

*Testimony of Michael J. S. to the Science  
Policy Committee of the American Mathematical Society  
Nov 17, 1985*

I have brought with me an example of a mailing that was sent out Friday, November 7. There is a cover letter, copies of the two motions and comments from Moe Hirsch. We are gathering cosponsors for the motions. We sent out about 200 copies in all, it is too early to have any responses yet, but Bob Osserman has had some experience with them at Stanford. There is also a letter from Secretary Pitcher indicating that the motions will be published in the January Notices together with a statement of procedural difficulties to final consideration of the motions by the business meeting at San Antonio. It is conceivable that different motions will be necessary, for example to :

- i) Put the motions on the agenda of the business meeting in Salt Lake or Atlanta.
- ii) Recommend to the Salt Lake meeting that the sentiment of the San Antonio meeting that the motions be passed, and
- iii) Request that the AMS abide by the motions until the Salt Lake or Atlanta meeting has a chance to act.

I have made my personal position clear in the AWM Newsletter and the October Notices with respect to military funding of mathematics." I think that the Reagan government has been escalating the arm race enormously, that the 'star wars' initiative is very dangerous and wasteful, that DARPA-CIA funding forms a continuum with SDI research. ....I am not going to apply for funding from DOD agencies."

Military funding carries dangers with it for the profession. Let me detail some of the ways.

A) Especially as the star wars issue continues to politicize the scientific community and to cause feelings to run high, military funding can be divisive. I for one already feel funny about attending conferences which I know to be mainly supported by military grants. Moreover, a new implicit criterion beyond quality is established for funding if a segment of the research community refuses to apply for funding from DOD agencies on moral or procedural grounds. Are we sure to be supporting the best research when the Harvard math department, among others, refuses to submit a grant proposal?

B) From the David Committee report, we have

Notices of the AMS, Aug 1984, Issue 235, Vol 31, No. 5, p. 450  
" Much (but not all) mathematical research has long-term payoffs; thus the field will be strongly affected by federal policy shifts which emphasize mission relevance or immediate applicability to technologies." And again,

Notices, October 1984, Issue 236, Vol 31, No 6, p 580

"An effort began several years ago to reformulate portions of the basic science programs as 'special research opportunities' and 'special focus programs' at ONR, 'thrusts' at ARO, and 'initiatives' at AFOSR." ... (referring to these)

- "1. Use of 'thrusts' limits growth of the 'core' program, ...
2. The inevitable drift is towards the more immediately applicable.
- 3....."



It is only reasonable to suppose military agencies have to justify their budgets on military grounds, and thus they will emphasize mission relevance and immediate applicability. Once again from the David Committee report Notices, October 1984 p.586 referring to decreases in the level of basic research support at the AFOSR

"These dramatic decreases were paralleled in other DOD agencies. They had begun before 1965, as a result of DOD policy changes emphasizing mission oriented research more directly."

This switch to more mission oriented research was before the Vietnam war protests, and well before the Mansfield amendment made mission relevance of research for DOD agencies the law in 1968. It seems that work supported by DOD grants shifts towards military instead of purely scientific interests. If for the moment mission relevance is being interpreted liberally in some DOD agencies, how long can we expect this to go on? Helena Wisniewski at Darpa, seems to understand the need for mission relevance well:

SIAM News, March 1986, p.1-2

"According to director Helena Wisniewski, who has a Ph.D. in dynamical systems, the overriding objective of the program is 'to provide significant mathematical results to solve critical scientific problems in the Department of Defense.

...  
In addition, specific areas of application have been established. According to Wisniewski, NIMMP-sponsored mathematics research will lead to 'new and improved capabilities for radar processing, crystallography, and aircraft design. Also, the program will provide the methodology to solve currently intractable problems in turbulence, robotics, and will aid in the design of high-speed memory devices for optical computers.'

...  
"Strict direction and goal-orientation, while a departure from the traditional approach to support of mathematics research within the government agencies, will enhance the new program's effectiveness, Wisniewski believes. 'We're not only funding mathematics for significant results. In addition, there is structure to the program.' One component, she says, is the integration of research by individuals. 'Each research area has specific mathematical objectives. One goal is for the researchers to share and combine their results to achieve the major objectives.

Even the mathematics community itself, in arguing for more DOD funding, accepts military criteria for success.

From the David Committee report

Notices, 1984 p.609, Attachment 2, Report by the Subpanel on the Department of Defense of the Mathematics Briefing Panel  
Hirsh Cohen (chair), Bill Browder, Julian Cole, Bradley Efron, James Glimm, Ron Graham

"An example of the possible enormous payoffs of improved statistical methods is the test firing program for the MX missile. With conventional statistical techniques a minimum acceptable confidence level of 72% would require 36 test firings in Phase I and the total sample size in all phases would have to be greater than twice the planned deployment size. With a new and different statistical approach based on Bayesian techniques in reliability, the Phase I test firing size has been reduced to 25 with an increase in reliability from 72% to 93% and an estimated direct cost saving of \$250 million.



E) Some people say that DOD is the only place to get more funds these days, so we have to go after them there. Others say that there are no more DOD funds anyway, and some of the new programs will quickly die so there is no reason to do anything now. It is hard to say what will happen, so I think that we had better make up our own minds. By comparison in computer science 1976 percentages of support for basic academic research were 61% at NSF and 30% at DOD while the 1985 figures were 37% at NSF and 53% at DOD. Clark Thompson has commented that "Computer science is not a branch of military science. But the Department of Defense now directs over half of academic research in computer science. This is too much." on a national level, the DOD share of federal research and development funds has increased from 50% to 72% between the decade of the 70's and 1986. Dick Karp at the Berkeley panel last August, had this to say

"Another objection to military funding in the universities arises from the mission-oriented nature of military research and the power that is concentrated in the hands of those who set the goals and dispense the money. In my own field, computer science, the Information Processing Techniques Office of DARPA has been the dominant funding source for experimental computer science in the universities. DARPA by itself has the ability to make or break a computer science department. The top computer science departments are, with one or two exceptions, precisely those that have large DARPA grants.

Many of the DARPA program directors have been men of great vision, and DARPA-sponsored research has led to great advances in fields such as computer networking and the automatic design of very-large-scale digital integrated circuits. Nevertheless, one must realize that negotiating a grant with DARPA is quite a different matter from making a proposal to NSF. A DARPA proposer must establish the relevance of his work to rather specific goals dictated by the military through DARPA, and must commit himself to reach those well-defined milestones by specified dates. If these milestones are not achieved then, regardless of the intrinsic merit of the work, the project may abruptly get the axe; this was the case with the Speech Understanding projects that DARPA supported at several universities about a decade ago.

In the case of DARPA's recently announced Strategic Computing Initiative the general goal is to advance the state of machine-intelligence technology through the fulfillment of certain specific military tasks: the development of an autonomous land vehicle, a pilot's associate and an aircraft-carrier battle-management system..."

I have seen a picture of this autonomous land vehicle displayed at a theoretical computer science talk. If we don't want to be putting pictures of tanks on the overhead projector we had better think about our funding sources now rather than later.

F) I sometimes hear the argument that if mathematics does not wish to be treated like history or music then it must sell itself on its applicability and seek military funding. There is one last disturbing thought here. The military does support music. According to figures of David Cole of the Center for Constitutional Rights published in the New York Times(?) there is 15+ million dollars for the military band. By comparison the budget of the National Endowment for the Arts is 144 million (Quoted by James Melchor at the Berkeley panel.)



This is a new criterion for success in mathematics.  
As military funding increases so to does the distorting effect it  
has on mathematics.

C) I have with me an article by Serge Lang from 1968, discussing government and especially DOD pressures on universities and individual researchers. John S. Foster, Director of Defense Research and Engineering seems to have been a forerunner of Donald Hicks in more ways than one, he was also trying to cut off the grants of critics. From the March 1985 Notices of the Am. Math. Soc. pp174-5 we have the milder Admiral J.B.Mooney, Jr.

"I am hopeful. I am looking forward to better things in our immediate future, not only for the mathematical sciences but for all of the scientific activities within the Office of Naval Research. We recognize the difficulties the mathematics community faces and the serious implications for national security that these difficulties imply. ONR is determined to do its part in correcting these problems and personally, I pledge to work hard and long for this revitalization.

"In return I ask for your support.

"In return I ask for your assistance, for you as citizen-scholars play a

"First, the mathematics and university communities can play a vial role in increasing congressional understanding of the ONR role. ONR funds basic academic research. This fact is not always understood in the halls of Congress. The simple fact is that budget cuts for ONR hurt academic research."

How far must our support of ONR research go?

Physics Today, July 1985, pp 55-6.  
"On the shopping list..."

"On the shopping list also are supercomputers that far exceed the capabilities of today's fastest Crays and Cybers, as well as software that contains 10 million lines of error-free code. We don't want a few lines of bad code."

'We don't want a few lines of bad code mistakenly setting off a nuclear weapon or causing a laser to miss a target,' said Edward Wegman, Chief of the Mathematical Sciences Division at the Office of Naval Research and one of the IST program's main research agents. Though not apparently funny, Wegman's remark drew laughter from the assembled deans and professors at the conference..

Do ONR supported researchers, feel free to be openly critical of star wars? Are we getting into a situation in which we are led to confuse the scientifically justified and the unjustified? Could this be good for the profession?

D) Gina Kolata's article in the current Science magazine, "Mathematicians look to SDI for Research Funds" contains the observation of Don Austin that the mathematicians came "with their hands open and their pockets empty". Motion 1 may help prevent this powerful image of a desperate, degraded profession begging for funds from questionable sources from recurring, at least under AMS auspices.