Stuart Mawler
smawler@gmail.com
http://www.mawler.com
December 2005

Elitist Language in Physics: The Self-Image of Physics

Abstract

Physics has long been accused of elitism in its dealings with other sciences and those outside of science. This paper looks for evidence of such elitism in the language used by members of the American Institute of Physics during the immediate post-WWII period of approximately 1945-55, when the physics profession was feeling the affects of atomic weapons and the perceived communist threat. The archival research uncovers clearly elitist language used by the physicists in three general categories: 1) professional-scientist elitism (scientists versus outsiders and the uninitiated); 2) inter-disciplinary elitism (e.g., physics versus biology or chemistry); and 3) intra-disciplinary elitism (e.g., an elite cadre of physicists directing the future of the physics discipline). This paper relies on the archives of the Physical Sciences Division collection at the National Academies.

Introduction

Leadership is part of the natural structure of any group; some persons generally come to dominate the group, particularly when the group is represented by a formal organization. Even without a professional society, the existence of a discrete profession is enough for self-organization. A physicist once noted that the profession of "physicist" is enough to create self-organization, saying, "The community of interests and objectives both brings about and gives significance to the self-organization of scientists".[1]

Elitism is the advocacy of, or reliance on, the leadership and dominance of an elite (in a society, or in any body or class of persons—hence "elitist").[2] Since the physicists themselves maintain keen awareness of organization within their community, it seems safe to assume that they recognize both the need for leadership and the separateness of physics from other

endeavors. Where there is a need for leadership, there is often an implied struggle to control that leadership. Where there is separateness, there is often a desire to highlight the unique and special qualities of the separation. In both cases, elitism can become a key part of the equation.

I assert that those on the inside (physicists) consider physics to be an elite science; they feel other sciences do not compare in importance to physics, which is the fundamental building block of all scientific endeavors. Physicists assume that their field is the paradigm to which other sciences aspire. I have chosen to focus on the language used by physicists in letters, meeting minutes, pamphlets, and other primary sources found in the archives of the National Academies as a means to prove the existence of language promoting physics as an elite science.

I believe that elitist language within physics is used to enhance the position of a particular group (generally "physicists"), allowing it to assume a leadership or dominant position. The leadership or dominance can come in many forms, including political power or intellectual superiority. The elitist language often directly compares one group to another, though either group (i.e., the elite group or the group over which influence and leadership is sought) may be subjective and ill defined (e.g., "lay persons") to those outside the discussion.

The elitist language used by the physicists in my sources falls into three general categories: 1) professional-scientist elitism (scientists versus outsiders and the uninitiated); 2) inter-disciplinary elitism (e.g., physics versus biology or chemistry); and 3) intra-disciplinary elitism (e.g., an elite cadre of physicists directing the future of the physics discipline). These three types form a continuum, where the issues become increasingly internal to physics, with professional-scientist elitism being at the most outward-looking end of the spectrum and intra-disciplinary elitism being at the most inward-looking. Further, each type of elitism can create a crisis where the elite group must decide whether to engage with (reach out) or disengage from the groups over which

the elites purport some level of leadership or dominance (e.g., scientific outreach to the lay public; cooperation between physics and chemistry; or outreach to physics students by leading physics organizations).

For this research, I specifically parsed the archives of the Physical Sciences Division collection at the National Academies. Though the collection is quite broad, covering a wide variety of topics and sub-committees, including everything from the American Institute of Physics to the Quantum Theory Committee, I quickly narrowed my research to the American Institute of Physics (AIP) in the immediate post-war period, up to approximately 1955/56.

I will begin by investigating two specific post-war objectives the AIP considered critical, according to the archival record, concluding with a more general discussion of the AIP's view of physics in the same time period. The first AIP objective that I assess is the creation of a new journal, which forces members to address the insider/outsider dynamic of any communication vehicle. The journal debate exists primarily at the professional-scientific end of the elitism scale, highlighting a crisis of engagement versus disengagement with the lay public. The second AIP objective leveraged in this paper forms a critical part of any form of elitism—the admission of new members to the group and the certification that those members have enough qualification to participate. While this narrative emphasizes intra-disciplinary elitism, it ranges widely, covering all aspects of elitist language. Naturally, elitist language will be found outside of these two narratives, and in the final section I bring to light many statements that complete the argument, emphasizing professional-scientific and inter-disciplinary elitism.

Creating *Physics Today*

The American Institute of Physics (AIP) began officially discussing the possibility of publishing a new journal in 1945, when a member "recapitulated the apparent need for a general

interest journal",[3] with other early reports indicating that "all commentors [sic] favored the general interest journal […] with general agreement that it should be non-archive on the whole [and] newsy". [4] From the outset, this narrative tells the story of professional-scientist elitism, where the initial outreach goals compared to the final resulting publication representing a shift from engagement of the lay public to disengagement and social isolation within the world of physics. In fact, the AIP Policy Committee itself notes that there are "conflicts between the 'internal' and 'external' purposes of the new AIP journal".[5]

One of the earliest and most detailed proposals for the new journal rests firmly in the engagement or 'external' camp. The proposal's author Dexter Masters, begins by emphasizing "the need for 'a unifying publication for physics' which will also deal with 'the growing impact of physical science on social, national and international life,' and will provide 'non-specialist…yet authoritative coverage…of physics and its applications to human welfare…for the educated layman'".[6]

Masters further highlights the outreach concept, while simultaneously pointing out the lower "quality, value, or character"[7] of the audience outside of physics when he argues that "emphasis [should be] given to extending the magazine's audience, rather than publication for a static and known group", which might be accomplished with "a slight alteration of values, and a slight *debasement of quality*", allowing "that a magazine generally of the kind proposed could reach a circulation of 100,000 or 200,000 or more" [emphasis mine].[8] Note that Masters specifically uses the term "debasement of quality", when referring to the wider distribution (or outreach) of the journal. Finally, Masters' concluding paragraph is the standard-bearer for the forces of engagement, when he notes that such a magazine is "inextricably bound up with public relations for the physical sciences in the modern world" and "that it would be a public service, and hence

is a professional obligation, is equally plain",[9] casting the duties of scientists in something like the mold of the colonial powers' 'civilizing mission' rhetoric, and falling well within the scheme of professional-scientific elitism.

When discussing the mechanics of communication with a less-technical audience, Masters recommends commercial magazine engravers and printers[10] because of the "better quality of work obtained, and by the opportunities to utilize presentation techniques (e.g. two color printing at no extra premium) not possible with other [scholarly journal] printers".[11] Masters' implication seems to be that the average reader needs flashier material, reliant on "color" printing and layout technique to convey its message, rather than the mere text of a scholarly journal.

While apologetic in his presentation, Masters asserts, "the magazine projected would be heavily illustrated—about 50%", but that illustrations are to be used *"in combination"* with text to "get across most effectively what needs to be got across" [emphasis in original].[12] Later, Masters specifically states that "authority and graphic presentation are not often found together in articles on scientific developments—though there is no inherent reason why they should not be".[13] The discussion of graphics and illustrations is an appeal to the AIP Policy Committee to approve the use of graphics and illustrations, where such use might have been considered less than scholarly.

In addition to separating the professional-scientific elite from the educated layman, Masters also separates science from journalism when he argues that they should "make full use of effective publishing and editorial techniques", "without compromising the standards of intelligent journalism on the one hand or the standards and authority of the Institute on the other".[14] Clearly, the standards of science are embodied by the AIP, and these standards are higher than those found in journalism.

Regarding the selection of material for the journal, Masters proposes giving "considerable autonomy" to the staff on the one hand, but returns to say that "the magazine, in short, should be staff-written but, in part at least, the editors would serve as processors of material *acquired from beyond the staff*. Careful checking of data used and the concurrence of those consulted would, of course, have to be standard practice" [emphasis mine].[15] An editorial board from the AIP would be needed since the published material would be intellectually out-of-reach of the staff.

As the debate around the potential journal continues, a counter-proposal is made to partner with the *Atlantic Monthly*, resulting in a science section inside that magazine at a lower cost than Masters' proposal, though the later proposal continues the outreach emphasis. A report to the Policy Committee concluded that the *Atlantic Monthly* "evidenced a most understanding interest in the problem, especially because they are already striving on a high intellectual plane to present straightforward, thought-provoking ideas to their some 160,000 key educated laymen subscribers",[16] emphasizing their intellectual credentials, lay audience, and subscriber base. Note, however, that the *Atlantic Monthly* subscriber base is on the upper end of the distribution that could be gained with the "debasement of quality" mentioned by Masters. Also of note is the emphasis on "key educated laymen subscribers", who, no doubt, are the only laymen capable of comprehending the world of physics. Another similarity with Masters' proposal is the view of the journal staff. Despite the "intellectual plane" of the *Atlantic Monthly*, "scientifically appropriate and authentic handling would be ensured through the guaranteed autonomous control by the AIP".[17]

Finally having decided to move ahead with an independent journal, the AIP approaches a Dr. Mills as a possible editor for the new journal.[18] Writing to Mills, the AIP defines the journal, saying, "it will be non-archival in character, but will contain authoritative, accurate, and

interesting information on 'what's happening in physics.' […] The Institute is now seeking to find a suitable and well qualified editor for this journal, one who can write well and interestingly, well above the quality commonly found in newspaper reporting, but *in a form somewhat more understandable by the average scientific reader than is common or even desirable in a technical scientific paper* that would be published in an archive journal" [emphasis mine].[19] The description of the proposed journal highlights two key aspects of the language of science. First, science is of higher quality than newspaper reporting, essentially indicting all journalism outside of science journalism. Second, the quote specifically acknowledges that technical language is intentionally written to be inaccessible to the average reader. Confusing language keeps the uninitiated from understanding anything that is happening inside science, making technically-oriented journals fall on the side of disengagement.

The debate between engagement and disengagement brought to light in the technical language of science is also clearly emphasized by the debate over the journal's name. Masters suggests "that a name of [a] general kind be used", since "such a name does no violence to the basic purpose of the magazine nor to its sponsorship, and carries itself less formidably and to a wider audience than a specialized name—such as "Physics"—ever could",[20] showing his opinion of the general audience that might be turned away by something so specialized and formidable as "physics". In September 1947, the AIP is still arguing about the name of the magazine. Echoing Masters' proposal, the Policy Committee feels the concern is to "choose a name more effective than PHYSICS in implying the non-technical, current-interest character of the new magazine", with the top four options being "Physics Outlook", "Physics News and Views", "Physics Frontiers", and "Physics News", with "Physics Outlook" winning.[21] Despite the concern around

accessibility, all the proposed names contain "physics", seeming to indicate a shift toward disengagement.

Once the journal is in publication, the shift to disengagement is complete. Announcing the free distribution of *Physics Today* to all AIP members as of 1953, an AIP report quotes from the journal itself, saying, "The value of Physics Today, as a property of the Institute and its members, is related on the one hand to the number of physicists it reaches, and on the other to the nature of its contents. The first of these considerations has been met by the Institute in again providing general circulation of Physics today to all members; the second will be satisfied largely to the extent that physicists support and make use of the journal as a medium for the advancement of their science and for the information of the profession".[22] The AIP chooses to disengage, retreating within a journal that primarily serves the purposes of the physics profession, insulating them from those outside the profession. Ironically, this disengagement speaks to elitism just as well as Masters' language about the lay reader.

Defining the Physicist: Classification, Certification, Curricula, & Joining the Club

When discussing the education of scientists immediately prior to the end of the war (in February 1945, with V-E Day on 8 May, and V-J Day on 15 August), but with the end looking clearly in sight (at least in Europe), an AIP report sets the tone for the immediate post-war period, saying, "To be sure, the experience of war work has in many instances proved to be as valuable as formal graduate study, and it would be regrettable if a lack of the doctorate should be over-emphasized when accomplishments are available as a basis of judgment. For many, however, there is no full substitute for further graduate training".[23] In the post-war world, the AIP finds itself increasingly concerned about what it means to be a physicist, who gets to

determine the qualifications of a physicist, and how new physicists are nurtured, educated, and brought into the social group. During the war, elite units of physicists solved highly complex and cutting-edge problems; the credentials of the team members could not be in question since they were crafted by real work done in the name of national defense. Following the war, the situation would change as men return from the war and complete or begin programs of study in science, programs expanding to meet the needs of American economic, military, and industrial hegemony. As the same report states, "[…] Physics is assuming a major role in the nation's service".[24]

The narrative of defining physicists can actually be separated into two smaller narratives, 1) certification of physicists and 2) secondary education, where the whole range of elitist language is used, combined with additional crises of engagement versus disengagement. The certification and qualification narrative begins with a draft pamphlet intended to assist students in making proper decisions regarding a possible physics careers. The pamphlet, appropriately titled "Careers in Physics", notes that "the National Roster of Scientific and Specialized Personnel lists some 13,000 persons as specialists and students in the field of physics, of whom perhaps not more than 9000 or 10,000 have sufficient training and experience to be called properly physicists".[25] In this quote, the field is set in several ways. First, the club of physicists is small, and, of that small group, only a select few are "properly physicists". Secondly, the training required to be a physicist is difficult and significant since a large portion of those who are already specialists and students do not have it in sufficient quantity or quality. Finally, there is an implication that some additional legitimizing force is required to label a person a physicist, since those not sufficiently trained or experienced are recognized by the National Roster. It seems clear that ordination as a physicist comes from the AIP, since that is the author of the

pamphlet. The pamphlet further notes that "the highest rewards and the greatest satisfaction comes from those who are best suited, intellectually and personally, to the profession and whose training has been sufficiently extensive and intensive to carry them to the limits of their own abilities",[26] summarizing that "a high level of general intelligence and the ability to apply this intelligence are prima requisites".[27] Only those of high intelligence need apply.

The pamphlet goes on to assert that a physicist's career "progress is largely dependent on his personal qualifications and abilities",[28] echoing the sentiments of Merton's norms, which emphasize the superiority of the science profession over other human endeavors.

However, it is not simply intelligence that is required. Without "some means of identifying and indicating the level of scientific competence of the individual scientist", "much confusion may result and consequently damage the prestige of science and scientists".[29] The group (scientists) needs to be protected from pretenders who might detract from the elite status. Further, "such confusion can only result in undue exploitation of scientists in their employment".[30] Scientists have certain perquisites that come from their professional-scientific elite status; without proper identification, some undeserving persons will get into the club and tarnish its image.

With a small group of people, classification is unnecessary; members can be qualified on an individual basis and often on reputation (either their own or that of their mentors). As the AIP Policy Chairman notes when discussing certification of physicists and physics programs, "the increasing number of physicists will soon force some method of accrediting or classification or even licensing, however distasteful".[31] The tone of the remark indicates that the elite group prefers to continue operation as a network identified by reputation and ability, but the landscape no longer allows it. The elite inner circle is then struggling with the necessity to determine who

should be in the group, ensuring that it remains essentially elite, though significantly expanded in scope, making this both a case of professional-scientific elitism and intra-disciplinary elitism.

The professional-scientific side of the debate comes out in a report highlighting the dangers of possible government interference in the form of regulation, noting, "these regulations can lead to regimentation if scientists are dilatory in presenting *the peculiar needs of their way of working*. It is possible now to bring to bear the necessary advice so that regulations permit maximum freedom for scientists working for the Government either directly or indirectly" [emphasis mine].[32] Scientists require protection from those outside the professional-scientific club since their needs are "peculiar" and cannot be grasped by government regulators.

The same report takes issue with the Civil Service policy of qualification exams open to all, a policy intended to make Civil Service open to any capable citizen regardless of pedigree. The report argues, "there is continually in Government, both Federal and local, considerable pressure towards the abolition of all educational requirements. The theory is that no public position should deny the application of any citizen who wishes to try for the employment and that the examination should, therefore, determine whether the man is qualified or not, rather than any fixed educational requirement. However, experience shows that the fixed educational requirement is of the utmost importance in reducing the number of applicants to reasonable proportions and preventing the entrance to the examination of persons who by reason of the inadequacy of the examination process to determine real accomplishment may succeed in slipping through, especially when ratification preferences are given to certain groups".[33] The report is unambiguous in its position that the Civil Service exams cannot possibly measure the qualifications of a scientist. Physics is beyond the reach of the uninitiated and any testing should not be open to the masses, but only qualified candidates. It is possible to suppose that the

problem is the ability of any test to adequately measure aptitude, but such a response is likely a modern answer to the question.

A much more likely response to the issue of Civil Service testing is that the AIP feels a test for scientific aptitude would be appropriate only if created and sponsored by the professional-scientific elite. Evidence for this attitude comes from correspondence between the AIP and the Educational Testing Services (ETS), where the AIP is "wondering if it would not be possible to devise some kind of achievement test which could be taken voluntarily by physics majors at graduation or possibly when they achieve graduate degrees which would have the same advantages as an accrediting system without any expense to the Institute of Physics".[34] This proposal is exactly what the physicists lamented when it came from the government in the form of Civil Service entrance examinations, with the major difference being the direct involvement of the AIP's professional-scientific elite in its creation.

Finally, during the same time period, the AIP begins considering student chapters of the organization at universities. While not specifically a form of certification, it is a mark of legitimization to belong to the leading organization for physics. The students seem to understand this implicitly since, according to the Tufts University Physics Department, "the students all seem to respond favorably to this as a method of speeding up their maturation as professional physicists".[35] Joining the official club is required for "joining the club".

Since a properly certified physicist requires significant amounts of education, the process needs to start early, so the AIP concerns itself with the details of secondary education. Discussions of high school education lend themselves to professional-scientific elitism since physicists and educator are inherently dealing with lay public. An AIP report falls clearly into this category, when it says, "those concerned with secondary education are moreover confronted

by a sweeping fundamental difficulty in that the American people are apparently not willing to devote a large enough share of the national income to education, nor to accept *a generally different educational course for the gifted, as opposed to the average student*" [emphasis mine].[36] Through the combination of secondary education and physics, the theme of gifted versus average students takes on the tenor of elitism. Only the gifted students will have aptitude with physics, so these students should be separated out to work on such things.

While setting up a conference on secondary education, the language moves from professional-scientific to inter-disciplinary elitism. When deciding whom to invite to the panel, a member of the NRC suggests to the AIP coordinator "that you may find John Mayor, Director of the AAAS Science Teaching Improvement Program, to be extremely helpful".[37] However, AIP's reply, which makes specific mention of Mayor in the negative, says, "the list of conferees, with the possible exception of Eurich and Carleton, consists exclusively of those whose primary concern is with the physics field",[38] which seems innocuous enough, except that it specifically is meant to eliminate all non-physicists from the conference on education. Since Mayor is qualified primarily in education and science in general and not in physics, his opinions are not sought in this conference on education. An exception is made for the American Association of Physics Teachers since that is a member society of AIP whose members are, ostensibly, trained in physics.

Finally, in a paper likely provided at the secondary education conference, one of the problems associated with physics education is that many teachers "are biology or chemistry majors 'requested' to teach a class or two of physics".[39] The implied problem is that the sciences are so different that skills from another discipline are not sufficient to teach physics. Later, the same document seems to elevate the profession of physics teacher to an almost religious calling,

saying, "a good physics teacher should regard his calling as a real lifetime responsibility".[40] A higher calling requires devotion, which can only be achieved through specialization.

Beyond the Narratives: A Physicist-centric Model of the Solar System

Elitist language might be expected in specific narratives, where there is an objective or a goal (e.g., publication of a journal or education and certification of physicists), but may be less prevalent in general discussions. However, statements made regarding the superiority of physics are scattered throughout the archives during this time period. These statements fall into the first two categories of professional-scientist and inter-disciplinary elitism.

The inter-disciplinary elitism covers a broad spectrum beyond its disciplinary knowledge. Physicists have a superior organization, as noted by a report that states, "The organization of physics in America has been increasingly studied as an example. Representatives of various planning and governing committees of psychologists, geologists, and biologists have for months frequently consulted the AIP on general matters of establishment, development, experience and policy".[41] The organizational superiority is so pervasive that it stretches even to their offices, of which the report says, "The impression this handsome building makes on physicists, educators, Government officials, industrialists, and others is considerable and favorable. […] It is significant that several other organizations having followed with interest the Institute's experience, are now taking steps to acquire better headquarters' facilities".[42]

If there were any question about how those in physics view their work, an AIP Director's report clinches it with the statement, "our science is so powerful a field of human activity that we cannot escape and must not shirk such responsibilities".[43]

Some of the most notable examples of inter-disciplinary elitism come from the "Careers in Physics" pamphlet, which explicitly sets forth what it means to be a physicist.[44] The document

begins with a paragraph stating, “Physics is in many respects the most fundamental of the sciences. It deals with the laws describing the behavior of matter, and the nature and transformation of energy. *It has been called the king of the sciences* just as mathematics has been called the queen. It is the foundation on which engineering and technology are built” [emphasis mine].[45] This document distinguishes physicists from “the chemist, the doctor, the biologist, the engineer, and others” by noting that a physicist “may be *capable of solving new and difficult problems* which have not been formulated into standard practice and which require going back to first principles and fundamentals” [emphasis mine].[46]

The pamphlet goes on to quote several unidentified physicists, making clear inter-disciplinary distinctions. One such quote addresses the physicist/engineer distinction, saying, “the physicist is best on those problems about which nobody knows anything or on which no one knows how to proceed”, further noting that “the average engineer is better than the physicist”, when there is a “well-defined program which can be followed”.[47]

Another anonymous quote places physics at the basis of almost every other field of endeavor. The quote reads, in part, “Who better than a physicist should be capable of understanding the fading of dyes, the action of drugs, the fractionation of petroleum products, the behavior of metals, plastics, and rubber under conditions of use, the profound differences in matter which are brought about by subtile [sic] rearrangements of the atoms within the molecule, the complex phenomena which take place within a living body? Our methods are fast and accurate, our instruments are capable of giving us specific information unobtainable by other means, our approach to problems is along fundamental lines; indeed our familiarity with electrons, neutrons, ions, atoms, and molecules, the very building blocks of nature, and with the many types of forces

binding these parts into the whole should place us in an advantageous position among research scientists, both academic and industrial".[48]

Another anonymous quote not only places physics at the basis of all science, it argues that other disciplines agree, saying, "The importance of a knowledge of physics is recognized by investigators in other fields of science. Research in any field can proceed only so long as improved methods of making accurate measurements are developed. Mensuration is a part of physics".[49] The quote captures mensuration (measurement) completely within physics, meaning that everything comes down to physics. Finally, yet another quote specifically highlights the medical discipline, saying, "Men of medicine and surgery, always good biologists, are now conscious of the fact that they should be trained in physics as well".[50]

Broader professional-scientific elitism is clear in discussions (often by personal letter) of the contributions of scientist to politics. One AIP member writes, "There is one subject on which I should like to expand somewhat, and that is the question of scientists in national and world problems. If anything, my feelings are even stronger than those indicated by the rest of the Committee, regarding the need for participation of scientists in world problems. […] International liaison at the scientific level puts men from different countries on common ground, since the scientific language is truly international. Science and technical progress are certaily [sic] well served by international exchange of views and knowledge".[51] Completing his thought on the next page, he writes, "But beyond assistance and collaboration on scientific matters, more general problems involving international relations might well be helped by participation of scientists".[52]

The Director's Report for 1955 makes a pitch for the value of physics and the need for public veneration for the discipline, saying, "In time, the motives and the accomplishments of physicists

will gain by their merit the understanding and approval of the public. But if it takes too long, there will be a dangerous interim *famine* of scientific leadership. *The attack on ignorance and disease will be delayed and the forces opposed to human freedom may prevail*" [emphasis mine],[53] noting also that "the AIP has just now established an office of information and public relations",[54] which will surely be helping the populace completely understand how physicists are single-handedly holding back the "forces opposed to human freedom" and attacking "disease" in a purely objective manner. This is a case of fear mongering of the most obvious type, with the AIP placing physics and physicists in the critical path of developments for which they are only marginally responsible (i.e., ignorance and disease). Also notable is the use of words like "famine", which play on the recent memories of starvation in Europe following the war and the attendant fight against communism. Phrases like "forces opposed to human freedom" also clearly reference the communist threat, which is somewhat notable, coming just ahead of Sputnik, and several years after the first Soviet nuclear weapons test. The report emphasizes this connection later, saying, "mounting evidence of Soviet progress in science has helped to bring about the recent improvement in selective service and reserve pressures for scientists".[55]

Later, the same report laments the lack of interest in physics by the general public when it says, "physics, which has done so much to create the material aids to modern living, to *establish an ethics and a culture founded on objective truth and even to preserve freedom itself*, now ironically meets in the home and family disinterest, aversion and sometimes even apprehension" [emphasis mine].[56] The most interesting point in this sentence is how physics (not science generally) created a culture of objective truth and preserved freedom. Clearly, physicists are riding high on the after effects of atomic energy, rocketry, etc., but this statement hits at something more profound. Later, what might have been a single statement is backed-up with

another, reading, "Numerous opportunities, often in the form of urgent appeals, arise for some well-qualified person to address high school and public gatherings about physics, *the ideals of physicists* and the advantages of a career in this field of science" [emphasis mine].[57] The rhetoric of cultural foundations and physics is not idle chatter; physicists possess coherent sets of ideals that can be articulated to high school children needing direction.

Conclusions

The language is clear: science and physics are guiding lights for society. Physics, in particular, is the paradigm of sciences—the "king of sciences". Both professional-scientist and inter-disciplinary elitist language appear in some way in all three sections of my research. Notably, however, only the narrative on defining physics presents any significant intra-disciplinary elitism. Perhaps the overtly promotional nature of some of the writings explains the lack of intra-disciplinary elitism outside of the certification of physicists.

While I feel that the evidence of elitist language is clear in the written record, what is not clear is just how much the elitist language corresponds to elitist thinking. Is the language actually being used to create wedges between groups, or is that reading a result of my own political perspective and the language is merely common to the particular field, social group, and time period? The ability to provide a solid answer may be limited, though ethnographic techniques might offer some opportunities in this area.

More concretely, my research practically begs to be extended beyond this survey to include a comparison of physics with other disciplines, either in the sciences (e.g., chemistry) or within technology, to see if the use of elitist language is the same. Specifically, I have labeled a sub-group of high-tech workers I call the High-tech Ultra Elite (HUE), which often leverages linguistic techniques (among many other cultural devices such as literature and film) for self-

segregation and organization. Any comparison of the somewhat well-defined world of physics with this more loosely-defined social network that I call the HUE would require significant background to establish the latter group's existence, but would end up with a textual analysis of the correspondence among members of the group. The correspondence would be analyzed for its use of professional-technologist elitism (e.g., IT versus the Marketing staff), inter-disciplinary elitism (e.g., programming versus testing), and intra-disciplinary elitism (e.g., hard core developers doing cutting-edge work versus business-oriented developers working in COBOL on a mainframe). Then the two instances of elitist language can be compared, looking at the situations in which they are used and qualitatively assessing the 'depth' of their rhetoric, while taking the cultural context of each into account.

A comparison between physicists of the post-war era and the HUE of the modern era may shed light on some potential parallels. According to the AIP Director's Report for 1951, a survey sent to all AIP members (the number of replies is not stated) reveals, "45% of the reporting physicists held Ph.D. degrees and 27% master's degrees. The median age (excluding graduate students) was 37. This is low among the branches of science and even lower among professions in general. In the newer specializations such as quantum physics and atomic energy, the median age is lower, as would be expected, than for physicists as a whole".[58] Since similar statements could be applied to high-tech work the possibilities for further research along a number of lines is quite broad.

Stuart Mawler
smawler@gmail.com
http://www.mawler.com

Sub Collections Accessed & Reviewed

1. Physical Sciences Division: Institutions Associations Individuals: American Institute of Physics: Policy Committee: Meetings: Minutes: 1945-1948.

2. Physical Sciences Division: Institutions Associations Individuals: American Institute of Physics: General: 1945.

3. Physical Sciences Division: Institutions Associations Individuals: American Institute of Physics: General: 1946.

4. Physical Sciences Division: Institutions Associations Individuals: American Institute of Physics: General: 1947.

5. Physical Sciences Division: Institutions Associations Individuals: American Institute of Physics: General: 1948-1949.

6. Physical Sciences Division: Institutions Associations Individuals: American Institute of Physics: General: 1950-1954.

7. Physical Sciences Division: Institutions Associations Individuals: American Institute of Physics: General: 1955-1956.

8. Physical Sciences Division: Institutions Associations Individuals: General: 1946-1954.

9. Physical Sciences Division: Committee on Fundamental Physical Constants—Joint with Division of Chemistry & Chemical Technology: 1947-1950.

10. Physical Sciences Division: Committee on Mathematics: Advisory to ONR: 1948-1950.

11. Physical Sciences Division: Committee on Mathematics: Advisory to ONR: Beginning of Program: 1947.

12. Physical Sciences Division: Committee on Mathematics: Advisory to ONR: Applications for Research Projects: Accepted: 1950.

13. Physical Sciences Division: Committee on Nuclear Science: Subcommittees: Symbols Units & Nomenclature: General: 1954-1961.

14. Physical Sciences Division: Committee on Nuclear Science: Subcommittees: Symbols Units & Nomenclature: Appointments: Members: 1957-1960.

15. Physical Sciences Division: Committee on Nuclear Science: Subcommittees: Nuclear Constants: General: 1947-1949.

16. Physical Sciences Division: Committee on Nuclear Science: Subcommittees: Nuclear Constants: General: 1950-1956.

17. Physical Sciences Division: Committee on Nuclear Science: Subcommittees: Nuclear Constants: General: 1957-1962.

18. Physical Sciences Division: Committee on Nuclear Science: Subcommittees: Nuclear Constants: Appointments: Members: 1948-1962.

19. Physical Sciences Division: Mathematical Problems to be Solved for use in Theoretical Physics: 1947.

20. Physical Sciences Division: Committee on Algebraic Numbers: 1920-1923.

21. Physical Sciences Division: Quantum Theory Committee: 1928.

Stuart Mawler
smawler@gmail.com
http://www.mawler.com

Sub Collections Referenced in End Notes

1. Physical Sciences Division: Institutions Associations Individuals: American Institute of Physics: Policy Committee: Meetings: Minutes: 1945-1948.

2. Physical Sciences Division: Institutions Associations Individuals: American Institute of Physics: General: 1945.

3. Physical Sciences Division: Institutions Associations Individuals: American Institute of Physics: General: 1946.

4. Physical Sciences Division: Institutions Associations Individuals: American Institute of Physics: General: 1947.

5. Physical Sciences Division: Institutions Associations Individuals: American Institute of Physics: General: 1948-1949.

6. Physical Sciences Division: Institutions Associations Individuals: American Institute of Physics: General: 1950-1954.

7. Physical Sciences Division: Institutions Associations Individuals: American Institute of Physics: General: 1955-1956.

8. Physical Sciences Division: Institutions Associations Individuals: General: 1946-1954.

End Notes

[1] Director's Report for 1952 (Draft), American Institute of Physics, by Henry A. Barton, 14 March 1953, p. 1, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: General: 1950-1954

[2] Oxford English Dictionary, online edition, 7 December 2005.

[3] Policy Committee Meeting Minutes, American Institute of Physics, 28 November 1945, by Henry A. Barton, p. 2-3, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: Policy Committee: Meeting Minutes: 1945-1948

[4] ibid, p. 3

[5] Policy Committee View of The Atlantic Monthly Proposal: A mechanism for accomplishing the AIP Journal Plan, 26 September 1946, unsigned, p. 2, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: Policy Committee: Meeting Minutes: 1945-1948

[6] Proposal of a Publication for The American Institute of Physics, by Dexter W. Masters, 3 July 1946, p. 1, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: General: 1946

[7] Oxford English Dictionary, online edition, 9 December 2005 (Definition of "debase": "To lower in quality, value, or character; to make base, degrade; to adulterate.")

[8] Proposal of a Publication for The American Institute of Physics, by Dexter W. Masters, 3 July 1946, p. 9, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: General: 1946

[9] ibid, p. 12

[10] ibid, p. 3

[11] ibid, p. 3-4

[12] ibid, p. 4

[13] ibid, p. 8

[14] ibid, p. 2

[15] ibid, p. 4

[16] Report to The American Institute of Physics Policy Committee, American Institute of Physics, 23 September 1946, by Harold W. Danser, p. 2, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: Policy Committee: Meeting Minutes: 1945-1948

[17] Policy Committee View of The Atlantic Monthly Proposal: A mechanism for accomplishing the AIP Journal Plan, 26 September 1946, unsigned, p. 1, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: Policy Committee: Meeting Minutes: 1945-1948

[18] Letter, from R.C. Gibbs to Gordon H. Mills, 19 May 1947, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: General: 1947

[19] ibid, p. 1

[20] Proposal of a Publication for The American Institute of Physics, by Dexter W. Masters, 3 July 1946, p. 2, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: General: 1946

[21] Policy Committee Meeting Minutes, American Institute of Physics, 23 September 1947, by Henry A. Barton, p. 1, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: Policy Committee: Meeting Minutes: 1945-1948

[22] Director's Report for 1952 (Draft), American Institute of Physics, by Henry A. Barton, 14 March 1953, p. 3, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: General: 1950-1954

[23] Report of the Director for 1944, American Institute of Physics, by Henry A. Barton, 28 February 1945, p. 4, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: General: 1945

[24] ibid, p. 1

[25] "Careers in Physics", undated, p. 2, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: General: 1948-1949
Though this document is filed in 1948-1949, it must have been written earlier and misfiled. In the "Report of the Director for 1944", Barton wrote, "In answer to numerous inquiries, the Institute prepared a mimeographed statement on the subject of physics as a career. This attempts to present the information needed by young men and women who are contemplating advanced study in physics. It is hoped that this statement, after editing and improvement, may shortly be issued as a printed pamphlet". Further, no mention is made of the new journal *Physics Today* on page seven, where the AIP journals are listed, and a note about a "recent conference of physicists" says, "the full report will be found in the November 1944 issue of *The Review of Scientific Instruments*", using the future tense for November 1944.

[26] ibid, p. 5

[27] ibid, p. 6

[28] ibid, p. 4

[29] "Why Classify Physicists", by Dr. Trytten, 13 January 1947, p. 5, in Physical Sciences: Institutes Associations Individuals: American Institute of Physics: General: 1947

[30] ibid, p. 5

[31] American Institute of Physics, Policy Committee, Minutes of the Meeting, by Henry A. Barton, 23 September 1947, p. 5, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: Policy Committee: Meeting Minutes: 1945-1948

[32] "Why Classify Physicists", by Dr. Trytten, 13 January 1947, p. 7, in Physical Sciences: Institutes Associations Individuals: American Institute of Physics: General: 1947

[33] ibid, p. 9-10

[34] Letter, from Henry A. Barton to Henry Chauncey, 27 May 1948, p. 1, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: General: 1948-1949

[35] Letter, from Stanley S. Ballard to R.C. Gibbs, 1 November 1948, p. 1, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: General: 1948-1949

[36] Director's Report for 1955, American Institute of Physics, by Henry A. Barton, 24 March 1956, p. 3, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: General: 1955-1956

[37] Letter from John S. Coleman to Henry A. Barton, 9 July 1956, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: General: 1955-1956

[38] Letter from Henry A. Barton to John S. Coleman, 12 July 1956, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: General: 1955-1956

[39] "Comments on various aspects of the problem", Physics in Education Conference, New York, 8-9 August 1956, unsigned, p. 3, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: General: 1955-1956

[40] ibid, p. 3

[41] Report of the Director for 1944, American Institute of Physics, by Henry A. Barton, 28 February 1945, p. 1, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: General: 1945

[42] ibid, p. 7

[43] ibid, p. 6

[44] "Careers in Physics", undated, p. 1, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: General: 1948-1949

[45] ibid, p. 1

[46] ibid, p. 1

[47] ibid, p. 1

[48] ibid, p. 3

[49] ibid, p. 3

[50] ibid, p. 4

[51] Letter from Richard H. Bolt to R.C. Gibbs, 23 October 1947, p. 1, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: General: 1947

[52] ibid, p. 2

[53] Director's Report for 1955, American Institute of Physics, by Henry A. Barton, 24 March 1956, p. 2, in Physical Sciences: Institutions Associations Individuals: American Institute of Physics: General: 1955-1956

[54] ibid, p. 2

[55] ibid, p. 4

[56] ibid, p. 3

[57] ibid, p. 3

[58] ibid, p. 5