suasion, is that ionicity is not a useful concept at all, because it does not appear in the Schrödinger equation. My point is that for a certain family of homologous structures, a rigorous mathematical definition can be demonstrated with remarkable precision. In this sense I regard dispersion theory as a tool for demonstrating the generality of Pauling's ideas, and I hope he will welcome this demonstration as a refinement of his work.

Reference

1. J. C. Phillips, J. A. Van Vechten, Phys. Rev. Lett. **22**, 705 (1969); J. A. Van Vechten, Phys. Rev. **187**, 1007 (1969), especially pages 1010–1012.

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No new breed

I take issue with the theme of your editorial, "A new breed of PhD?" (November, page 80). Evidently you believe that PhD training in physics is likely to develop individuals who can formulate solutions to environmental and sociological problems in the most general way, and that this presumptive skill would create a demand for physicists on interdisciplinary teams directed at solving such problems. My own experience convinces me that, but for a few, physicists are specialists, as are most other highly trained persons, and when they are removed from their field of specialization they do not possess insights or faculties superior to those of other specialists. The exceptional few with broader gifts may also be found in other disciplines. Granting however, for the sake of argument, that one is more likely to find the exceptional talent in physics than in biology, such a case offers little justification for training the average, bright student as a physicist; in this realm brightness is not enough. Indeed, the most celebrated physicists have been in sharp disagreement on environmental and sociological problems, such as the health hazards of man-made radiation. This fact does not commend the physicist to the market for reliable answers to environmental and sociological problems. Present circumstances demonstrate most poignantly that physicists have been rather ineffectual in solving the sociological problem of their own economic survival in the industrial–political environment. They have not had the organizational intelligence to limit their members to ensure a favorable market for their skills, as have others with a heavy investment in specialized training. This fact does not encourage one to look for leaders of men among physicists. If any qualities may be said to be widespread among physicists, they might be the propensity for self-deception, mutual disregard and the willingness to be subservient.

Alvin D. Hofer
Williamsville, N. Y.

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The editorial in the November issue, if read and taken seriously by other prospective members of interdisciplinary teams, ought to close a few more doors for unemployed physicists. . .

Highly developed and skillfully analytical minds are encountered in all disciplines, including "unlikely" ones such as art, business, music and advertising. Physicists have no distinguishing characteristics as a group beyond a greater than average exposure to the field of physics.

. . . unless he is already irrevocably committed to being known as a physicist, my advice to the alert, intelligent, nascently analytical young man with an interest in physics is to identify his formal training directly with one of the developing areas that may more certainly in the near future provide employment among satisfyingly challenging problems. He is then more likely to be a leader than simply a minor member of an interdisciplinary team.

Let's face it—physics has advanced in recent years because of public support, not because of unique qualities of physicists. The honeymoon is over. The support is going elsewhere for the forseeable future.

Thomas Mariner
Mt. Joy, Pa.

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What is it that compels editors of PHYSICS TODAY to continue to pontificate about the unsurpassed training of persons currently holding a PhD in physics, and about the vast opportunities for intellectual conquest open to any alert young man or woman possessing such a degree? . . .

Perhaps my horizons are not what they should be, but it seems to me that a physicist is not "someone who has a knack for formulating the description of a system or theory of a process in the most fundamental and general terms," although that definition certainly makes fine public-relations copy. At the risk of displaying my naivete, I must confess that I had always thought that a physicist is someone who (at least initially) is more deeply involved in, committed to, and interested in the physical description of nature than anything else. I distinctly remember hearing words of this sort from senior faculty when it came time for me to apply to graduate schools. But let us suppose that I have been suffering delusions about the purpose of a graduate education in physics,

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and that the graduate schools themselves must change with the times. I am left wondering whether, if PhD candidates are to be "encouraged to select thesis topics dealing directly with environmental or sociological problems," they will be supervised in their research by senior physicists who have abandoned careers in, say, axiomatic quantum field theory to pursue the shining star of the newly relevant disciplines. . .

HARVEY S. PICKER
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International opportunities

PHYSICS TODAY should be complimented on finally dealing with international opportunities for physicists (September, page 37), and in that connection with the problem of science development in the emerging countries. As someone with an active interest in this area for the last eight years, both individually and through organizations such as the Committee for International Education in Physics (CIEP) of the American Association of Physics Teachers, I would like to add some general remarks.

Science development in the emerging countries, a problem of foremost priority, should only benefit from the temporary excess of physicists in the developed countries, provided efforts are made to smooth out the interface. In fact, a considerable amount can be done in this area without the outlay of any substantial new funds,[1] and with the existing manpower available in the sciences. Four general types of activities might be mentioned:

1. Coordination of existing resources. When it comes to filling positions available in the developing countries, to providing visitors and lecturers in those countries, to repatriating young scientists from abroad, to providing minimum requirements for scientific survival in the developing countries, and to many other aspects of scientific activity, often the potential is present on both sides, and what needs to be done is to distribute the relevant information and coordinate the needs on the two sides. The CIEP is beginning to make a dent in this problem but much remains to be accomplished. It is important to emphasize that *coordination* does not mean *centralization*. Nothing could be more damaging to the cause than to impose on it a cumbersome international bureaucracy.

2. Slight modifications of existing organizations to fit actual needs. A perceptive recognition of existing needs (even if they are not communicated without solicitation) and of existing opportunities must lead to a modification of the existing organizations to fit the actual situation. This remark is also relevant to some of the organizations described in the article. It is precisely the tendency toward rigidity that has handicapped some of the past efforts. Science development in the emerging countries is not a science, perhaps not even an art, and only a highly pragmatic approach will make any inroads at all.

3. Experimentation with new programs. It follows from the previous point that constant experimentation with new ideas and new programs is a must. This can often be done on very little money.[1] It requires, however, the participation of enthusiastic people experienced both in the sciences and in the context that the developing countries offer.

4. Extra-organizational, individual initiative. Much can be done, and in fact can be better done, by individuals or groups of individuals, not associated with formal organizations. Bilateral arrangements between university departments fall into this category. Another example is the Physics Interviewing Project (see September, page 76). In fact, without such initiative the large programs also dry up eventually. Easier availability of minimal funds for such initiatives would therefore be advisable.

Whereas the CIEP is neither omniscient nor omnipotent, it construes its purpose to be of maximal assistance to physicists interested in international activities. It can be contacted by writing to me at:

Institute of Theoretical Science
University of Oregon
Eugene, Oregon 97403

Reference

1. M. J. Moravcsik, *How to Help With Modest Resources* (Lecture given at the meeting of the British Association for the Advancement of Science, Durham, September 1970) and Minerva, Spring 1971 (to be published).

MICHAEL J. MORAVCSIK
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Society's responsibility

I am much astonished by Ashley Grayson's comment in the October issue (page 11) to my earlier letter proposing that the government train surplus physicists for jobs in other fields (July, page 13). Almost definitely, he misunderstood my intention.

First, my suggestion was particularly aimed at newly graduated PhD's or PhD candidates now in training. As mentioned by Stephen Paley on the same page of the October issue, "According to the American Physicists Association, based on assumptions that