

LETTERS

represent actual electrons that are attracted to the surface by a positively charged rod. Adult physics students, even after learning quantum mechanics, do not have this misconception corrected. Nevertheless, using only the concept of the electron orbital and the Pauli principle, it is possible to give a correct qualitative description of surface screening by electrons in metals.

Reference

1. V. E. Kenner, R. E. Allen, W. M. Saslow, *Phys. Lett. A* **38**, 255 (1971).

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2/93

What Really Keeps Women from Physics?

As a physicist with more than 20 years' experience who was recently forced to leave the United States to obtain emotionally satisfying employment, I find the article "Women in Physics: Reversing the Exclusion," by Mary Fehrs and Roman Czujko (August 1992, page 38), extremely disturbing, on several distinct levels.

First of all (and this is a relatively minor point), why, at a time when thousands of existing physicists and engineers are unemployed or underemployed, should we be shooting ourselves in the foot by encouraging *any* newcomers to enter the profession? The supply of physicists and engineers in the US far exceeds the demand, and anybody who enters these fields in the foreseeable future will simply displace someone else.

Second (and this is much more important), aside from our own selfish interest, isn't it morally reprehensible to seduce innocent young girls (or anybody else, for that matter) into a profession where *all* the practitioners—male *and* female—are treated like \$#!*, a field that always has been and always will be overpopulated, underpaid and underappreciated?

According to Fehrs and Czujko there is a malevolent conspiracy on the part of "the physics community and society at large to exclude women from physics." The weapons used in this insidious campaign include "sexist jokes," "social overattention" and (horror of horrors!) "total reliance on male pronouns." If a person who sincerely wants to be a physicist can't stick to her guns in the face of male pronouns, how will she cope with the *real* flak that gets thrown at all of us during our careers?

On yet a third level, it is very disturbing to see the pages of PHYSICS

TODAY being used to spread "politically correct" thinking and tired old feminist rhetoric. This is ironic, because the real problem for physicists and engineers, male and female, in the US is not "sexism" (whatever that is); it is anti-intellectualism. In fact, Fehrs and Czujko come very close to the truth but then shy away from it when they grudgingly admit that "for whatever reason, women react more strongly to both positive and negative comments than do men." Precisely! And it is not socially acceptable in the US to be a physicist or engineer. The huge imbalance between the number of male and female physicists is simply a reflection of the fact that boys and men are more willing than girls and women to do things that society disapproves of. And why are physicists so despised? Because we have a reputation for being able to think clearly, for being cold and logical, for being unswayed by emotion. It doesn't matter whether we actually fit this stereotype; what matters is that society perceives us as being capable of thought, and to quote from Bertrand Russell, "People fear thought more than they fear anything else on earth—more than ruin, more even than death."

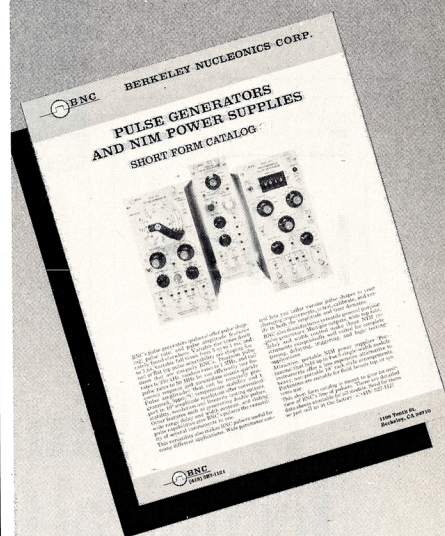
Fehrs and Czujko gloss over the increasing participation of foreign women in American universities. Obviously, outside the US, it is still socially acceptable to be intelligent, to be highly educated, to worship knowledge and to respect learned people. A foreign woman with a PhD in physics from an American university can go back home and become a respected leader, even if she happens to be from a society with very strong ideas about traditional gender roles.

As a final example of the way in which Fehrs and Czujko consistently overlook the obvious in favor of political correctness, consider their statement that over 5000 American women got medical degrees in the US in 1990 compared with 63 in physics and that physics is thus "not get[ting] its share." They raise the absurd rhetorical objection that "one would be hard-pressed to argue that physics calls for 80 times as much . . . commitment as medicine." Of course not! The point is that medicine is, apparently, 80 times more rewarding than physics and 80 times more socially acceptable. Americans are obsessed with physical health; therefore physicians ("real doctors") are seen by the public as gods and goddesses.

Fehrs and Czujko paint an overly optimistic picture of life as a physicist, so overly optimistic that it borders on lying to young people. Any-

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LETTERS

body—male or female—who sincerely enjoys doing science *as an end in itself* and who wants to become a scientist or engineer ought to go ahead and become one. But he or she ought to do it with both eyes open; he or she ought to realize that science, like virtue, is its own reward—and its only reward!

JOHN L. WALLACE
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9/92

I have left the physics department at a university where I was one of two American females among 90 to 100 physics grad students. When news of my departure made its way around the department—which has graduated a whopping 1 American woman PhD out of 15 American woman graduate students in the last ten years—I was greeted with such conversational gems as “Guess we lost another one” and “Giving up, huh?” (Even the woman in charge of the Graduate Professional Opportunities Program, specially designed to recruit minority and women students, said only: “So you’re leaving, huh? Guess another one got away from us.”)

These are the same men who bemoan the lack of women in physics—as long as *you* bring the subject up. It never even occurs to them to wonder why physics and women don’t mix (or perhaps they simply think, with the “right stuff” thinking that seems to characterize hard science, that the women just don’t have what it takes). These men who dedicate their lives to finding the umpteenth digit past the decimal place on a number that 99.99% of humanity will never hear about flounder when confronted with a concrete problem faced by physics the world over: Feminine minds are going elsewhere. Not only that, but if this problem is not met head-on in the next few years, these men will be left alone in their offices with their books and computers while we make discoveries for other disciplines.

Many men graduate students say things that are, if more infuriating, at least more honest:

▷ “What do you mean, they don’t support women students? You have a fellowship, don’t you?” Shouldn’t I? I also had a 3.7 GPA as an undergrad at Penn State and graduated Phi Beta Kappa. “I don’t have the money to buy the VCR I want,” thinks the man grad, “and you’re complaining about underrepresentation? Hey, honey, you’re *paid* to put up with this.”

▷ “You’re not friends with the Chi-

nese women”—said when I try to speak of the acute cultural isolation and loneliness of being half of the American women in the department, by men with not one native Asian student in their own peer groups. This is insulting not only to me but to the Asian students, pawned off like some last-resort friends.

▷ “You’re just too sensitive”—said after I remark on the pornies on the computer graphics system and the girlie posters on the locker room—excuse me, laboratory—walls. No other employer who so loudly claimed to offer equal opportunity employment would dare permit such things.

▷ “If women are ever going to succeed in physics, it’s going to take people who are willing to break down the barriers.” When a man says that, he is in effect propping his feet up on his desk and daring me to change his attitude. It is *not* the responsibility of the lone first woman to make the environment amenable to women. We did not erect the barriers in the first place; it will take concerted effort by the *men* to appreciate the obstacles and to work *with* us in making physics a friendly place for us.

▷ “Yeah? Name one!”—yelled gleefully at me when I spoke of women scientists who have contributed and been forgotten or had their work co-opted by men through the centuries.

There also was the time I was sent to Argonne National Lab to represent the university at a college fair. I was mistaken for a secretary four times and hit on three times, once by a university department head.

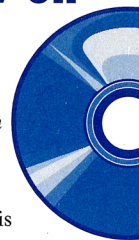
Add to this the countless times I’ve mentioned an idea for homework or a practice test problem and had it rejected, then seen it accepted as a stroke of genius when mentioned by a man student. (All I could wonder is whether this unconscious theft of my contributions would have stopped after I obtained my degree—when grant money was on the line. You can answer that question as well as I.)

Is this the mental and emotional payback I’m expected to make for the checks thrown at me for two years? Sure, I got fellowship money; I also got headaches, soaring blood pressure, a racing heart and dizzy spells.

I passed my departmental qualifier the first time around, finishing first in quantum mechanics. I am certainly qualified to pursue a physics career. Yet I left, and am relieved—not happy, mind you—to have done so. And for the rest of my life, I will wonder whether or not I could have been a physicist in a phys-

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ics that was warmer and more genuinely welcoming, less out-and-out hostile, to me and mine. I will wonder whether or not the choice was truly my choice or was made for me by my having been all but told to go away by those already in residence.

The recruiters and professors, and the grad students as well, like to talk about how there aren't enough women physicists. Their inaction gives the lie to their claims of concern. They never stop to wonder why the money is not enough. They marvel at our departure, as if women were alien creatures with unfathomable motivations. They are blind to the fact that no woman will stay in a place where she is not welcome, and that makes creating a friendly environment in physics the responsibility of the *men*, not the women.

JANIS CORTESE
Irvine, California

8/92

Mary Fehrs and Roman Czujko present a focused, intense criticism of the physics community at large. However, while they provide credible statistical data on women's low participation in physics, they give no scientific data to support their and "others'" (unreferenced) claim that exclusion by the physics community is its major cause. The omission is especially ominous because Fehrs and Czujko do not stop at describing the problem but proceed to prescribe solutions based on their scientifically unsupported casual inferences and possibly false premises.

Several important questions remain untouched by Fehrs and Czujko's arguments. First, they never explain why women's participation in other previously exclusively male domains has been "dramatically increasing" while participation in physics has hardly changed. Are we to conclude that the male members of the physics community are engaged in a conspiracy to keep women off their turf, while other scientists meekly accept females or even actively seek them out? Why is stereotyping of women more prevalent in physics departments than in other science and engineering faculties? Finally, and most importantly, why do some traditionally more sexist societies have a better record of women on physics faculties than does the United States or Great Britain? To answer these seminal questions, several possible explanations of the underrepresentation of women in the world of physics have to be considered.

First, one needs to examine whether there are genuine gender

differences that affect educational and career choices in the sciences. Fehrs and Czujko confront one such issue when they question whether gender differences in mathematical test performance, which do seem to exist, can account for the differential male-female enrollment in physics. By presenting data illustrating that even among students of identical math ability, girls are significantly less likely than boys to take physics, they convincingly argue that test performance alone does not explain the differential enrollment. A related question that they do not consider, however, concerns the possibility of gender differences in students' *interest* in physics. (The origin of these potential differences in interest ought to be irrelevant for this discussion. Whether the differences are genetic, the result of environmental influences or a combined effect of both, once established to exist, they would need to be acknowledged and dealt with.) Many studies have reported that males are more interested in the sciences—with the exception of biology—than are females and that this trend is reversed for literature and foreign languages.¹

Although high interest is assumed to be motivating, the concepts of interest and motivation are not interchangeable. The focus in interest research has been on the cognitive component, that is, on how individuals as a function of interest represent and process information. The facilitative role of interest in learning and development, which has recently been reiterated by numerous researchers, seems to hold across many types of tasks and age groups, and is thought to have long-lasting effects on an individual's engagements.²

In addition to individuals' personal interests, classroom instruction and materials also have been shown to play a role in learning.³ Special interest-evoking strategies might be needed before genuine gains can be made in girls' participation in physics. F. Kubli, for example, studied factors that contributed to how interesting students found the subject.⁴ Finding strong gender differences, Kubli went on to suggest ways in which physics could be made more interesting to girls. One of the specific suggestions was to link physics problems to everyday situations. Sheila Tobias has made similar points.⁵

A second, related issue that may help to explain why female underrepresentation in physics is more prevalent in some countries than in others concerns the effect of compul-

sory versus voluntary course participation. The study of physics is part of a set curriculum in many European and Asian countries, but it is often a matter of choice in North American high schools. The effect of such early choices unfortunately tends to be permanent. Once a student does not take high school physics, for all practical purposes she or he tends to exclude herself or himself from any future involvement with the subject. Physics education, like all science education, tends to be cumulative: Participation at advanced levels depends upon earlier engagement.⁶ In countries where girls must take physics, perhaps for several years, exposure to physics may generate interest. To examine this hypothesis, the relationship between the length and extent of girls' participation in high school and college physics classes and their later career choices should be studied.

A third factor that needs to be examined before we can make any sense of the cross-cultural differences in career choices involving physics is the remuneration and status of physics faculty relative to other academic professions. Research has shown that in addition to the differences in physics enrollment in the early stages of academic training, females are more likely to leave the area after sustained training. M. Nevitte, R. Gibbins and P. W. Codding found substantial gender differences in the "defection" rates and career aspirations of Canadian male and female undergraduates majoring in science.⁶ They also found that academic performance affected the defection rate counterintuitively: The best female performers were the ones most likely to defect from science. This pattern suggests that other professions may offer better opportunities for the most gifted women candidates, in terms of either remuneration or status.

Interest, compulsory versus voluntary curriculums, and relative remuneration and status are only a few of the things that may play crucial roles in the dismally low female participation in physics in North America. Scientific examination of these hypotheses not only may help to reveal the roots of the problem but also may point to future solutions. Superficial explanations, even when trendy and "politically correct," never do justice to complex and deep-rooted problems.

References

1. See various articles in K. A. Renninger, S. Hidi, A. Krapp, eds., *The Role of Interest in Learning and Development*, continued on page 90

continued from page 15

- Lawrence Erlbaum Associates, Hillsdale, N. J. (1992).
2. R. R. Cocking, K. A. Renninger, in *The Development and Meaning of Psychological Distance*, R. R. Cocking, K. A. Renninger, eds., Lawrence Erlbaum Associates, Hillsdale, N. J. (1993), p. 3.
3. M. Lehrke, L. Hoffman, P. L. Gardner, eds., *Interests in Science and Technology Education*, Institut für die Pädagogik der Naturwissenschaften, Kiel, West Germany (1985). R. M. W. Travers, *Children's Interests*, College of Education, Michigan U., Kalamazoo (1978).
4. F. Kubli, *Interesse und Verstehen in Physik und Chemie*, Aulis-Verlag Deubner, Cologne, West Germany (1987).
5. S. Tobias, *They're Not Dumb, They're Different: Stalking the Second Tier*, Research Corp., Tucson, Ariz. (1990).
6. M. Nevitte, R. Gibbins, P. W. Codding, Can. J. Higher Education 18(1), 31 (1988).

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The article "Women in Physics: Reversing the Exclusion," by Mary Fehrs and Roman Czujko, demands that deliberate action be taken to rectify conditions that drive women away from physics. Fehrs and Czujko's entire thesis is based on two facts: first, that fewer women than men choose physics at the introductory levels, and second, that women drop out of the "physics education pipeline" faster than men.

The explanation given for both of these observations is that women are being *excluded* from physics. This alleged exclusion, we are told, is a result of there being too few women role models, faculty and fellow students. We are assured that action taken to increase the number of women in such positions will keep women in the pipeline.

An *a priori* assumption made in the article is that the greater number of men than women in physics indicates that something is wrong with physics. However, given the undeniable fact that there are biological, psychological and cultural differences between men and women, why should one expect men and women to have the same affinity for physics? One certainly need not invoke concepts such as exclusion to explain the imbalance.

Furthermore, the data presented in the article that supposedly "confirm" the problem are selective. For example, the data focus only on fields that are *unpopular* among women and deny the reader a global picture with which to put the data in their proper perspective.

The table below lists the ten most popular fields of study among women and the percentage of degrees conferred to women in each field¹ in 1988. In these ten fields, women outnumber men at the BA level by an average of 3.9 to 1 and by as much as 10 to 1. Although one might argue that men are being excluded from these fields, it is more reasonable to suggest that we are simply seeing a reflection of the wonderful fact that men and women are different.

Field	Percentage of degrees conferred to women		
	BA	MA	PhD
Home economics	91.7	88.1	73.5
Library science	86.2	78.7	NA
Health science	85.4	78.3	56.7
Education	76.9	75.1	55.0
Foreign language	72.8	68.1	56.2
Psychology	70.0	67.1	54.3
Law	68.3	26.3	25.8
Public affairs	68.1	63.1	49.4
Letters	66.7	65.8	54.9
Communication	60.2	60.0	45.8

Clearly, the data indicate that women are not merely men of a different gender. Women make their own choices, and they tend to choose differently from men. In fact they tend, much more than men, to choose fields that deal directly with people and with culture. Physics is at the opposite end of that spectrum, where it would be quite natural to find fewer women.

More importantly, however, these data also illustrate that women drop out of the "education pipeline" faster than men in *every* field. And the drop-out rates are typically the same as are seen in physics. There is nothing peculiar about the trends seen in physics. Instead, the data suggest that women in all fields are not as likely as men to commit themselves to getting advanced degrees. Physics cannot be held responsible for this, and the "deliberate action" demanded by the article is completely unjustified.

Essentially, these findings invalidate the entire thesis Fehrs and Czujko present. They also bring up another, more serious point. The additional data are of crucial relevance, readily available and from an obvious reference, yet they were omitted from the article. Their omission then led to totally misleading conclusions. Studies of the kind presented by Fehrs and Czujko attempt to influence policy decisions, which in turn affect the way we all do physics. What defense do readers have against such errors in articles of this type? Physics contains a complex web of interdependence throughout its entire structure and provides a measure of

insulation from such errors; social science does not. Thus articles of this nature should not be published without incontrovertible statistics and without having survived *skeptical* review. Anything less is an invitation to fads, politics and propaganda to invade physics. Once such damage is done, it is very difficult to undo.

Reference

1. US Bureau of Census, *Statistical Abstract of the US: 1991*, Washington, D. C. (1991).

PAUL J. DRALLOS
University of Toledo
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9/92

I enjoyed the article "Women in Physics: Reversing the Exclusion." I have my PhD in medical physics, master's in physiology and biophysics, and BS in biomedical engineering, and am currently on active duty in the Air Force. Women have been the minority in both my education and my career. This ratio can work to our advantage. If you are the only female in a class of 30 males, when you excel, you will be noticed even more. However, if you fail, that will be noticed even more too. I'm not saying that we are necessarily being discriminated against; it's just like having one orange in a class of apples: The orange stands out, and it doesn't matter if that orange is a black, a Hispanic, an Asian, a Caucasian or a female. We just hope that in this situation the orange will be treated fairly. When I was in ROTC camp at Eglin Air Force Base, there were about 10 women out of 130 cadets. Each week of the six weeks, one individual was assigned to be the group commander. During two of the weeks, women were selected. This hardly seemed fair to the males, given the overall ratio. I viewed this as an opportunity to show that ability depends on the individual and not the sex of the individual.

I feel that sometimes women go into a situation looking for any hint of discrimination. If you have this attitude, I am sure you will find a way that you are being discriminated against. However, if you have a positive attitude and you think that you can succeed on your own merits, I believe that most often you will get a fair shake.

We need to make an impact on today's children, both boys and girls. Why not influence children in their elementary education? Aren't most elementary educators women? This is one group of individuals with whom we should speak. Ask your child's teacher if she or he makes the effort to call on boys and girls equally

in class and pushes both sexes to excel equally. I plan to take an active role in the education of both of my daughters (ages 5 years and 7 months). I tell my 5-year-old she can do anything she wants to. She must be taking me literally, because she wants to be both a cosmetologist and a veterinarian!

KRISTIN NATVIG SWENSON
David Grant Medical Center

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The tenet that women are being turned away from physics by physics faculty at major institutions, possibly in high schools, by parents and perhaps even by society as a whole may have some basis in fact. But I—a woman undergraduate majoring in electrical engineering—think the point is a bit more subtle than “girls are discouraged because boys do better in math” or “physics is a male-dominated field” (the first statement of which is not entirely true and the second of which obviously is). It is a question that might best be left to “so-called” sociobiologists.

The significant thing, as I see it, is that physics at any level requires a great deal of commitment. Certainly, many students who undertake the study of physics at the college level (in the standard core calculus-based sequence), even having had the necessary prerequisites, are put off by the “atmosphere,” grading and approach to subject matter,” as Mary Fehrs and Roman Czujko point out. Further, many students are indeed disappointed by the failure of most introductory physics courses to convey the “beauty and excitement of physics and its relevance to students’ social concerns and intellectual interests.” But while it’s one thing to see and appreciate the “beauty and excitement” in relativity, for example, it’s a completely different matter to go through the long derivations needed to have real understanding. Thus the physics atmosphere is often dry, to say the least. The point seems obvious: If we cannot make physics attractive to the majority of students (and it’s not clear to me that we should), how can we expect to make physics attractive to a single group, such as women?

Physics is not for everybody. In general I think there is far too much emphasis placed on turning out physicists and engineers in this country—this when the majority of the population lacks the basic capacity to undertake such lofty career goals. A more reasonable goal would be to turn out students who are science literate, so that when an informal poll is

taken on a university campus, students confronted with the question “What does a physicist do?” will give a reply with a bit more depth than “Make bombs,” and when the word “nuclear” (as in “nuclear power”) comes up in conversation, we won’t have people running for cover. A populace that has some understanding of the beauty and excitement in science will ensure that science claims its preeminent place in our lives.

CRYSTAL A. BARKER
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9/92

I am enthusiastic about the goals of the authors of “Women in Physics,” but I don’t quite share their conventional assumptions. As they mention, physics is not such an easy or lucrative way of making a living that being excluded is really that big a hardship. I feel equally concerned about men like myself who must work much of the time in a nearly all-male environment. I have had women as fellow students, colleagues, assistants and bosses, and I always welcome the relief from the monotony of so many men. I believe that most male physicists feel similarly and that most of the problems are due to a few who are uncomfortable with women in one way or another.

The assumption that mathematical and spatial ability is the one relevant biological difference between men and women is questionable. Communication deficits, which often force men into fields such as physics, are much less common in women.

DAVID INGHAM
Palo Alto, California

8/92

FEHRS AND CZUJKO REPLY: The critical comments on our article seem to arise from a misunderstanding of its aim and basis. Our focus in the article was purposely narrow. First, our statistical work emphasizes differentials between physics and related fields: We study the success of those fields in attracting and graduating female students relative to that of physics. Our assumption is that in intellectual challenge and required commitment, such related fields as mathematics, chemistry and so forth are fundamentally similar to physics. The data show that regardless of the complex societal factors that discourage women from careers in science, physics does less well than its allied fields in attracting and keeping women students. Most of the reasons for the differential attrition rate of women physics students have nothing to do with competence in the

field. Thus the number of women lost reflects not only lost opportunity but lost quality.

The second thrust of our article was to suggest that individual physicists and physics departments have the power to recoup the lost opportunity—to reverse the differential losses relative to allied fields. The challenge is for individual physicists and physics departments to accept responsibility for doing what is within their control rather than wait for solution of the broader societal problems or the general remaking of society. In line with this challenge, we discussed success stories and offered concrete suggestions for reversing the differential loss of female physicists.

The suggestions for departmental and personal action were obtained in large part from the topical conference “The Recruitment and Retention of Women in Physics” (of which we were cochairs). That conference, held in November 1990 in Chevy Chase, Maryland, was supported by grants from the NSF, APS, AIP and AAPT. It was attended by over 100 female faculty, graduate students and undergraduate students as well as over 20 male physicists, many of whom were physics department chairs. The overall tone of the conference was positive, and the discussions there were based on the specific experiences of those who have made a strong commitment to physics but still see barriers to the participation of women.

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8/93

Is Africa Ignored in ‘International Science’?

It is amazing how the issues of international scientific education, contact and funding manage to evoke great discussion when they concern the former Soviet Union, Europe, the United Kingdom, the Middle and Far East, and Australia. I suggest looking at a map of the world and observing a very large continent called Africa. The many suggestions, often good, on promoting international science are consistent in omitting Africa. If there is any place on our planet that is in dire need of international contact and aid for scientific education and research, it is Africa.

LAURENCE LAVELLE
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Princeton, New Jersey ■

1/93