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4. M. Walker, Nature **359**, 473 (1992).
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IRVING KLOTZ
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12/92 *Evanston, Illinois*

Tips for Sympathetic Symposium Speakers

I always enjoy Professor Mozart's offbeat observations and tendentious manifestos, as well as the more cautious suggestions of his medium David Mermin, who is lucky to have such an interesting visitor. (We never see any "Mozarts" out here in the Midwest, though I think Elvis occasionally visits Urbana discount stores.) Regarding the Reference Frame discussion on the physics seminar (November 1992, page 9): I have seen enough worthy talks in my few years to know the situation is far from hopeless, yet I couldn't help but recall some of the worst talks I have ever seen.

▷ A specialist in certain highly technical applications of advanced mathematics to solids began his talk portentously: "I'm sure you've all seen hundreds of talks on this topic, so I won't insult your intelligence with a lengthy introduction." The talk was completely incomprehensible to nonspecialists. Members of the audience demonstrated their intelligence by fleeing in droves.

▷ During one seminar, several faculty members in the audience—mind you, we're talking about real professors here, not just us dumb grad students—found one of the speaker's central assertions dubious. He deigned to spend a moment explaining it but then abruptly cut off the discussion, here reconstructed with modest poetic license.

Speaker, responding to question: This elementary point you raise may or may not be valid, but I don't care; I have made great strides, and they alone justify the rest of my presentation.

Listener: It is infinitely more satisfying to understand 0.01% of a seminar than 0.00%.

Speaker: Let us not tarry; I have prepared a large number of transparencies and it is vitally important for me to display every one of them.

▷ A visiting theorist says, "The experimentally relevant case is for $t \approx U$, but I still think the case $t \ll U$ is interesting." He does not explain why. Are we supposed to know? Or is it only interesting to other people studying the same limit?

On the basis of these and other observations I offer my own conclusion: The proliferation of poor-to-mediocre physics talks is the ineluctable consequence of our funding priorities. We reward firstly research, which is often extremely technical and which in any event demands the generation of original results, though "original results" sometimes fail every measure of value other than never having been seen before; secondly, we reward teaching, which is important, though at its worst it merely trains students to churn out "original results"; and following in a distant third place—because we scarcely reward it—is scholarship.

I hesitate to define "scholarship," but it most certainly includes the passing down of knowledge in a manner more critical and skeptical than we associate with the word "teaching," and a more serious and less self-serving discussion of the merits of particular avenues of research than practitioners are capable of providing. These characteristics have nasty implications. A "scholar" might tell you that your application of recondite mathematical methods is diverting but does nothing for our understanding of physical law. He might tell you that your experiment does not add to knowledge simply because it gives new data points. "Scholars" probably get punched in the nose more often than the rest of us—but wouldn't that brighten up a 4:00 pm snoozer?

While we utopians await the complete intellectual overhaul of physics, I heartily endorse one of the "Mozart" ideas: A speaker does not have to explain in paralyzing detail his or her own research accomplishments. When preparing a talk, imagine yourself in the audience. Think of things in your field that they're unlikely to know but would find useful and understandable. My first year at Illinois I delivered two utterly dreadful talks to classmates, after which I developed this rule of thumb: If you're afraid of insulting their intelligence, then the only intelligence you're overestimating is your own.

(I'm trying to assert my own marketability here, so maybe Reference Frame-*doyen* Mermin would be kind enough to name this maxim after me.)

JIM CARRUBBA
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1/93 *Urbana-Champaign*

David Mermin's timely comments and his friend's advice on the present state of colloquia can be compared to Planck's advice to Schrödinger.

In June 1926 Schrödinger was invited to visit Berlin to give a lecture, and he wrote to Planck for advice regarding the level of presentation. Planck's response[1] is still useful as a guide:

> You also ask about the level at which your lecture should best be given, or rather at which it should begin. I would like to propose, in agreement with my colleagues, that you imagine your audience to be students in the upper classes who, therefore, have already had mechanics and geometrical optics, but who have not yet advanced into the higher realms; to whom, therefore, the Hamilton–Jacobi differential equation, *if* they are acquainted with it at all, signifies a difficult result of profound research, deserving of reverence, and not by any means something to be taken for granted. Under no circumstances, however, should you be afraid that any one of us will consider one sentence of yours to be superfluous. For even if the sentence should not be necessary for an understanding of your train of thought, it would always offer the particular interest of seeing what special paths your thought takes and which particular forms your perception favors. For all of us the main point of your lecture will be what you yourself in your letter designated as a general survey of the fundamentals for the purpose of orientation without much calculation and without many individual problems.

Planck then goes on to suggest that Schrödinger give a second lecture, at which time he can go into greater detail.

Reference

1. K. Przibram, ed., *Albert Einstein: Letters on Wave Mechanics*, Philosophical Library, New York (1968).

MICHAEL W. FRIEDLANDER
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12/92 *St. Louis, Missouri*

Many congratulations to N. David Mermin for his Reference Frame column in the November 1992 issue. As an astronomy graduate student, I can relate very well to many of the points he brought up about the disastrous state of today's physical science colloquia.

Grad students here are "expected" to attend most or all colloquia offered

by the department. I find some astronomy talks fascinating and informative. But many others quickly manage to lose and alienate most graduate students—and, I suspect, many faculty members whose areas of research are something other than the speaker's. The attitude many scientific colloquium speakers seem to have is, "I'm going to impress you with how smart I am and what good research I've done." That attitude is what makes speakers include plastic sheets full of equations comprehensible only upon prolonged reflection and graphs complex enough that it would take most listeners at least several minutes to grasp their intended meaning. And then the faculty wonder why grad students seldom ask questions of colloquium speakers. Perhaps it's because we don't want to appear ignorant of something the speaker assumed was "obvious."

The best talks are almost always those in which the speaker's attitude is, "I'm going to teach you something interesting about astronomy." The talks from which I've learned the most do not necessarily cover subjects of which I have extensive prior knowledge. Instead, they are those in which the speaker takes time to explain the qualitative basis of his or her subject. Talks at professional meetings are a different situation, but when speaking to a department whose members have widely varying interests a speaker should always follow this rule: If someone in the audience is also an expert on the speaker's subject, that person may not learn much from the talk, so the two should set aside time for a face-to-face meeting rather than bore their colleagues with somniferous details.

DOUGLAS O'NEAL
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12/92 *University Park, Pennsylvania*

David Mermin was right to be irritated and depressed by the style, or lack of it, of speakers who give special talks and colloquia.

I long ago learned of sound advice given by a minister in the Scottish Presbyterian Church who was teaching aspiring young ministers how to give a sermon. It applies to physics as well, and I have endeavored to practice it. The minister said: "First you tell them what you are going to tell them, then you tell them, and then you tell them what you've told them. Then you sit down." I commend this approach to anyone planning to give a talk. It should help to keep the audience awake and, with any luck, attentive.

I should add advice given to me in 1967 by Felix Bloch. I was chatting to him after he gave us a colloquium talk and said how much I enjoyed it, especially as I was familiar with some of the material. He wagged a finger at me and said, "Never underestimate the pleasure you give an audience by telling them something they already understand."

J. F. ALLEN
University of St. Andrews
12/92 *St. Andrews, Fife, Scotland*

Professor Mozart's advice on presenting physics talks contained much that was helpful, but I believe that most experienced speakers would disagree with him on the use of text in overhead transparencies, especially when the speaker's native language is not English. In such a case, written text on the transparency can be essential. Some years ago, I heard a French nuclear spectroscopist from CERN give a talk (in "Franglais") on his group's experiments with irradiating very hot liquid metal targets with high-energy protons. One sentence early in the talk was, "We begin by 'eating the target." That got the audience's attention!

R. A. ESTERLUND
University of Marburg
1/93 *Marburg, Germany*

MERMIN REPLIES: Only those speakers Professor Mozart disapproves of need the advice of J. F. Allen's much quoted minister. If you take Mozart's advice instead, what you tell them will be so lucid and gripping that you could even sit down after telling them what you were *going* to tell them. After you have actually told them, they should all then be perfectly able to tell *you* what you've told them, making it tedious at best for you to do it yourself. Planck's advice to Schrödinger, on the other hand, is precisely what Bill Mozart had in mind.

I was surprised to learn that many young physicists (like Douglas O'Neal) take it for granted that speakers deliberately give incomprehensible talks in the hope of impressing their audience. That this view should be so widespread is a sad commentary on how we conduct our profession. My theory has always been that such speakers are not doing it on purpose but suffer from the bad examples they have seen themselves as students and from a failure ever to have asked themselves just who it is they are addressing. Many seem to be speaking only to themselves. I find it hard to believe their purpose is to be unintelligible. If the stratagem is indeed to impress with impenetrable erudition, then it has (at least with me) precisely the opposite effect. I pay no further attention to people who give such talks—it is simply not worth the effort.

I agree with everything Jim Carrubba says. If he could find a more pithy formulation of his maxim (I can't—maybe a Latin translation would do the trick) I would gladly name it *Lex Carrubbensis*.

Finally, R. A. Esterlund has a valid point. I faxed a query to Professor Mozart, who is currently in the Urals, trying to assemble a team of coal miners to do some cut-rate tunneling in Waxahachie. Here is his reply:

> I'm embarrassed to have forgotten that when the lecturer or listener is not a native speaker the redundancy provided by sheets of plastic can be a significant help. But efforts should still be made to reduce the text on the screen to a minimum, rather like subtitles in a foreign film. The deadly effect of the practice on those who *can* understand you without it should not be overlooked.

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Technology Transfer Touted

James S. Langer makes a valuable contribution concerning our understanding of the relationship between materials research and technology transfer with his article in the October 1992 issue (page 24). The concept of technology transfer is often discussed in the context of international competitiveness in the global marketplace. The United States currently exports 10.5% and imports 10.9% of its gross domestic product. Thus the future of the US economy will be determined far more by what happens in domestic markets than in international competition.[1]

The issue of technology transfer should become a common policy thread among the university, governmental and industrial sectors, which form the R&D spectral components of basic research, applied research, development and production. Furthermore, it must be accepted not only at the policy level but at the managerial and technical levels as well. The R&D spectrum, which forms the supply side of technology,