WHAT'S WRONG WITH THESE REVIEWS?

N. David Mermin

Se vuol ballare, signor Contino, il chitarino, le suonerò. —Figaro

The story you are about to read is true. The names, to be sure, have been changed, but not to protect the innocent. Professor Mozart would have been only too pleased for me to use his real name, but we agreed that you, dear reader, might think you were reading a piece of special pleading on behalf of a particular person. Far from it. The point of my tale is not that one physicist has been badly dealt with by the National Science Foundation; indeed Mozart has been very well treated over the years and considers himself lucky to have escaped this time with the wherewithal to keep supporting a solitary graduate student. No, the point of this tale is to illustrate more vividly than reams of surveys or statistics could possibly convey what has happened to NSF support for research in condensed matter theory.

Condensed matter theorists have been maintaining for some time, in these pages and even on the op-ed page of *The New York Times*, that their discipline is being starved by NSF. In reply, NSF has insisted that things are hard all over, and scientists from all over have tended to agree. So I offer the tale of Professor Mozart as a benchmark against which to test the plight of your own field. Have things like this been happening to people in your corner of science?

My tale begins several months ago, when NSF phoned Professor Mozart to tell him that a small condensed matter theory grant he shared with Professor Beethoven would be renewed, but with a 20% cut—Mozart was to lose 30% and Beethoven 10%.

David Mermin is a professor of physics at Cornell University. He always knows exactly what he's going to be doing next, but he has a devil of a time remembering what he used to be doing.

Mozart was told that four of the five reviewers had given the proposal E's (the highest possible rating) and one a G (two notches down from the top or two notches up from the bottom, depending on the case you're trying to make). Mozart was informed that he, not Beethoven, was responsible for this blemish, and was urged to get his act together if he expected to get any support at all in the next round.

Mozart, who knows perfectly well how things stand in condensed matter theory and had been expecting far worse, was actually relieved by this turn of events. He was downright pleased to have been presented with an irrefutable piece of evidence that the point had been reached where a set of ratings just one reviewer short of perfection could lead to a 30% budget cut in a program that was modest to begin with, and he entertained several nearby colleagues with this latest horror story. It traveled quickly around and soon showed up in Bob Park's APS computer newsletter, *What's New*, as an anecdote about a man who had won an APS prize for "outstanding contributions to physics" and then had his NSF grant cut by 30% after getting four E's out of five on his proposal.

Shortly after his anonymous appearance in *What's New* Mozart received a call from NSF. Somebody had gone to the archives, looked up recent citations and tracked him down. How could he have spread such misleading information? There was already too much hysteria in the air, and this kind of irresponsible talk only fanned the flames. When Mozart saw the actual reviews he would realize how fortunate he was to have been renewed at all! Distinctly chastened, Mozart said that when he received the reviews he would insist that Park run a correction if that seemed called for.

So when the reviews arrived Mozart opened them with grim foreboding, prepared to see in black and white the unvoiced doubts that sometimes tormented him in private midnight moments. What he first noticed was that *What's New* had indeed misrepresented the bare facts of the case. The proposal was, to be sure, given four E's and a G, but one reviewer addressed only Mozart and one only Beethoven. Mozart's actual grades were only three E's and a G. Beethoven (who was still cut 10%) got four E's. (Beethoven was furious, but that's another story.)

Equally alarming, Mozart had been told in the admonitory phone call that one of the three E reviews that addressed both Mozart and Beethoven should be dismissed as superficial, and there it was, at the top of the pile: a four-liner saying only that Mozart and Beethoven were both well-known condensed matter theorists whose earlier work for NSF was "of the highest quality and covers a wide range of topics." The proposed research was "interesting, deserves support, and the reviewer has no doubt that significant contributions to the field will be forthcoming as it is carried out." Mozart says he couldn't agree more that this is the most flagrant kind of two-person E-boilerplate. We trust that NSF has expunged the author from its roster of peers.

So there was poor Mozart, down to two acceptable E's. The first nonsuperficial E review began with a reference to Mozart and Beethoven's joint "long track record of doing excellent research, including the recent work" on the previous grant. But the next sentence sent a chill through Mozart: "Mozart's proposal for future work appears feasible, but is a bit sketchy in parts, and not overly ambitious." So the E was a slip of the pen, or perhaps a manifestation of Beethoven's formidable coattail powers? No, not at all! "This is not troubling," continued the reviewer, "because I am confident based on his superlative record that he will make important contributions to our understanding of [*deleted to preserve anonymity*], although at this point I do not know

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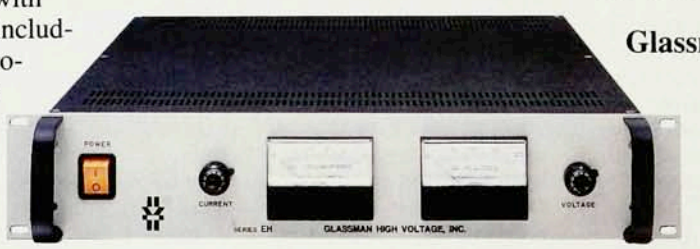

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what they will be (and apparently neither does he in great detail)."

"What do you make of that?" I asked Mozart.

"The reviewer is absolutely correct," he said. "I never know what I'm going to do until I've done it; otherwise it wouldn't be research."

"Mozart," the reviewer concluded, "thinks very clearly and elegantly. I strongly recommend funding his research on the basis that the NSF should be funding some very basic research and that he is one of the best and most productive scientists in the country in his field."

His spirits more than a little buoyed, Mozart moved on with diminished but still significant trepidation to the second nonsuperficial E review, which said of Mozart and Beethoven jointly: "I give this proposal the highest rating. It is difficult for me to imagine its not being funded." The reviewer then considered Mozart on his own: "The work by Mozart on [*deleted*] was truly important to the field of [*deleted*]. It established a general framework for [*deleted*] that has become the standard. The discovery that [*deleted*] was an elegant and surprising result of this general investigation of [*deleted*]. The studies of [*deleted*] greatly enhanced our understanding of these unusual materials. The review article with Boccherini on [*deleted*] was a service to the physics community." And then, returning to Mozart after waxing equally rhapsodic about the work of Beethoven: "Mozart's continued research on [*deleted*] addresses interesting and unanswered questions in these fields."

You can imagine Mozart's delight in reading all this, after his telephonic reprimand from NSF. But what about that smoking G? Here it is:

"Mozart's ideas are reasonable and worthwhile, but I don't see anything exciting or new. He proposes further work on [*deleted*] which will fill out our understanding of these materials. If the NSF budget for condensed matter theory were larger, I would recommend funding, as Mozart is a productive, highly competent physicist. However, if you have proposals from young scientists with interesting new ideas that are put forth in considerable detail (*i.e.*, longer than the two pages Mozart bothers to write here), I think it is clear where your priorities should be. For a fundable proposal nowadays I expect to see 10–15 pages of well-thought-out ideas, some of which involve finishing up old work, but the bulk of which involve new directions. I don't see that here."

"What's this?" I asked Mozart. "You wrote a two-page proposal?"

"Well," he replied, "the expository text for my half of the proposal, excluding the general preamble, lists of publications and that sort of thing, ran to about ten pages. As the reviewer who mentioned 'sketchiness' seemed to understand, I've never been good at anticipating what I'll be up to next, so I wrote the 'Work Proposed' section in the form of a brief commentary on the 'Work Accomplished' part. It seemed efficient to lay the groundwork for my best guess at where I would be heading in the next three years in the context of where I had already been. Had I realized what I was letting myself in for, I could easily have redistributed a considerable amount of text between the two sections, and the next time around I certainly will. But the criticism that I did not spell out all the discoveries I intended to make in the next three years is absolutely correct.

"Anyway," Mozart concluded amiably, "I entirely agree that in these hard times the interesting new ideas of young scientists should have the highest priority. It's just unfortunate that we have to sacrifice the reasonable and worthwhile ideas of productive and highly competent older people to do it."

Mozart asked me to emphasize that the NSF program officers in the condensed matter theory section are doing a heroic job, having to make impossibly fine distinctions to distribute grossly inadequate resources in a rapidly expanding and exceptionally productive field of science. I would only add that it is sad that the funding crisis in condensed matter theory has now reached the point where reviews like those I've just quoted (the reading of which filled Mozart with pride and pleasure, though he had been led to dread their arrival) can form the basis for a grim warning from a program officer that their recipient is lucky to be renewed with a mere 30% cut. What makes this even sadder is that it still seems to be the party line at NSF that no special funding crisis exists in condensed matter theory. Equally distressing is the message that you had better spell out in lengthy and explicit detail where your research is heading over the next three years, preferably jumping off in an entirely new direction, if you wish the people at NSF to continue to support you. I hope they haven't really adopted this recipe for opportunism and mediocrity, but it worries me that they may now be so desperate to find any excuse to turn down proposals in condensed matter theory that they will start believing their own rationalizations. ■