

letters

ture of the fundamental limitations imposed on the handling of information by the laws of physics. This field is still very clearly in its hesitant infancy. In this note I only want to call attention to the fact that these problems exist by citing two of the most recent references^{1,2} and an earlier more philosophical one.³ These studies treat the *interaction* of information streams and are therefore not simply based on Shannon's theory of the linear-communications channel.

References

1. C. H. Bennett, IBM J. Research Develop. 17, 525 (1973).
2. R. Landauer, Journal of Statistical Physics 9, (December 1973).
2. R. Landauer, IEEE Spectrum 4, 105 (1967).

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Fathers with PhD's

Jane Jackson in her letter "Mothers with PhD's" (June 1972, page 13) proposes that men physicists ought to be shown "how it can be to their advantage to work at less than full-time positions." I can see only two alternatives if her proposal is to be implemented: either employers pay the same salaries for part-time employees as for full-time employees, which can hardly be expected, or men will have to be convinced that it is to their advantage to take salary cuts proportional to the cut in their employment time.

The female physicists in whose favor male physicists are supposed to volunteer a reduction in their incomes can be divided into two subjects: (a) those who are married to a gainfully employed male and (b) those who are not married to a gainfully employed male. Subset (b) includes women who are the sole breadwinners of their families. There is no reason why a male physicist who is the sole breadwinner of his family should reduce his income in favor of a female physicist in subset (a). It would mean that not only he but also his wife and children should sacrifice to enable another family, which is usually well off, to increase their income even more. A case can be made, however, for a voluntary income reduction by male physicists in favor of female physicists in subset (b). Exactly the same case can be made, of course, for a voluntary income reduction by employed physicists of either sex in favor of unemployed male physicists who are the sole breadwinners of their families. I understand there are quite a few physicists in the latter category these days.

Hence, it follows that the problem is symmetric with respect to sex. The real need is to find positions for unemployed physicists who are not supported by a gainfully employed spouse. This could possibly be accomplished by temporary sacrifices by those who are employed until the present slump is over.

The demand by the Committee on Women in Physics for special treatment of women is a red herring, because it is not related to economic need and because it is undemocratic.

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THE AUTHOR COMMENTS: The *real* need is to find positions for unemployed physicists. It is immaterial whether or not they are supported by a gainfully employed spouse. They are physicists, and they must be allowed to *be* physicists. A second need that permanent part-time positions can supply is to make our profession more flexible—to provide an alternative, for whoever wants it and for whatever reason, to the present arbitrary dictum that one works full time or not at all.

The advantages of part-time employment are numerous and apply to *both* sexes (contrary to the assumption implicit in E. Fontheim's letter). I outlined several of them, for academically employed physicists, in my letter of June 1972. In my previous letters and in these comments I address myself to males, only because I believe that men as a group are less aware than women of the possibilities and advantages of part-time work.

The APS Council apparently agrees that part-time employment offers advantages to both sexes, for its letter to employers of physicists, which was sent to more than 500 academic departments, government laboratories, industrial firms, and technical institutes as a result of the February 1972 report of the Committee on Women in Physics, contains the recommendation: "We urge that your Organization make senior appointments and tenure available to persons other than those giving full-time service and that both men and women be eligible for such appointments." (Please note that no special treatment of women is demanded here.)

Suppose that a man decides that he would prefer to work part time. What then would be the economic considerations? They are broader than Fontheim implies. As I discussed in my previous letter, a man who chooses to work less than full time could (a) lower the standard of living of his family, (b) expect or allow his wife to help support the family, or (c) maintain the present standard of living of his family but put

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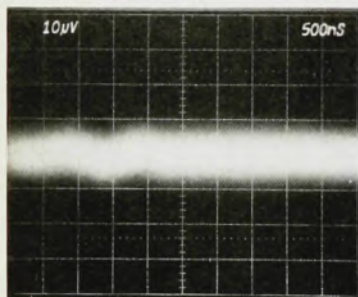
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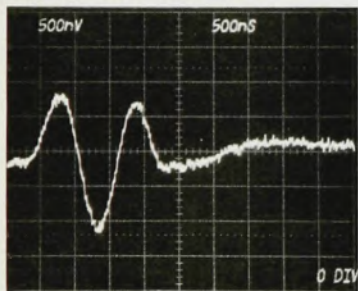
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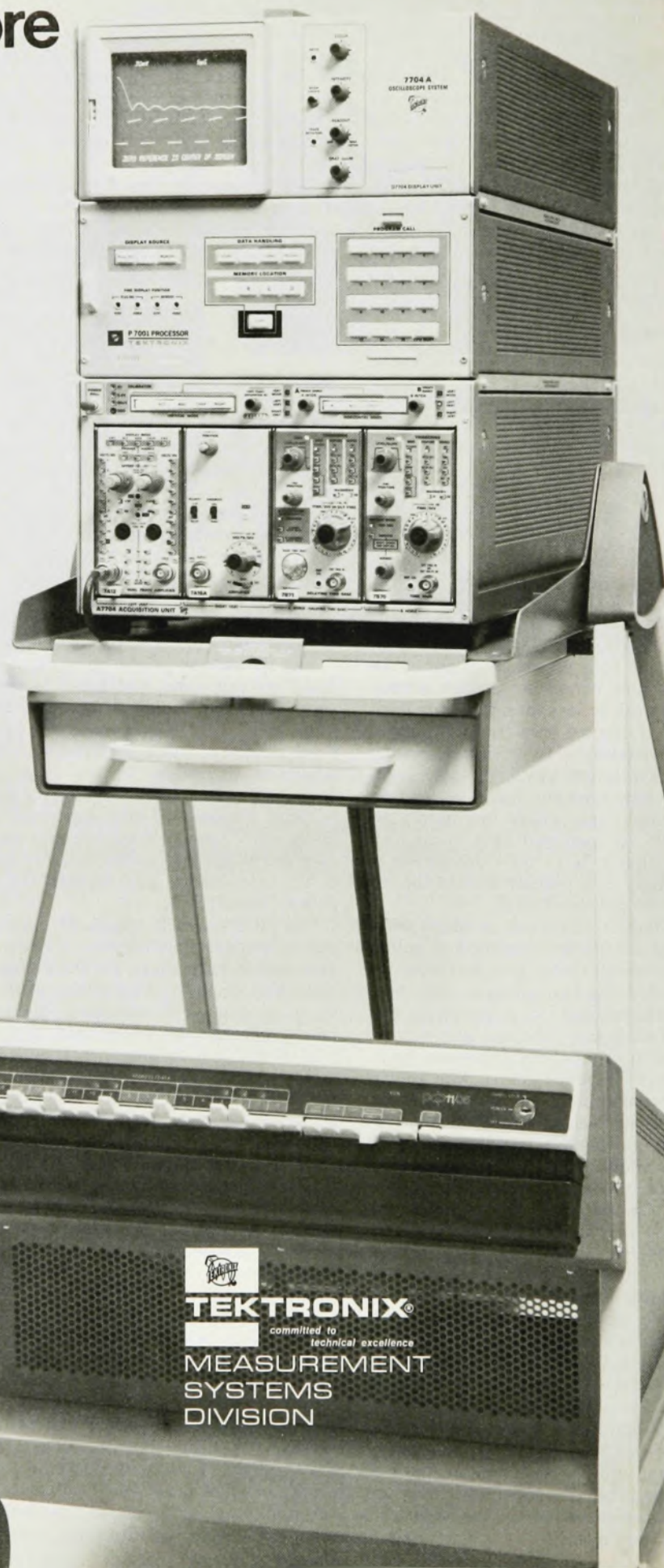


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less money in the bank, into investments, etc. Take alternative (a): For example, which is more important to a child—luxurious surroundings and all the material possessions he could desire, or ample time with his father? Considering alternative (b), why should a man necessarily expect nowadays to be the sole or even the primary breadwinner of his family? With regard to alternative (c), I expect that there are a great many physicists who are so well paid that they could live just as comfortably on $\frac{3}{4}$ or $\frac{2}{3}$ of their present full-time salaries.

It is a tragedy that so many physicists are being forced out of their profession by the scarcity of full-time jobs. The situation could be partially alleviated if permanent part-time positions were made available and if people were encouraged to make use of them. At the same time our profession would become more flexible; the choice would exist for those who want it. Why should one be expected to work either full time or not at all? It makes no sense, both in physics and in many other professions. Finally, physics itself would surely benefit if more physicists were allowed to participate in their profession.

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Physics-related jobs

I would like to expand on a statement made by Arnold Strassenburg (October, page 23) which I believe to be the key issue at the heart of getting more physicists into physics-related problems. Strassenburg states that "many industrial laboratories prefer graduate engineers to physicists largely because they are more experienced in coping with practical problems and more willing to attack them . . . The main problem is one of attitude."

It is the attitude of both the professors and students in graduate physics departments that becomes their own worst enemy.

As a physicist with a background in theoretical solid-state physics who has worked primarily on industrial development projects, I remember an instance in which I visited my former university and told a former professor of theoretical particle physics about work I was doing on the spectral reflectance of hair, skin, wigs and beards. He laughed at me as though I were joking, and yet this research was related to 45 million dollars in other R&D.

I personally do not feel that my background or training was lacking in the pursuit of industrial problems. What was lacking was a proper atti-

tude towards industrial research. I must say that I had to fight with my own inner feelings about applied research for four years before I came to peace with myself.

These inner feelings arise, in general, from a notion among physics professors that research in physics for knowledge itself is the ultimate achievement for physicists. This of course arises from their enthusiasm for the subject (for which they cannot be blamed) and rubs off on their students. However, physics is not a closed system, and some physicists must interact with the outside world.

Engineering graduates are instilled with a different mental set. They are trained from the beginning to think of themselves not so much as electrical or mechanical engineers, but rather as *problem solvers*. Their allegiance lies not as much with the discipline itself as with the company they work for and the current problem they are working on. Physics graduates, on the other hand, have the same basic tools to solve problems, but usually their allegiance is to the field itself; because they have unconsciously been brainwashed into believing that applied research is somehow "dirty," they shun it.

Simply changing curricula to a more interdisciplinary nature cannot be the total answer to the physicist's job problems. Restructuring a curriculum to meet the needs of a fast-paced society is a little like setting up a new Maginot line. A good solid foundation in the *fundamentals* of physics and mathematics and the *desire* to solve applied problems is really what one needs.

Armed with this solid foundation and an ability to read and think all physicists can become "problem solvers." They already have the tools and where there is a will there is a way!

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In the thoughtful and interesting article by Arnold Strassenburg there appeared a table of enrollment in physics-related courses offered by physics departments from "Survey of Enrollments and Degrees in Physics," AIP Publication R-151.9.

I was surprised to find that the enrollment in courses concerning issues of science and religion was reported to be zero. I am unaware of the survey sources from which this information was obtained, but it certainly did not include The Cleveland State University.

For the past several quarters I have been teaching a physics course for non-

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