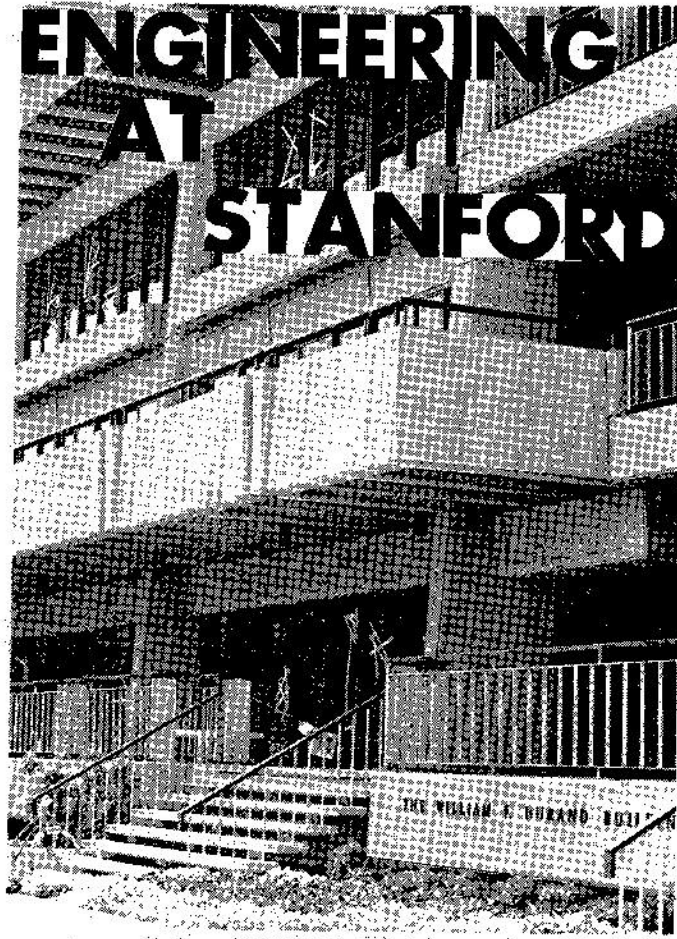


ENGINEERING AT STANFORD



By Pacific Studies Center

A few years ago the Stanford School of Engineering was rated first in the nation in a prestigious magazine poll. The Engineering School, led by the Department of Electrical Engineering and the growing Aeronautics and Astronautics Department, is the center of the Mid-Peninsula "Community of Technical Scholars" created and celebrated by Provost Emeritus Frederick Terman. The Engineering School has attracted--and grown with--the aerospace and electronics industries which populate the Stanford Industrial Park and much of the rest of the Peninsula.

Through research, consulting, sponsoring conference, and training on all levels, the School of Engineering has made Stanford, with its environs, a brain center for the American military empire. In return, those who have profited from the services of Stanford Engineering have supported it well.

research

Engineering's most direct link to the U.S. military is its research. The Department of Defense sponsors several million dollars of research annually in the Engineering school, primarily in the Stanford Electronics Laboratories. Though we do not have, at this time, a detailed description of Defense-sponsored work at Stanford, we present here a general analysis.

Classified Research: Secret war research is the backbone of America's technological warfare. Last year the April Third Movement forced Stanford to phase out secret research, and Stanford claims that the task is nearly completed. Though this work will be continued at off-campus centers such as the Stanford Research Institute, last year's change was a step forward.

Basic Research: Much of Stanford's current Department of Defense (DOD) research, according to the men who carry it out, is "basic." This means that it has no immediate military value. The Defense Department, to compensate for unexpected Vietnam War spending, has cut back basic research funding; and the Mansfield Amendment makes it illegal, beginning July 1, 1970, for the DOD to fund research without military applications. Technically this means that starting this year DOD-sponsored research cannot be considered basic research. But in practice one can expect as many fund-seeking researchers to lie to the DOD about their "applied research" as researchers doing applied research will lie to the Stanford community that their work is innocuous.

Even without the Mansfield amendment, one can still question the nature of basic research. Given the political context of American society and the concerns of the sponsor, research must be judged in terms of how we expect it to be used--not how much medical techniques would improve if only America changed its priorities. Is research "basic" when anyone who is building missiles or supersonic aircraft can use it? Finally, we can question the funding of basic research with no foreseeable application merely

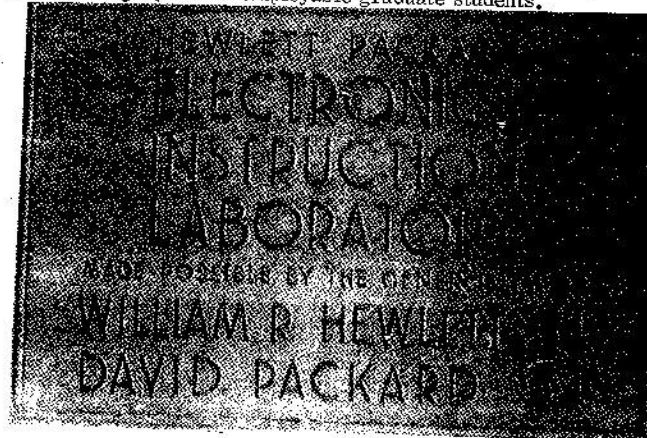
because funds are needed for much more important work. It is difficult to condemn all "basic research"--funded by DOD or other agencies. One must, however, examine it carefully.

Applied Research: Publicly available mission-oriented research is extremely valuable to the military. One suspects that the Stanford Electronics Laboratory contract "Research and Development Program on High-Speed Switching Technology with High-Low Impedance Capability for Microwave Applications," sponsored by the U.S. Navy Ordnance Systems Command may soon find its use in the offshore shelling of Vietnam. Non-classified research at Stanford may exist as the extension of similar secret research elsewhere, or the military may find it feasible to leave such applied research declassified because only Russia has the technological and economic base to apply such work, and Russia may already have similar systems.

Training

Stanford's Engineering Research ties with the DOD must be understood as part of the training and socialization of Engineering students. Graduate students trained through DOD research drift easily into military-connected work once they get their degrees.

Furthermore, anyone seeking a career in engineering has a strong chance of working for the Department of Defense or war-related industries. That is, the bulk of Stanford's engineering graduates end up doing war work, because today in America most scientific and technical work is military oriented. As Frederick Terman boasts, Stanford engineering graduates naturally accept work in local companies. Unfortunately, these companies draw the bulk of their business from the Department of Defense and its contractors. In addition, many departments have "affiliate" programs. Cooperating companies--again, chiefly defense-oriented--receive biographies of employable graduate students.



Retraining: Many Stanford Engineering students are men already working for private war industry or for military laboratories. On leave from their jobs, or attending Stanford part-time, they take advanced coursework in their special fields. Last year the training of Engineers already in industry took a giant step forward with the inception of the Durand Building-based "Instructional Television Fixed Service." Through this program, whose cost is defrayed by participating companies such as Lockheed and Hewlett-Packard, several hundred engineers, mostly in the local war industries, are able to participate in Stanford's Honors Cooperative Program.

Building and Serving Industry

Many local industries have developed directly from the Stanford Engineering School. Ambitious graduates and faculty, with the help of Stanford land policies and men like Frederick Terman, have built industrial giants like Hewlett-Packard and Varian, successful firms like Microwave Electronics and Applied Technology which have been absorbed into larger corporations (Teledyne and Itek), and smaller firms like Granger Associates. A number of professors, such as Allan Peterson of Radioscience, still sit on the Boards of Directors of these companies, whose work is closely related to the research that they--the professor-directors--do on the Stanford campus.

Many more professors (and grad students), not so fortunate to own stock in these companies, supplement their income by consulting part-time. Very little information is available about the extent of this relationship.



"We have been pioneers in creating a new type of community--one that I have called a 'community of technical scholars.' Such a community is composed of industries using highly sophisticated technologies, together with a strong university that is sensitive to the creative activities of the surrounding industry. This pattern appears to be the wave of the future." -- Frederick Terman

The Engineering departments and laboratories provide another continuing service of the defense industry: They sponsor conferences. For example, in 1962 the Electronics Laboratories, under the direction of William R. Rambo, hosted 400 engineers and scientists from government and industrial laboratories for the sixth "Department of Defense Electromagnetic Warfare Symposium." This past summer a similar conference entitled "Stanford Univer-



William Rambo
Director-Applied Electronics
Laboratory

sity's Electronics Research Review" again featured Dr. Rambo, a respected member of the "Old Crows" electronics warfare fraternity.

Government & Industry

The corporations which benefit from research, training, and services of the Engineering School would like to see such benefits continue and expand. Consequently private financial support, scarce around much of the rest of the university, is readily available. In addition to scholarship and grant programs, some department-space-defense companies pay \$5000 to \$10,000 annually for five-year memberships in the Aero and Astro Associate Program. According to a Department publication, the Associate Program "assures an expeditious transfer of research results to its members through seminars, reports, and faculty visits to member corporations."

Private Industry and government agencies also support the engineering school when construction funds are needed. The Electronics Research Laboratory was made possible by the

generosity of Bill Hewlett and David Packard. The new Durand Space Engineering Building, home of Aero and Astro, Radioscience, and the Guidance and Control Laboratory, was funded with \$992,000 from the Air Force, \$2,080,000 from NASA, and \$1.4 million from private industry. The money was raised by the chairman of the Stanford Trustee Committee on Gifts, Roger Lewis--Chairman of the Board of General Dynamics, of F-111 fame. Contributors included Lockheed, Boeing, General Electric, General Dynamic, Hughes, etc. According to Lewis, "The private funding, mainly from corporations, along with the excellent grants from NASA and the Air Force, will assure a well-rounded, integrated facility serving the needs of higher education, industry, and the government. This is an excellent example of joint cooperation."

Such cooperation requires coordination. While it would be foolish to assert that corporate executives run the School of

"Stanford serves as a beacon that attracts the brightest graduates of schools located all over the nation. Once here, these young people naturalize easily. This is of real significance in the research-oriented industries, whose success in the market-place is a function of technological competence. On the average, the local companies have been able to recruit better brains than their competitors in other areas, and have been more successful as a result."

Frederick Terman

Engineering, they do play an official advisory role. In January, 1967 the Engineering School formed an "Advisory Council" which reads like a "Who's Who in the Defense Industry." The Advisory Council provides "the distinguished counsel of leaders, a critical review of the School's current and projected programs and plans, outside viewpoints that will assist the School to provide a more complete and valuable education, and a liaison with the outside community."

The Government has a less official "advisory" role. With its massive funding leverage, it too can influence the direction of the School. Sometimes this happens through the refusal to fund projects, but more often it happens as Stanford officials and researchers try to impress the frequent visitors from Government who check up on their projects. The threat to cut back funding if ROTC were eliminated may have been an empty threat, but through such leverage (usually exerted in more subtle ways) the Federal Government not only influences the Engineering School, but the University as a whole.



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