affects the neighbouring field of ecocriticism, which made great strides in recuperating nonfiction nature-writing as a fully-fledged literary genre in the 1990s, but partly by soft-pedalling or even overtly denying its permeable boundary with science and its writings. Counter-moves have not been lacking (Buell 397-423; Alaimo), especially from "culture-oriented" viewpoints (Heise), but science still typically functions as the non-literary "other" in this field. Many ecocritics are finding themselves marginalized within the literary academy as a result of their focus on an ideologically limited selection of nonfiction. In order to escape this ghetto, many have turned, not outwards to other cultural traditions of nature-writing or other nonfiction genres, but back into the traditional suite of literary genres to which their colleagues can most easily relate (Wallace and Armbruster 3-4). The pressure to adhere to the conventional "literary" canon cannot be underestimated, even among such radically minded critics as these.

Most "literature-oriented" research into modern literature and science situates scientific nonfiction as background for a text belonging to a less controversially "literary" genre: for example, as the discursive context within which, or against which, a chosen novel was written, rather than as the main focus of analysis. In the last ten issues of our two journals, only two "literature-oriented" research articles focus primarily on texts belonging to other genres: Emerson's essays, and an early modern astronomical treatise. This tendency of "literature-oriented" research persists even within the now widespread tradition of showing how literary texts do not merely reflect on or transform scientific ideas, but actively participate in the making of knowledge. This critical trope is familiar from other versions of "literature and", from politics to philosophy. It implicitly works to elevate the perceived importance and agency of the literary text, which in turn justifies sustained literary-critical attention to that text's inner workings as the primary object of interest. It challenges received understandings of the literary as an isolated, ivory-tower sphere of activity; but in most cases it reinforces received understandings of what texts qualify as literary.

Alongside these pressures which dog the sustained literary analysis of modern scientific nonfiction, there are difficulties of scale. In "culture-oriented" and "literature-oriented" literature and science scholarship, almost all the literary-critical attention devoted to works of scientific nonfiction, including much early modern work, has been of the fine-grained kind, designed to elucidate linguistic texture, leading metaphors, buried ideologies or myths, implicit narratives and moments of spectacular display. Like much of the work of rhetoricians of science, which informs many of these studies, its strength lies in the illumination of a text's most telling passages in dialogue with larger purposes and implications, rather than appraising the text as a composed whole in the way many literary critics approach a novel or epic poem: as a literary performance displaying aesthetically significant form. Even seminal studies of Darwin as an imaginative writer, from Hyman's *Tangled Bank* to Beer's *Darwin's Plots*, attend much more to the shapes of the implied narratives of causality or mythic and literary patterns structuring these writers' arguments, and to fields of allusion in selected short passages, than to the overall textual arrangement of these arguments and patterns. A similar focus dominates subsequent "literature-oriented" studies of other scientific nonfiction (e.g. Leane; O'Connor, *Earth*). Whatever the benefits of such an approach, our readers are left to conclude that the only large-scale form embodied in a work of scientific nonfiction is that of an argument, explanation or repository of information, and that any other formal aspects exist only at the micro-level or in isolated "literary" passages.

Part of the challenge here is the sheer discursive complexity of the works in question. Methodological weaknesses aside, Hyman was heroic to even attempt a literary analysis of Frazer's twelve-volume *Golden Bough*, and he can hardly be faulted for not producing an adequate account of its overall form. Even for shorter works, one of the biggest problems facing scholars who wish to conduct "literature-oriented" research on modern scientific nonfiction, arising from its largely absent critical tradition, is the lack of a commonly agreed generic framework to work with or against. This region of the literary landscape remains mostly unmapped beyond vague labels such as "essay" or "treatise". An excellent start has been made by rhetoricians of science, and by the growing number of historians of science who see literary history as an important building-block for their own work. Their analyses, however, prioritize methods from rhetoric, book history and reception history. Publishing formats and reader responses take centre-stage, with literary criticism used (if at all) only to show how readers are persuaded of a particular scientific truth or view of science.

The resulting generic profiles of scientific nonfiction either sidestep literary questions altogether—such as the generically meaningless category "popular science"—or embrace many different fictional and non-fictional, narrative and non-narrative literary forms under a single label such as "evolutionary epic", "reflective treatise", "familiar format", "seashore natural histories". Loose categories like these have enabled some tightly focused historical analysis and valuable departure-points for literary analysis (e.g. Eger; Secord, *Victorian Sensation*; Secord, *Visions*; King), but overall, this sector of the literary-historical map is a *terra incognita* whose very existence is not yet agreed by the literary academy. Historians' analysis of science writing has greatly invigorated our field, but it does not remove the need for more extended, macro-level literary-critical treatments of modern scientific nonfiction. On the contrary, its valuable insights make the extreme paucity of such treatments all the more glaring, because they raise questions still left largely unanswered. How, for

instance, do the many genres of science writing connect with the more familiar genres of literature? What place do they have in literary history? What manner of literary achievement do they represent (besides their scientific significance or pedagogic effectiveness)? How are we to recapture the pleasure felt by their contemporaries in reading them? Why are some of them more satisfying than others for present-day readers? General questions like these are rarely of more than passing interest in the various disciplines within science studies, but they are fundamental to literary studies, especially in its "literature-oriented" mode.

Recent "culture-oriented" work has shown how rewarding science writings can prove under the literary-critical microscope, drawing attention to the diversity of literary strategies found within such writings and to their cultural functions. Meanwhile the fertility of sustained "literature-oriented" approaches in this arena has been amply demonstrated in limited areas, such as Darwin's writing. There is, of course, a world beyond Darwin. The early nineteenth century may be the period in which the restricted definition of "literature" first gained ground, but as James A. Secord has shown, readers in this period engaged with reflective scientific treatises as passionately and imaginatively as with novels or epics. This blurs Thomas De Quincey's famous distinction between the educational but ephemeral "literature of knowledge" and the emotionally engaging and immortal "literature of power" and invites us to look more closely (Secord, *Victorian Sensation*; Secord, *Visions* 243-6; O'Connor, "Science"). Nor need we stop with the nineteenth century. Even in the heyday of literary Modernism, a movement often credited with completing the separation and elevation of "the literary" above matter-of-fact domains such as science, works of scientific nonfiction should (in T. S. Eliot's opinion) be included within the category of literature if they were deemed intelligible and significant enough (Whitworth 44-5).

With all this existing research to draw on, those wishing to undertake more sustained "literature-oriented" studies of modern scientific nonfiction cannot complain of any lack of equipment or inspiration. The point of doing this would *not* be to reduce the specifically aesthetic or creative aspects of literary writing to irrelevance or collapse "literature-oriented" approaches into a subfield of "culture-oriented" research. That research is already an established strand within literary studies: it operates independently of the literary canon and no longer needs to attack that idea to survive. Rather, the aim would be to show that features generally felt to distinguish canonically literary writing from other discourses are at work throughout (not just occasionally popping up in) much scientific nonfiction as well as in the better-understood genres of fiction, poetry, drama and life-writing—in all periods, not just in the pre-modern era before the aestheticization of the category "literature".

From a literary-critical point of view, of course, there are important differences between a specialist scientific paper and a work of science writing aimed at a wide readership (Myers, *Writing Biology*). Both make use of literary tropes, but the second will tend to do so in more overtly imaginative ways, so it presents a more promising starting-point for those whose primary goal is to elucidate "literature" in the restricted sense. That distinction is hardly new, but it is still often tacitly assumed (by literary scholars and science studies scholars alike) that the priorities of nonfiction science writing were, and are, always limited to the communication, promotion or decoration of scientific knowledge, and that their literary features are just tools to that end. One reason why works as dissimilar as Darwin's *Journal of Researches*, Miller's *Old Red Sandstone* and Frazer's *Golden Bough* were hailed as literary as well as

scientific masterpieces in their own time (and have been read as literature long after their science has become outdated) is that they speak to other aspects of human experience beyond science. They do not just mimic literature; they are a branch of literature, a branch which (like much nature-writing or lyric poetry) privileges non-narrative modes of organization and does not situate itself as fiction.

Attending in a more sustained, focused way to these wider alignments in modern science writing could enrich both our sense of how scientific meaning is culturally constructed *and* our understanding of the relationships between scientific knowledge and literary form. The dyad "literature and science" will then no longer be treated as an implicit dichotomy (as "literary writing and science writing") but as two categories which operate at different conceptual levels and thus overlap more intimately, like "literature and knowledge" or "literature and politics". Besides its "culture-oriented" potential, such an approach would enable us to broaden the literary canon without necessarily following Stanley Fish and other radical nominalists in rejecting the idea of literature altogether. I doubt that it will be possible or even advisable to dislodge most literary scholars' preference for devoting close attention to the more canonical genres. Yet a reminder that these do not constitute the limits of literature, even in the restricted and belletristic sense of the term, seems worth making, especially as our field comes under renewed attack from ideologies derived from purely utilitarian approaches to the hard sciences.

How will our colleagues in mainstream literary studies respond to this attempt at broadening their canon of genres? There are grounds for hope in the renaissance of literary-critical interest in one important branch of nonfiction—life-writing—and in the renewed public interest in nonfiction as a legitimate focus for creative writing, as seen in the acclaim earned by the geological writings of John McPhee in recent decades. "Creative nonfiction" is a recent coinage but hardly a new phenomenon, as the literature of science over the past few centuries bears out. It is, however, still largely uncharted territory for the literary critic, despite the riches brought back by recent explorations. It is time to start mapping it in earnest.

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