Constructing Texts in Fringe Science:

Challenges In Propaedeutics[1]

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When a colleague reviewed one of my books, he used the term *propaedeutics* to describe the work I was doing: digging deeply into a technical field and making it more approachable for lay audiences as well as scholars from fields other than nanoscience (Schwartzman, 2006). Propaedeutics refers to an introductory course into a discipline such as an art or a science, etc. Sir William Hamilton (1836) and Morris Kline (1972) characterized mathematics as the propaedeutic of all reasoning. J. D. Morell (1849) described Judaism as a propaedeutic to Christianity. A 1997 *Times Literary Supplement* book review by Colin McGinn more recently asserted that:

> … the job of philosophy is essentially propaedeutic, anticipating the news of the real knowledge-gatherers. Or again less ambitiously, philosophers are scientific commentators or PR people—analyzing scientific theories, inter-relating them, telling us what significance they have for us. (McGinn, 1997, n.p.)

Promoting a positive place for propaedeutics in democracy, McGinn identified its role as helping citizens and others know what deserves their attention.

As communication scholars interested in the rhetoric of science and technology, it is imperative that we develop a degree of familiarity with an individual or set of scientific or technological artifacts. The sophistication must be sufficient to understand the subject of study, although the level of familiarity may not enable us to actively participate in scientific research and technological engineering per se. We try to avoid Alexander Pope's (1709) consternation that a little knowledge is a dangerous thing. Much to the dismay of some of our colleagues, social scientists and humanists are often perceived by natural scientists as interlopers

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1 This essay was developed in conversation with Greg M. Wilson at the ARST Octavian table discussion on "Nanotechnology and Synthetic Biology."

rather than as colleagues. As such, some rhetoricians and social scientists have attempted to immerse themselves in the science and technology fields that serve as the subject of their scholarly activities. That role is assisted, and in some cases facilitated, by the propaedeutic scholar (Lyne & Howe, 1990).

Propaedeutics has its detractors. The anonymous author of a 1905 book review of George Galloway's *Studies in the Philosophy of Religion* made a similar claim linking psychology with metaphysics "with dire results to intellectualism" (Anonymous, 1905, p. 170). The characteristics of a propaedeutic scholarly work can open it up to jeers from some intellectuals who find the tireless collection of bits of information in order to compose a flowing narrative that fosters common understanding a pedestrian exercise.

For those who practice the art, propaedeutic approaches prepare students at all levels not only for subsequent levels of schooling but also for life after school, and they provide students with opportunities to engage in everyday, socially relevant activities that shape community and individual identities alike (Roth & Lee, 2005). However, propaedeutic work also refers to preparation that enables citizens, the public, and individuals from outside one discipline to introduce and maintain meaningful discourse between disciplines (McKeon, 1980). In this way, propaedeutics is the crux of all public and extra-disciplinary criticism. And in that sense, propaedeutics is a lot like mathematics and philosophy.

The public sphere is broken—at least as it functions in the world of emerging science and technology. Traditional efforts aimed at resolving some deficit in the public have been discredited (Irwin & Michael, 2003). Yet, few know much, if anything, about some of these emerging fields, and fewer still have any opportunity to interface with them at any level. In addition, for most of the public, there is a disinterest in emerging science and technology until the only role left for them is protest and indignation. Consequently, activities involving citizen participation in emerging science and technology decision-making have become more prevalent. How effective these activities may be has been the subject of much debate.

The traditional source for information about science has come through the mass media. The social amplification of risk (Kasperson et al., 1988) argues that risk is socially constructed and that one major influence on risk amplification (and in some cases attenuation) is the mass media. The role of the media in science and technology has changed dramatically. Traditional mass media—newspapers and magazines—have relegated the role of science and technology journalism to digital media. It is simply cost prohibitive for many newspapers to retain science journalists, and studies suggest the reading public has not demanded extensive science and technology coverage in newspapers (Pratt, 2007). Science television tends to focus on hyperbolic programming, though some documentaries are outstanding but underviewed. On the Internet, we find Wikipedia, blogs, and other digital venues filling the void. While many commentators deride digital science coverage as inaccurate, there is little empirical support for this point of view. Nonetheless, there are some demographic variables that must be taken into consideration, since digital resources are primarily consumed by younger, more educated, and wealthier populations.

Finally, we have the problem of public interest and attention. While it might be interesting for academics and public relations professionals to design public outreach and engagement activities, the effectiveness of such acts is wholly dependent on the willingness of the public to consume these activities. If we host a science café at a local bar and only college professors and graduate students attend, we may be excluding important target populations. Science museums do a fine job exhibiting new developments, but the population who visits science museums are educated and sophisticated while the general public often is not. As such, citizen outreach activities may not be optimal, as these activities may not be reaching the optimal populations, and digital ones are supplanting traditional print and television-based media. Taken together, the communication of science and technology with and to the public is very challenging.

When President Clinton adopted the National Nanotechnology Initiative, the initiative included a call for ethical, legal, and social implications (ELSI) scholarship. ELSI was a research program associated with the National Genome Research Institute, and it received some positive reviews. In response, teams of scholars came together to vie for National Science Foundation (NSF) nanoscience ELSI grants. One of the first grants funded involved a team on which I served while at the University of South Carolina. We brought together a statistician, an artist, a science fiction scholar, three philosophers of science, some engineers, a few chemists, and a communication professor who was a devotee of fringe science (me). In time, other programs surfaced at other universities, and research activities blossomed. A major component of most of their activities was citizen outreach and engagement. Assessment activities were mixed but, by and large, some members of the public learned a little about nanoscience, some were excited, and others were dismayed. Some engagement scholars learned some hard-fought lessons. Members of the public did not tend to understand much more after the engagement exercise than they knew beforehand. After some post-engagement exercise surveys reported the participants were polarized into more positive and more negative perspectives, some expressed concern whether their participation was relevant to decision-making, and others felt the activities were primarily mollifying rather than formative. These results do not seem to bode well for the public given the fringe science and technology horizon. In my humble opinion, contemporary fringe science includes a handful of subject issues, three of which have seemed to dominate the discussion.

Scholars in the rhetoric or science, technology, and medicine can contribute to public understanding by exposing to rigorous analysis the claims and counterclaims made by proponents and opponents. Exposing parties with special interests for their hyperbole, government promoters for their over-enthusiasm, and even civil advocacy groups for fear-mongering contextualizes or frames the debates over these advanced technologies and can provide entry points for public discourse.

Nanotechnology

Nanoscience is important for many reasons, including its economic growth potential. Developments are slowly becoming products and services. Nanotechnology is behind improvements in electronics, coatings, medical diagnostics and treatment, sunscreens, defense, and so forth. While nanotechnology has been more of an evolution than a revolution, nanoproducts are becoming common. Whether nanotechnology is "green" or not has become an issue. Indeed, recent claims regarding "green nanotechnology" have made substantive inroads into the rhetoric of nanotechnology. The public has begun to consume nano-products, though there remains considerable disagreement on the environmental health and safety of nanoproducts. Proponents of life-cycle analysis want cradle-to-grave assessments of nanoproducts, and some non-governmental organizations still call for regulations and moratoria.

Synthetic Biology

"Synbio" is genetic engineering on steroids. The field involves creating new biological systems and is an extension of synthetic chemistry. Rather than altering already existing strands, synthetic biology entails building from scratch. We already have international competitions called iGEM using bio-bricks to produce biological systems and operate them in living cells (iGEM, 2012). There is a large and growing movement of biopunks, known as DIYbio (DIYBIO, 2013; Wahlsen, 2012). This movement encompasses a network of citizen scientists and do-it-yourself biological engineers who experiment in garages and home laboratories and see themselves as an alternative to corporate science. The guru of this scientific development is Craig Venter who funded Celera Genomics and created the J. Craig Venter Institute, which helped engineer the first cell with a synthetic genome (Fox, 2010). With potential applications in sustainable agriculture, alternative energy production, and environmental remediation, many scientists are excited about the applications of synthetic biology. On the other hand, there are a plethora of concerns about creating new life and how it will interact with life forms that evolved more naturally. Given how easy it is to buy gene segments for a few thousand dollars over the Internet, the Department of Homeland Security (DHS) and the Federal Bureau of Investigation (FBI) have been following the claims and counterclaims of synthetic biology practitioners (You, 2010). Concerns from groups, such as the ETC Group in Canada, involve the lack of transparency and public understanding (ETC, 2010a).

Geo-Engineering

Geo-engineering involves deliberate intervention into the planet's climate system to mitigate climate change. At this point in time, we are seeing laboratory-directed research activities involving two primary categories: carbon dioxide removal and solar radiation management. Most proponents argue that geo-engineering should be used as a supplement to more traditional conservation-based efforts. If we believe we are in a climate crisis, then these options may be relevant (Kintisch, 2010). Efforts include underground sequestration of carbon dioxide to blasting sulphate particles into the stratosphere, dumping iron particles into the ocean, and more. Amid some public unease and the absence of robust public debate, it might be important to provide some mechanisms for public participation (ETC, 2010b).

Fringe sciences, like those mentioned above, are complicated. While information about them is available, these sciences have not made significant inroads onto the public agenda, by and large. How, then, can the public sphere function in the twenty-first century? Engagement activities, while desirable on their own, may have limited impact on how decisions are made. The role of the propaedeutic communication scholar is to find creative ways to learn and report from the fringe by uncovering proponents and their arguments and by directing attention to the informed debates that are undertaken in the name of fringe science. This process involves some sensitivity to conflicting information separating fact from fiction, an understanding of the special defense and homeland security-related issues that creep into these debates, a willingness to engage the scientific and engineering community over their motivations underpinning their research agenda, a strong sense of research ethics, and much more. The propaedeutic communication scholar must learn the language and process of science to understand how and why scientists are drawn to research. While it may not be necessary to commit to earning advanced degrees in science and engineering, the propaedeutic communication scholar finds his or her literature from more traditional communication and rhetoric sources supplemented heavily by readings in science and engineering, attending meetings held by scientific professional societies and organizations, and keeping abreast of science policy debates at many levels of government here and abroad. This career choice is not for everyone, although it can present rewarding and wonderful opportunities to "be relevant."

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