
Interview with David A. Sanchez

David A. Sanchez, professor of mathematics and provost at Lehigh University, has been appointed Assistant Director for Mathematical and Physical Sciences (MPS) for the National Science Foundation. In his new position, he will oversee five research divisions, including the Division of Mathematical Sciences (DMS). The following interview was conducted by *Notices* Staff Writer Allyn Jackson on 5 April 1990.

Notices: *Congratulations on your appointment. The new David Report will be making a "balance argument", saying that funding for mathematics is out of balance with that for other sciences. Would you care to comment on this?*

Sanchez: We were advised at one time when we wrote that report that balance isn't going to win the day. When you look at the balance argument, you see that it's also "balanced" with an argument about the increased responsibility of the community for mathematics education. There was a real conscious effort on the part of the writers of the David II report, including myself, to moderate the argument so we didn't say, "We issued this report 10 years ago, and here's where we are, we haven't gotten it". Otherwise people would say, "Well, okay, wait another 10 years. What have you got to tell me that's new?" ...

Notices: *Within the MPS directorate, is mathematics in balance with the other disciplines?*

Sanchez: It's gotten larger increases, but then again it was a small potatoes operation before. It's a tough question, because of the differences among mathematics, astronomy, physics, chemistry, and materials research to decide what a balance is or what it should be... That's the problem with this crazy directorate. But I think basically mathematics has done very well, and—this is something the physics community shouldn't misinterpret—I think mathematics will continue to do well. But as well as it wants? No.

Notices: *In the 1990 budget plan, mathematics got the largest increase. Some divisions even took a cut, when*

you take inflation into account. Were some of the other divisions resentful?

Sanchez: No, I haven't detected that. That's an interesting question. One of the things I bring to this job is four years as a university administrator. If I think of my five divisions as colleges, I face the same kind of problems. One of the things you have to have is a budget allocation process that isn't painful, that people understand. And somebody has to make the decision (me) and then, with respect to the other assistant directors, [NSF Director Erich] Bloch has to make the decision. I suggested this about a week ago, to [the MPS divisions], and they said that was great, it's a wonderful idea. We all prepare requests, and we all lay them out, and everybody gets to talk about what they think is important, and I listen, and I say, why do you think that's better?... That had never been thought of, and I suggested it, and suggested it also as the model for how my directorate would work with the other directorates.

Now, I suggested this in a memo to Bloch, and it met with mixed reaction, because they are *not* used to dealing with that kind of a budget process. But when times get tough, you can defend your budgetary decisions if you're open about it. So if somebody comes up to the biology director and says, how come MPS got this percentage? You can say, well, we thought about it, we talked about it, and I'm satisfied, don't go criticize them. You might criticize the decider, but he's got to make an eventual decision. But don't go criticizing Sanchez, because he got more for mathematics than biology. It's got to be an open process and a fair fight.

Notices: *That process would also help collaborative efforts, which Bloch himself wants to see more of.*

Sanchez: That's right. If you get people to stop thinking "turf" and start thinking "collaboration," one of the ways you can do it is to make sure everybody knows what everyone's doing...

Notices: *[During today's meeting of the NSF's Mathematical Sciences Advisory Committee, Science and Engineering Education (SEE) Director Bassam] Shakhshiri said that people have to avoid making "invidious comparisons" between funding for research and education. Yet*

Congress has been giving large increases to SEE, above what NSF has requested.

Sanchez: [During a recent hearing with Bloch and Senator Carey of Nebraska], Carey was pounding on the table, saying “What are you going to do about the President’s mission that says we want to be Number One in the year 2000? ...What are you going to do, Mr. Bloch, how are we going to get there?” I asked myself a question: Suppose we decide, we’re going to marshall our resources to become Number One in 6th grade science education and 12th grade chemistry education in the year 2000. If we embark on this program, we might suddenly realize that about 1995, we’re 20th in the world in mathematics research and 50th in the world in physics research. This is the dichotomy of mission—that the Foundation has to carefully balance and sort of resist the idea that we’re going to become the science manpower-womanpower pool of the whole government, of the whole country. I worry about that... It’s good that the Congress and industry, and all these folks are worried about math and science education, and these star-studded panels of governors and people are issuing these manifestos, and all that. I think that’s great because it’s getting people excited about it, and by God, it’s time. But I worry that we have to also have this other mission and that has to be done. And if it isn’t we’re going to be in real bad shape 10 years down the line.

[Presidential Science Advisor D. Allan] Bromley, and the committee of science advisers to Bromley, are going to be looking at that question, that somehow, as you put these big things on line—Hubble space telescope, the Supercollider, and all that—somebody has to have the responsibility for putting in the human infrastructure needed to make the thing work. What if you had a Supercollider and nobody showed up? And it shouldn’t be NSF, unless we get the funds for it. Somebody else should be out there saying, if DOE’s going to do this, if we’re going to build a Supercollider, we also ought to throw in \$5 million, or whatever it takes, to put in postdoctoral and graduate fellowships in particle physics.... There has to be a collaborative effort [among government agencies] to look at the whole human resources question. It can’t just be NSF’s bailiwick, just as I don’t think K-12 science education should be NSF’s bailiwick. We share responsibility with a lot of folks...

Notices: *You’re going to be faced with some difficult choices balancing those kinds of things (like large research facilities, or the Superconducting Super Collider, that are very visible) with something like mathematics, which is the quintessential small science.*

Sanchez: And I have probably the most nightmarish directorate of all, because it runs from mathematics—which could be computing time, pads of paper, chalk, blackboard and a little travel cost—to astronomy, which is major facilities, big scopes, that kind of thing. Then

you’ve got chemistry in there, with laboratory science, and physics, which is different, and materials, which is really a mix of physics, chemistry, and engineering. It’s a tough call.

Let me talk about the question in general. I think the pressure on the entire scientific community—the small science-big science question—is really beginning to surface now. Physics is upset about it, chemistry is upset about it, astronomy is upset about it. Bromley is concerned about it. How are you going to convince kids to go into mathematics when they don’t see a career path out there? Well, how do you create a career path? Mary Wheeler hit it right on the nose: you have to have postdocs, graduate fellowships, opportunities for kids: “Hey, I’m going on to college, on to get a PhD, on to graduate school; you can get supported!”. So, I have a feeling that that pressure’s going to come down from the top. It will be reflected in the budgets. How it will be reflected, I don’t know. The David Committee’s report is going to come out, it’s going to say, we’re still down there about 1700 [principal investigators], we recommended 2600, we’re still 900 short. That’s their little cry for, “What the hell are you doing for the individual investigator?” So, I can’t say I’m going to find a magic panacea and start shifting funds.

See, mathematics doesn’t have the schizophrenia that the other communities do. As you say, it’s the quintessential small science. The physics community really has to ask itself, “How does the public feel about our hue and cry about small science when, down the road here, we’re building this 7.9 billion dollar gadget, the NSF is building us this 200 million dollar thing”... Somebody’s got to say...[if you want all that stuff, you can’t have the other]. In mathematics, they can’t say that. Mathematics in a sense has shown a greater interest in the whole manpower, funnel, pipeline question, so that it sits very well with respect to Congress. I think the budgets reflect that interest...

Notices: *Most mathematicians think the number one priority is to increase the number of principal investigators. Should that be the number one priority for DMS? A lot of mathematicians think it should be.*

Sanchez: No, it should be one of several. I think there are too many other things that have to be done. I don’t like to set up a number one priority, because then you’re automatically stuck in a mode of where, well, if that’s your number one priority, why don’t you put all your money there? I really don’t like to do that. It’s an extremely important priority, there’s no question about it. Is it as important as increasing the number of mathematics majors? That’s a tough question. Let’s see—if we produce three more math majors across the country at every institution of higher learning, we would produce about 500 new Ph.D.s in mathematics [because it takes about 10,000 B.A.s to produce 500 Ph.D.s]. That’s a very

important priority. Now I have a bunch of PhDs, I have opportunities for them—jobs; postdocs; if they're good researchers, support funds. So that question is intimately tied with the question of, should we have 600 more principal investigators? See, it's a whole chain-of-events kind of thing.

Notices: *Another priority the Advisory Committee has been discussing is ways to get more people into circulation in the research community. The idea of small research grants—for travel, visitors, equipment, etc.—coordinated by the AMS has been discussed. What do you think of that idea?*

Sanchez: I don't have any problem with that. There is this viewpoint that, somehow, this is the loser's game—the loser's bracket of the NCAA Mathematics Finals! You got in the loser's bracket, so you go here and apply for these grants, and the winner's bracket goes on and gets the two month's summer support, travel to Europe and all that. I don't think of it that way. If you've got a fixed pie, there are only so many ways you can slice it. The question is, is it encouraging people to do mathematics?

I like this idea that I think is being bubbled around of seed money grants, where a program officer has a certain amount of discretionary money, and can just read a proposal—especially from a young investigator—and say, “Gee, that sounds really good”, maybe bounce it off one reviewer... Fine, fund the proposal. Forget about the peer review and everything else, fund the proposal and say, “We think it's a nice idea, why don't you pursue it for a year or two, and then if it looks really good, you can go into the regular granting process”. I don't have any problem with that. Does that mean that that person is not as good as the person who went through a formal granting process at NSF or who tags onto a block grant? Come on... I like some of these ideas.

I think the most explosive, dangerous idea—and that's something that has to be looked at across all scientific disciplines—is this concern about capping grants. Mathematics is just a threadbare science. I can speak as one mathematician—we're a happy bunch of poverty-stricken scholars. And that shouldn't be meant pejoratively, but we're not a big-demand operation. And if we took the lead on [salary caps], I think that would be a bad sign. I think that's a decision that has to be made way up there, to say, we're just going to cut across the board. That's a decision that all the divisions have to discuss...

But on the other hand, to say we've got some more innovative ways to use our money, to try to keep mathematicians alive, doing things, creating things—that's no problem, I don't think anybody would criticize that. Because everybody realizes there's only a certain amount of grant money out there. So if you've got people

who are trying to come back into mathematics—they've been out of research 5-6 years because they got involved in teaching or administration, and now they're trying to come back—these are fine researchers who maybe dropped out of doing research, and now they're coming back. What do you do about that? Well, I don't think they're second-class citizens. Eventually, the quality will rise to the top, and they'll be the people applying for the regular grants program. Money's tight. I would certainly, at certain times in my career, have appreciated the ability to garner a little grant to support some travel or bring a colleague to work with me. And I was supported by the NSF for a number of years, and not supported in other years...

One of the things that's hurting us right now is the inflationary cycle of faculty salaries versus fixed budget for research monies, versus academic year support, which mathematicians don't get, but other disciplines do... If you decided to take away academic year support in the medical schools, you could demolish whole budgets of big universities, because they rely a lot on research grants supporting faculty so that they can take that money.

Notices: *NSF does not give much academic year support, does it?*

Sanchez: It's not an agency where there's a lot of academic year support. DMS doesn't do it at all. There are other areas of the sciences and in engineering where there is some, but it is not a major portion of the NSF budget. On the other hand, it *is* a portion. And if you want to say, “We've got to try to squeeze more dollars into the research pool”, how do we do it? If you start going after academic-year support, there are going to be a lot of college presidents who come roaring down to Bloch's office and start pounding on the table...

Notices: *Any further comments?*

Sanchez: I like to think that this job does require a modicum of competence and good will. I think one of the things that's really nice, that I like, that I've seen, is—austerity (or maybe poverty!) produces brotherhood. I think all the directorates are beginning to feel a lot of pain, a lot of concern about some of these issues. And consequently I see much more collegiality among the directorates. I get along well with [the other assistant directors]. There's a lot of talking among ourselves. I think that's healthy, and may not have been the case before. There's a lot more of a sense of “We've got a really serious problem”, not, “Hey, that's your problem, not mine”... I think that's good. And I like working in that kind of atmosphere, because I like to take shots, I like to have informal talks, criticize, and not feel like I'm stepping on people's toes. If you're willing to be honest with each other it makes for a better working environment, and I've seen that. And I hope it continues.