

PhD language requirement

As someone who has lectured abroad and published several translations from other languages, I am concerned that the language requirement for the PhD in as-

GUEST COMMENT

by

Owen Gingerich

tronomy, and similarly in physics, is rapidly being abandoned. I have never achieved a spoken fluency in any language other than English but I have, however, invested some time at increasing expense to a busy schedule to master at least a reading ability; as a result I have published book-length translations from the French and German, in addition to some substantial translations from Latin.

In 1976 I was asked to participate in a panel discussion on the doctoral language requirement and therefore I wrote to the largest and most prominent US astronomy departments to get some statistics. I enquired whether their requirements were set by the university or by the department, and if the same requirements were followed by the physics departments; the evidence suggests that the physics departments do match closely with astronomy in terms of the language requirement.

The Harvard University astronomy department abandoned any requirement in the languages for a PhD a number of years ago; some other schools have done so only recently. The schools with no PhD language requirement include the Universities of Maryland, Indiana, Michigan, Chicago, the Massachusetts Institute of Technology and the University of California, Berkeley. Some places (as of a year ago) have retained the requirement of one language—California Institute of Technology, and Arizona, Yale and Princeton Universities.

From a pragmatic viewpoint, I think there is little justification in asking astronomers to learn a language and pass a language exam to obtain a PhD. I say this for two reasons: most sessions of international meetings are conducted in



English, and the bulk of recent journal articles appear in English or in English translation. Unless one is working in the history of science, active research in astronomy is done with extremely recent papers. When I wrote an astrophysics paper several years ago, half of the references were to other people's preprints. Even though 15 years ago a large proportion of German and French articles were represented in the literature, today this is irrelevant to the majority of current research.

In 1971, Richard B. Rodman, the principal translator of *Soviet Astronomy*, compiled some statistics on the recent literature. He found that 50 000 pages of astronomical literature were published that year and consisted of the following: 70% in English, 20% in Russian (of which 7% was in English translation), 4% in French and 3% in German. An astronomy student might be advised to learn Russian, yet he would have access to most of what he needs without doing that. Of some 1000 citations in the Russian astronomical journals, more than a quarter of them are to *Soviet Astronomy*, which has been available in translation since 1957. *Astrophysica* and *Soviet Astronomy Letters* are also translated. Although only one-third of the total pages of Russian journals are being translated, 45% of the citations in the Russian articles are to works that are translated. The higher-quality material is being preferentially translated and is therefore

available. In Europe, where scientists were concerned that their work was simply being redone without citation, several journals were combined into *Astronomy and Astrophysics* in 1969, and now the majority of contributions, even from the French and German astronomers, are written in English.

As for international meetings, consider the triennial congresses of the International Astronomical Union, where the official languages are English, French and Russian. At the official opening and closing sessions the Russians generally waive the right of translation and so they are conducted in English and French. My impression is that at least 90% of the scientific sessions are conducted in English.

When I wrote to the various astronomy departments, several astronomers replied that it was particularly difficult to require a language if a student has not mastered a foreign language before graduate school. At the same time, many correspondents deplored the trend toward the abandonment of a language requirement in astronomy programs.

It seems to me that the loss of the language requirement has taken place without sufficient thought as to the ramifications. In this age of employment difficulties, an intellectually elite group is being trained and eventually awarded PhD's. In order to preserve the great tradition of internationalism in science, I think that this group could be required

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to obtain some degree of mastery in a foreign language, if only as a concession to the historical origins and image of the scientific enterprise.

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1/6/77

Physicists' image

Far from improving the image of the physicist in the public's mind, William Fowler's article (April, page 33), "Physics in 1976—A Personal Account," will only confirm his impression of the physicist as a Dr Strangelove technocrat. Society needs physicists more for their brains, not for their skill with a welding torch.

I also object to Fowler's vision of the physicist on scientific grounds. It has been pointed out many times that in the 1930's, while E. O. Lawrence—the epitome of the sort of physicist Fowler admires—was building bigger and bigger machines, the *real* discoveries were being made in Europe with very modest equipment. One should also remember the disaster caused by Lawrence (the Oppenheimer Affair) when he became involved with politics. I prefer Einstein!

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4/15/77

I applaud William Fowler's article concerning the image of the physicist. I agree with him that our image is very often that of the ivory tower, lab-coated mad scientist. I only wish that Fowler had also addressed the fact that physicists are always imagined as *men*. He would not have to look far in the APS or elsewhere in the physics community to find that women physicists have contributed to the profession more than the words "chairperson" and "vice-chairperson." Was Chien-Shiung Wu's foremost accomplishment that of being the first woman president?

It would have been heartening to find pictures of women as well as men pursuing physics or their hobbies. If Fowler cannot find any in the files, I would be glad to supply a few. At least he did show a man in the kitchen.

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Nuclear safety

I must comment on Harold Lewis's review of my treatise *The Accident Hazards of Nuclear Power Plants* (Univ. of Mass.

Press) in March, page 63. Lewis concludes that "there are mistakes," but nonetheless my book "is a good source, when read warily." However, the two "examples" he alleges to justify the implication that my work is interspersed with errors are fictitious. Firstly, he claims that my book asserts that in a water-cooled reactor "one can see leakage in the pressure vessel before a catastrophic failure." He says "one can't." On the contrary, I made no such assertion. The book merely notes that slow crack growth and a leak-before-break is "expected," as I interpreted the Atomic Energy Commission's 1973 report, *The Safety of Nuclear Power Reactors* (WASH-1250, pages 7.8-10). That report, which I neglected to cite, emphasizes leak-warning as a backup to inspection for cracks. I then added that I am "not in a position to comment on the reliability of such forewarning" (page 39). In effect, I merely left it as a question. (Britain's Marshall Report, issued after my book, shows a leak-before-break may be unlikely, as Lewis noted. This needs further study.)

Secondly, Lewis alleges that my book asserts that "a reactor can somehow explode like an atomic bomb." (He says "it can't.") This second allegation is also untrue. On page 12 of my book I state in regard to nuclear runaway (an explosive power excursion) "However, no nuclear-weapon-type explosion appears possible in a water-cooled reactor." (The physical reasons are noted on page 17.) This covers 97% of US power reactors. The book asserts a severe potential for *nuclear explosions* in the liquid-metal-cooled, fast-neutron, breeder reactor (LMFBR), but I state that it is "not of the magnitude of an atomic weapon, though that has not been ruled out, but severe enough to release great amounts of harmful radioactivity" (page 2). The highest estimate I give (and prove) is 20 000 pounds TNT (equivalent). A-bomb yields are of the order of 20 000 *tons* of TNT. (The book shows that an abandonment of 150 000 square miles could be the consequences, due to plutonium fallout alone.) However, because an LMFBR would contain several "critical masses" of fuel, there is the question whether a severe explosion might compress momentarily one such mass of fuel to generate an A-bomb size excursion. It is only a question; but because of practical limits of computation and experimentation, it remains unanswered. Regarding the LMFBR explosion potential, the book quotes Argonne National Laboratory: "mathematically derivable upper limits are not obtainable" (page 138).

Eventually, a *subjective* judgment will have to be made as to whether reactors are safe. (The book identifies many crucial subjective assumptions.) The public decision will therefore depend on *who* decides. For this reason the book devotes

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