Livermore and Los Alamos: Another Look at the UC Link

Livermore, Calif. The nuclear weapons laboratory established in 1952 near the California farming center of Livermore was a product of the Cold War at its most intense. Livermore lab was conceived by its partisans as a means of pressing ahead with development of thermonuclear weapons. The dominant scientific presence there from the start has been physicist Edward Teller, but the lab's key sponsor was Ernest O. Lawrence, who employed his personal prestige to make Livermore in its early years an extension of Lawrence's famous radiation laboratory at the University of California at Berkeley. This history is commemorated in the lab's present name, Lawrence Livermore Laboratory (LLL). It is largely because of the Lawrence legacy that throughout the post–World War II period both Livermore and its older counterpart laboratory at Los Alamos in New Mexico have been managed by the University of California (UC). The two labs have been the design source of all the nuclear weapons in the U.S. arsenal.

For most of the postwar period, Livermore and Los Alamos operated under the heavy mantle of secrecy which covered the country's military nuclear program; the labs were accepted virtually without question by the public on the grounds of nuclear necessity. In recent years, however, both the secrecy and the consensus have begun to be challenged.

The most significant current reflection of the new reservations is a report by a committee appointed by UC president David S. Saxon to look into the relationship between the university and the weapons laboratories. The committee was headed by William Gerberding, formerly executive vice chancellor at UCLA, now chancellor of the University of Illinois at Champaign-Urbana. The committee report, which Saxon made public last month, recommends continuation of the university connection with the labs, but only on condition that substantial changes are made in the university's management role. The crucial recommendation is for creation of a board of overseers which would maintain closer contact with the labs' administration and exert stronger influence on policy affecting both weapons research and the energy R & D which has been growing at the two laboratories.

Other recent developments indicate a shift in attitudes toward the weapons laboratories:

• An organization of professional staff members, the Society of Professional Scientists and Engineers (SPSE), founded at Livermore 5 years ago in response to layoffs, has acted both as a union and a source of criticism of lab management and policy. SPSE's members have argued that cuts in basic research funds at Livermore threaten the future quality of the lab's work, and they have questioned the scientific standing and judgment of some administrators at the lab.

• The weapons labs have become a special target of a coalition of Bay-area groups and individuals actively opposed to the nuclear arms program. This coalition, the UC Nuclear Weapons Labs Conversion Project, was formed in 1976 expressly to influence university actions in negotiations over renewal of the 5-year management contract with the federal agency—now the Department of Energy—which owns the weapons labs. The conversion projects' main aim has been to keep pressure on the university administration to make public more information on the weapons lab program and to allow broader discussion throughout UC system of the university role. Dissatisfied with the administration's response, six members of the project last November occupied President Saxon's office in Berkeley and were arrested on trespass charges. (They were acquitted in a trial in Berkeley early this February.) The coalition is seeking to build support both inside the university and outside and has links with the state and national movement to oppose nuclear weapons and nuclear power. While the group sees the issues affecting Livermore and Los Alamos as identical, it has focused its attention mainly on Livermore because it is only 40 miles southeast of Berkeley.* The coalition, for example, has raised the issue of danger to health and safety of both LLL workers and area residents from the presence of plutonium at the lab.

• A flare-up over renewal of the UC contract occurred early last year when a group of universities in the Rocky Mountain and High Plains states formed a consortium and sought to replace UC as contractor for Los Alamos. The consortium argued that the growth of energy research at Los Alamos was making the laboratory an important regional resource and that universities in the region should be directly involved. The proposal was derailed at the behest of the administrator of the military nuclear program who made clear that the government regarded weapons research as the paramount responsibility of the lab and wanted UC to continue as sole contractor (*Science*, 13 May 1977).

The incident underlined a fact acknowledged by all sides in the present discussion of the UC role—the weapons labs are federal laboratories which play an important part in U.S. foreign and defense policy. Major decisions about the lab are federal decisions and there is no sign that Congress, the Executive, and especially, the military currently contemplate any substantial changes.

This perception is strongly held among lab officials and university administrators, which is not particularly surprising, but it also seems to be shared by those active in the conversion project. "Conversion" implies a shift from military to peaceful research, and the project asked for a commitment to convert the labs to nonmilitary research in the contract extension last spring. But the group appears to accept that the university's power to influence basic lab policy is limited. And the majority view within the coalition is that continuation of the university link with the labs offers a better hope for keeping weapons development under control than does severing the tie.

What can the university actually do to influence the weapons program? The issue was first broached seriously at the end of the 1960's when the university-wide academic senate raised the question of the labs' contract. Antiwar sentiment was sharp and feelings against military research on campus ran high. The senate formed a committee chaired by UCLA political scientist Paul Zinner to look at the lab issues. The Zinner committee recommended that UC continue to manage the laboratories, but, if it were not possible for the university to strengthen administrative control and participate in policy decisions, the ties should be cut. The recommendations

*LLL has about 6500 employees and an annual operating budget of over $300 million, more than 60 percent of the budget supporting national security work. The University of California receives a management fee of $3.5 million on contracts which cover Livermore, Los Alamos Scientific Laboratory, and the Lawrence Berkeley Laboratory.

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were endorsed by a system-wide vote of the faculty and passed on by the UC president at the time, Charles Hitch, to the Board of Regents. It should be remembered that the issue had been raised by the faculty and the regents were not particularly pleased to receive unsolicited advice on the matter, but they approved the recommendations in diluted form.

A major Zinner committee recommendation accepted by the regents was for the creation of a scientific advisory committee to monitor UC-lab relations. Last year, a report by an internal university committee provided a generally favorable verdict on implementation of the Zinner reforms. The Gerberding committee, however, had a different reaction. In its report, the committee made the following comment:

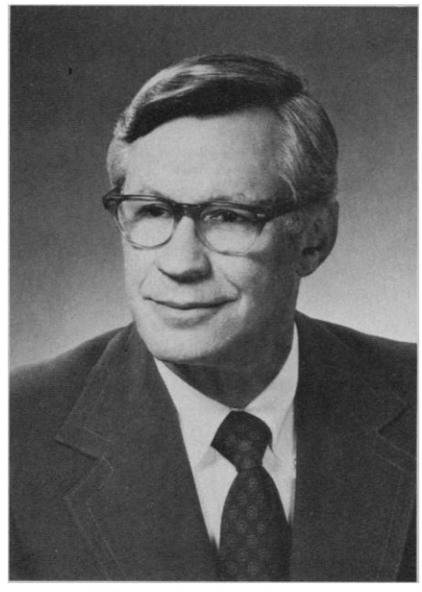
> Despite the Zinner Committee's recommendations, despite the Regents' responses, despite the administrative report on the extent of implementation, and despite the changes actually made, we see very little difference between the current relationship of the University to the Laboratories and that which obtained when the Zinner Committee was appointed and which its report initially described.

UC president Saxon seems to have appointed the Gerberding committee in large measure because the issues raised by the Zinner exercise remained unresolved. The conversion project and other outside critics kept questioning the university link with the labs, and UC faculty, particularly Berkeley faculty, were asking why the Zinner committee recommendations were never carried out.

Saxon now sees the Gerberding report as a basis for negotiation. The next step, he says, will be discussions with faculty, students, regents, lab staff, representatives of the public, and, perhaps most important, with officials in Washington with direct responsibility for the labs.

Saxon, a physicist, was a faculty member and administrator at UCLA before joining the UC administration in Berkeley in 1974 and being named president a year later. As for his own view of the Gerberding report, Saxon recently told an academic assembly that the committee recommendations "provide a sound and workable framework for the future."

Saxon, in an earlier interview, agreed that the proposal for a board of overseers is the crux of the matter. He says he can understand widespread skepticism about such a board after the experience with the Zinner reforms. And he does say that "The notion that a board of overseers could get the labs out of the weapons business is unrealistic, somewhat naive.



UC president David Saxon

The labs are carrying out national policy and you have to recognize it."

Saxon, however, does think that a board of overseers could have substantial influence. One of the things that appealed to him in the report, says Saxon, was the view that the "environment and atmosphere of the labs can be enhanced so as to encourage discussion and dissent."

The task, says Saxon, is to make clear "the domain in which a board of overseers could have significant influence." What is important, he says, is to define such areas with the labs' patrons in Washington, to find out if Harold Brown (Secretary of Defense) and James Schlesinger (Secretary of the Department of Energy) are willing to accept a significant role for such a board. "If there's no overlap," says Saxon, "if all they want the overseers to do is to keep the faculty senate off their backs," then the discussion would be fruitless. His feeling, however, is that there will be an overlap.

As UC president, Saxon says he has access to "the military stuff" if he wants it. He says he has not tried to use this access to influence the program. "I find that as a physicist I might be tempted, but it would not be the soundest thing on an individual basis."

Saxon thinks that university control should be oriented "toward administration not program aspects of the labs." For example, he describes himself as a strong supporter not only of nuclear test limitations but of a comprehensive test ban treaty and says he is glad President Carter favors moving in that direction. But Saxon does not think that he himself should attempt to tell the lab directors what to do in the program areas affected.

The final university authority on any change in the UC role is the Board of Regents, and it is to the regents that Saxon would ultimately go with proposals for change. The majority of the 26-member board were appointed by former Governor Ronald Reagan during his two terms in office, and they are generally regarded as conservative in outlook and as favoring the status quo vis-à-vis the labs. In the past 6 months, however, ten regents appointed by Governor Jerry Brown have joined the board. These regents are viewed as politically liberal or heterodox.

In the view of a regent whose term ended early this year, the regents are not thinking much about the weapons labs. Frederick G. Dutton, a former assistant secretary of state under Democratic administrations in the 1960's and now a Washington lawyer, says he tried to raise the issue of the labs with little success. Until there is a Brown majority on the board Dutton says he does not expect the issues to get serious attention. Even then he thinks that the making of any major change in the university's role would be "problematical." His view is that the university—"a solid impervious mass of academic people"—has lived with the arrangement since World War II and that "the income and rationalizations in favor" of the tie have made the matter "a closed book." Brown himself has not gone on record with his views on the issue.

What attitude lab officials will take toward the proposal for a board of trustees and other Gerberding recommendations has not been signaled. In general, sentiment at the labs has favored continuing the university tie and the advantages it carries for the lab.

Teller, an emeritus for the last 2 years, is still an influential figure at Livermore. He wants to see "interaction continue" between the university and the lab and feels that increasing that interaction would, in fact, be "better for both." Teller, like others, points out that Livermore has unparalleled facilities and equipment, notably lasers and computers, and he would like to see these used to advantage by researchers doing pure science in the university.

The early link with Berkeley, which brought to Livermore such lab luminaries of the 1950's as Herbert York, Harold Brown, and John Foster, who became Pentagon notables in the 1960's, is now thoroughly attenuated. But faculty from Berkeley and other UC campuses do work at Livermore as consultants, and an applied science program estab-

lished by Teller in collaboration with the University of California at Davis has about 100 graduate students in the program at Livermore.

More elusive, is the value to the lab of the university connection in recruiting of staff. There is general agreement that the UC tie makes the labs more attractive to prospective employees from academe. Many staff members obviously feel that the university aura also helps to give the lab a more relaxed, less bureaucratic atmosphere. One weapons scientist observed during an interview, for example, that he doubted that he would be talking to a reporter at all if the lab were run by a government agency or an industrial contractor and that he valued the latitude provided.

This view is shared to some extent by SPSE members, but they are quick to point to important ways in which the lab differs from a university. Basic research is restricted effectively to work closely relevant to lab projects. Beginning professional salaries at the lab compare favorably with junior faculty salaries, but flatten out sooner than university salaries. Rules on consulting and benefits from patients are much more restricted

Briefing

The Quick, the Dead, and the Cadaver Population

The Department of Transportation has issued a stop-work order putting all work with the cadaver population into suspended animation.

The Department has been prompted to this exercise of its powers by Congressman John E. Moss of California. During the recent debate on air bags, Moss learned that dead bodies had been used to assess the protection afforded by the devices to passengers in car crashes.

He wrote to the Secretary of Transportation saying, in effect, that the Department had better have good reason for its use of cadavers because many would find such research morally offensive. Moss is chairman of the House subcommittee on oversight and investigations, and his opinions are of interest to the Department of Transportation.

Department officials soon ascertained that Moss himself was among those who found such research morally offensive. It was explained to Moss that almost all the cadavers so used come from the "willed body program," and that family permission is secured whenever possible. Crash testing requires an insignificant number of bodies compared with other uses, such as in medical schools. The information gained from cadavers is regarded as critical to the design of better dummies, and the present research program will be completed by 1980.

In full understanding of all these reasons, Moss replied to Secretary Brock Adams on 6 January, he nevertheless adhered to the view "that the use of human cadavers for vehicle safety research crudely violates fundamental notions of morality and human dignity, and must therefore permanently be stopped."

The Department issued 90-day stop-work orders to its six contractors in mid-November, and the ban is being continued by mutual agreement until 1 July, when a review of policy will have been completed. Some observers believe the Department may just be trying to wait Moss out—he has announced that he is retiring at the end of this session—but others say that Joan Claybrook, the new head of the National Highway Traffic Safety Administration, is interested in a serious review. The issue is not likely to become a political bandwagon: most congressmen seem interested in keeping as far away from it as they can.

One research contractor is at Wayne State University. Asked what he will use instead of cadavers in crash tests, chairman Albert I. King says "Living volunteers—but at lower g's." Wayne State uses about 10 to 20 cadavers a year in its crash test program.

Moss's inquiries elicited from the Department of Transportation the following official account of how cadaver crash testing came into being. Originally, it seems, crash studies were performed on "a dummy representing a 50th percentile male." Unfortunately a court "found the dummy insufficiently objective as a test device." After further test and development, "the Hybrid II dummy was adopted . . . as the official measuring instrument." One feature lacked by the Hybrid II dummy was the characteristic known as "biofidelity." It behaved well in frontal crashes but failed to mimic human kinematics in side and rear crashes as well as in pedestrian impacts.

The search began for an advanced dummy. But design of a better dummy required comparison with the real thing. "Of all available surrogates for the human body, the cadaver possesses by far the greatest mechanical and geometrical similarity with the living person," the Department of Transportation explained to Moss. True, cadavers were of different shapes and sizes, but "the variability of the cadaver population accurately reflects the variability of the population of living humans which the safety standards are designed to protect." Not that cadavers are perfect: "It is generally recognized that a number of limitations exist in using the cadaver as a surrogate for a living human being." Nonetheless, "prohibition of cadaver use for trauma research would set back progress towards these important ends many years into the future," the Department of Transportation concluded.

Moss read this document, but was persuaded to the opposite view.

Contrary to Fears, Public Is High on Science

The public is sometimes said to be "anti-science," but the evidence of recent public opinion polls undertaken in the United States and nine European countries show, on the contrary, that public attitudes toward science are strikingly favorable.

The scientific community in the United States "is greatly concerned about public attitudes toward science and technology because it perceives a deterioration in these attitudes to be the cause of many of its current problems," notes the National Science Board in a recent report.* But the evidence of surveys conducted for the board by the Opinion Research Corporation in 1972, 1974, and 1976 indicates that "the public continues to have an overwhelmingly positive general reaction to science and technology."

The public's esteem for scientists in 1976 was second only to its esteem for physicians. Seventy-one percent of the

**Science Indicators 1976.* Government Printing Office, Washington, D.C. 20402. $4.75.

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for lab staff than for university researchers. And the lab pay and promotion system heavily favors administrators over scientists who stick to R & D work.

SPSE members conceded that they think the university connection has had something of a "benign influence" in protecting people who have exercised the relatively new option of criticism at the weapons lab. "At the beginning," said one veteran scientist, "people did not have the idea they could dissent." Now they do, but the SPSE members say that the organization took the precaution of associating with the California state employees union before they took on management.

SPSE steers clear of weapons policy criticism and arms control issues. A range of attitudes on these subjects are held among the members, but the organization does not discuss or take stands on matters such as nuclear testing or the neutron bomb. Such discussion would only be divisive, says SPSE leaders, and the organization needs to maintain solidarity when dealing with issues of pay, promotion, and working conditions and when commenting on the quality of administration and of science at the lab.

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populace considers that science and technology have changed life for the better, only 7 percent consider the change to have been for the worse.

In cases where science and technology are deemed to have caused problems, the public is capable of drawing distinctions in imputing blame. Sixty percent say that government decision-makers are most at fault, 14 percent point the finger at business. Only 5 percent blame scientists directly, and 7 percent blame technologists and engineers.

The public shows considerable confidence in the ability of science and technology to help solve public problems. Asked in which specific areas tax dollars should be spent, respondents rank health care highest, weather control and prediction lowest. Despite confidence in their problem-solving ability, a sizable minority of the public would like to see social control over science and technology increased. A plurality of 45 percent say the degree of control should remain as it is, and 10 percent that control should decrease.

Very similar results are reported by a survey undertaken for the Commission of the European Communities.† Sixty-nine percent of people in nine European countries consider science to be "one of the most important factors in the improvement of our daily life."

Like Americans, Europeans place highest priority on medical research; agricultural research comes second and pollution control third. Europeans overwhelmingly favor the idea that their states should pool their scientific research effort, only 14 percent favoring separate national research programs.

Results were consistent from country to country except for the German public, whose attitudes toward science were consistently dourer.

"The main surprise—and this must be stressed—no doubt lies in the extremely strong and widespread consensus in favour of science," note the commission's reporters. "There is no crisis of confidence in science among the general public of Europe."

†*Science and European Public Opinion*. Commission of the European Communities. Rue de la Loi 200, B-1049, Brussels, Belgium.

Britons Are Nobeler, Americans Nobelest

Nobel prizes may not be the best comparative index of scientific prowess among nations, but none is perfect. Statistics* compiled by the National Science Foundation show that Germany, the United Kingdom, and the United States have dominated the field since 1900 but in interestingly different ways.

In proportion to each nation's population, British scientists have won most Nobels in each decade from the 1940's to the present. For the previous 40 years Germans were in this position. Germany's Nobel prize performance fell after 1940 to about half its previous level (for reasons presumably having much to do with the persecution of its Jewish population), and has remained at that level ever since.

In terms of absolute numbers the United States has beaten its two European competitors in each decade since 1940 and in each of the three scientific disciplines for which the prize is awarded.

Nobel Prize laureates in science proportionate to population for selected countries, 1901–1976.

Period*	United States	United Kingdom	West Germany†	France	U.S.S.R.	Switzerland	Netherlands
Average number of Nobel Prizes per 10 million population per year							
1901–1910	.011	.115	.198	.153	.014	.278	.727
1911–1920	.018	.067	.113	.101		.513	.156
1921–1930	.023	.156	.221	.075			.270
1931–1940	.062	.149	.230	.049		.488	.119
1941–1950	.092	.142	.091			.667	
1951–1960	.172	.174	.057		.020		.093
1961–1970	.128	.222	.086	.104	.013		
1971–1976†	.175	.238	.082			.278	
Number of Nobel Prizes awarded							
1901–1910	1	5	12	6	2	1	4
1911–1920	2	3	7	4		2	1
1921–1930	3	7	8	3			2
1931–1940	9	7	9	2		2	1
1941–1950	14	7	4			3	
1951–1960	29	9	3		4		1
1961–1970	25	12	5	5	3		
1971–1976	22	8	3			1	
Total	105	58	51	20	9	9	9

*Presented by location of award-winning research and by date of award. †Includes East Germany before 1946.

As for the Fields Medal, the mathematician's equivalent of the Nobel prize, the United States has garnered 35 percent of medals awarded since 1936, France 20 percent, and the United Kingdom 15 percent.

Nicholas Wade

*Science Indicators 1976. Government Printing Office, Washington, D.C. 20402. $4.75.

An entirely different perspective on how the university is doing in managing the lab is held by antinuclear critics, whose views are shaped by their hopes for change in the UC role. The conversion project is a coalition made up of groups and individuals with differing—in some cases widely divergent—attitudes, but they have managed to agree on basic policy and tactics.

The three main components of the coalition are the War Resisters League/West, Berkeley Students for Peace, and the Ecumenical Peace Institute. The coalition represents elements which came together in the movement opposing U. S. involvement in Vietnam. Observers say the current coalition is more patient, less radical in its rhetoric, and at least in its outward manifestations, not sectarian politically.

Charles Schwartz, a Berkeley physics professor who has been a campus gadfly on political and social issues and is associated with the conversion project, says that while members of the coalition want to see the labs converted from military research they see it is "impractical to say stop it." Majority feeling is that the university can't unilaterally convert the labs. The coalition wants the university "to engage in efforts with others to control developments in the labs." Most see conversion as a long-term goal. Some, who adopt a strict moral position, insist that to accept the long-term goal is to legitimize weapons involvement.

The immediate aim of the coalition, however, is to generate discussion and debate involving people outside the university community as well as within. Members of the project see the acquittal of the six members of the group in the trespass trial as a sign of growing public awareness and concern about the nuclear arms issue.

Obstacles to Discussion

Conversion project leaders say the group is pleased with the progress made in prodding the university administration to address the problem and in learning more about the structure and programs of the labs. They argue that lack of public knowledge about the labs has been a major obstacle to a critical public discussion on the subject of nuclear weapons.

The plan is to keep the pressure on the university—a demonstration at Livermore is scheduled for late April—and to carry on with the effort to build a broad political base of opposition to nuclear arms.

The coalition members recognize the complexity of the problem, acknowledging that the Soviet Union also has a nuclear weapons program and that the problem of nuclear proliferation has attained serious dimensions. But they justify concentrating on the U.S. weapons labs on the grounds that the United States has been the innovator and consistently set the pace in the arms race, and that heading off new weapons development offers a hope of slowing the race which shows signs of getting out of control.

The fact that the weapons labs are of but not in the university is obviously bothering people in a way that it did not 10 years ago. Some observers say that the UC faculty are increasingly embarrassed by the university's tie to the weapons labs and would like to cut the silver cord. But the Gerberding report has come along with a suggestion that the university redefine its public service function by attempting to manage the labs in a more meaningful way. And surprisingly, the principal parties in the debate seem warily willing to give it a try.

—JOHN WALSH

New Review of Nuclear Waste Disposal Calls for Early Test in New Mexico

Searching around the country for a suitable place to bury the high-level wastes produced by commercial nuclear power, the government appears to have moved one step closer to deciding that the first repository will be placed in the state where the atomic age began, New Mexico.

After a 3-month study, a special task force reviewing waste management for the Department of Energy (DOE) has found that highest priority should be given to the capability to place spent reactor fuel in permanent geologic disposal. (In the past, the emphasis was on proper disposition of wastes from chemical reprocessing of fuel, which the Carter Administration has decided to delay indefinitely.) To start the demonstration, the task force recommended that 1000 reactor fuel assemblies representing about 500 tons of fuel be buried in a bedded salt formation in southeast New Mexico not far from Carlsbad. The fuel is to be deposited in a specially built mine designed to provide access to the Salado salt formation at a depth of 2100 feet. Construction of the mine has not yet begun, but the demonstration is due to start in 1985.

The task force report was quickly criticized by state officials, whose immediate concern was the degree of control they will have over future waste disposal plans. "This report makes passage of a bill to give states like New Mexico veto power over waste disposal projects more important than ever," said Senator Peter Domenici, one of the state's two Republican senators, only hours after the report was released. Just a few weeks ago the New Mexico congressional delegation was assured of such veto power by DOE Secretary James Schlesinger (*Science*, 10 March), but the latest department statement revived the feeling that DOE plans for the Carlsbad site were changing so precipitously that state control was becoming illusory.

The Carlsbad project, named the Waste Isolation Pilot Plant (WIPP), started as a plan for geologic disposal of low- and intermediate-level "military" wastes—debris generally contaminated with plutonium but not containing the hottest products of nuclear reactions. Next, it was suggested for disposal of high-level military wastes, first on an R & D basis and then on a fully licensed basis. Now it is being proposed for high-level civilian wastes, at least on a limited scale. The latest recommendations present "an entirely different picture than the one indicated by recent DOE policy," says Domenici. What remains true, however, is that the WIPP site in New Mexico is the only location where the federal government has elicited even tacit approval for permanent geologic disposal of wastes that are radioactive at any level. After being rebuffed by at least a half-dozen states over the past 2 years (*Science*, 23 September 1977), the government has rather limited options, particularly if it needs to move quickly.

The proposal for the Carlsbad site is

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