Texas Uses Oil to Fuel Research

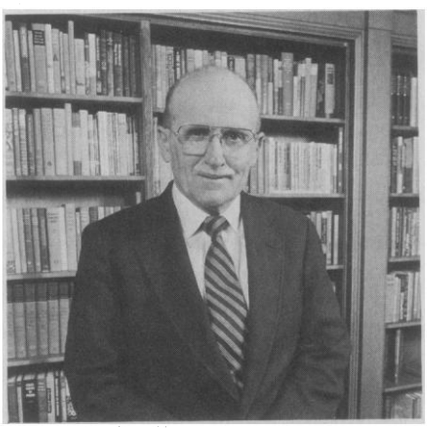
The University of Texas has a $1.8 billion endowment based on oil revenues. It is using the proceeds to boost its research capabilities

Austin, Texas. When the National Academy of Sciences recently released a series of studies assessing the quality of U.S. graduate programs, the results were greeted with some satisfaction at the University of Texas (UT) in Austin. Eighteen UT programs were ranked in the top 20 nationwide. But that is still low on the totem pole compared with where the university expects to be a decade hence. "I would hope that 10 years from now, when someone asks which are the best universities, we will be in the top two or three," says UT's president, Peter Flawn. If UT does not achieve that lofty goal, it will not be for want of trying.*

At a time when many universities have been forced to trim their activities in the face of severe budgetary problems, UT has been spending hard, building new facilities, and hiring new faculty. What is happening at UT is, in many respects, similar to what happened at other universities in the 1960's, when federal money was pouring into higher education. The difference, however, is that UT's expansion is being financed to a large extent by state funds and by the income from a massive endowment derived from oil revenues.

This oil money and the opportunities it provides have in the past few years attracted several prominent scientists to UT, and they, in turn, are bringing in a cadre of bright young faculty members. Among the new recruits are Steven Weinberg, who won the Nobel Prize in Physics in 1979 and was hired from Harvard last year; astrophysicist John Wheeler, recruited from Princeton in 1976; fusion theorist Marshall Rosenbluth, who followed Wheeler from Princeton in 1980; oceanographer Arthur Maxwell, who arrived from Woods Hole last year; and botanists Richard Starr and Malcolm Brown, Jr., who were hired away from Indiana University and the University of North Carolina, respectively, in 1976 and 1982. Surveying UT's new scientists recently, *Discover* magazine labeled them "a faculty the football team can be proud of."

In addition to acquiring a first-class faculty, UT has ambitions to build and attract some major research facilities. On the drawing board, for example, is a plan to construct the world's largest optical telescope at the University's McDonald Observatory in West Texas. A new research ship may soon be built for UT's recently established Institute for Geophysics. And, in an effort to capture perhaps the biggest research plum of all, UT is likely to join with Texas A & M University and other higher education institutions in the state in a bid to have the next major U.S. particle accelerator built alongside A & M's sprawling campus in College Station, 100 miles east of Austin (see box on page 392).



Peter Flawn

Aiming to put UT in the top three

And UT's ambitions do not lie just in the sciences. During the past few years, the university has been expanding its library resources and acquiring an outstanding collection of rare books and manuscripts for its Humanities Research Center. The university also constructed a building to house the Lyndon Baines Johnson Library—the first presidential library to be sited on a university campus.

These ambitions are fueled by oil, a commodity which, by an extraordinary stroke of luck, UT owns in abundance. In 1876, the state constitution set aside 1 million acres of land in West Texas, the income from which would be used to establish a fund for the "maintenance, support, and direction of a university of the first class." Seven years later, the legislature added just over 1 million more acres to the university's endowment. In spite of its size, however, the university's land provided little income in the early years, because it was essentially useless for anything except grazing. Then, in 1923, oil was discovered on part of the holdings, and the university's finances have never been the same since.

Almost half the university lands are now under oil and gas leases, and the income—which amounted to just over $200 million last year—is pouring into an endowment called the Permanent University Fund. As oil prices ballooned during the 1970's, so did the fund. It now stands at about $1.8 billion, which makes it the largest university endowment in the country, a fraction above that of Harvard.

The chief use of this huge endowment has been to generate construction funds for the University of Texas system and Texas A & M, which was given a share in the proceeds of the permanent fund in 1931. In essence, the universities use the fund as collateral to borrow money for construction. By law, they can borrow up to 20 percent of the value of the permanent fund, which means that while the fund has been growing, the money potentially available for building has also been expanding rapidly.

The permanent fund itself cannot be spent, but the income from its investments can. Last year, this income, which is known as the available fund, amounted to a cool $143 million. Under state law, two-thirds goes to the UT system and one-third to Texas A & M. The available fund is used to pay off the accumulated debt, and what is left of UT's share each year goes to the Austin campus to supplement state appropriations for educational support.

Although this available fund money amounts to less than 20 percent of UT Austin's $200-million general budget, it provides critical support for such items as libraries, research, the acquisition of computers, repairs, and capital improvements. "Without it," says President Flawn, "we would be just another university."

When UT attracted Weinberg from Harvard last year, people outside Texas began to notice that it is not "just another university." Weinberg, who had already scaled the heights of academe with his Nobel Prize and professorship at Harvard, says he was attracted to Texas because he was given the opportunity to

*The University of Texas has fourteen separate branches, including five health science centers and one special cancer center. This article focuses only on the Austin campus, which is the largest, most prominent, and most broadly based unit in the system.

put together a first-rate theoretical physics group there. Part of his agreement with the university was that he would have the resources to hire three more faculty members. Few universities in the country are now in a position to make such resources available to attract a senior researcher.

Press reports at the time Weinberg was hired noted that UT was paying him a salary of $110,000. Weinberg declines to discuss specifics, but says he is not being paid much more than he received from a joint appointment at Harvard and the Smithsonian Astrophysical Observatory. In any case, he says, a salary increase alone would not have been sufficient inducement to leave Harvard.

Although Weinberg's appointment drew a lot of public attention, John Wheeler's move to Texas from Princeton in 1976 was widely noted in the physics community. A theoretical physicist who worked on the Manhattan Project and later made some seminal contributions to astrophysics (a major topic of his research was black holes, a term he coined), Wheeler says he was attracted to Texas because it was "a place on the up when many are on the way down."

Flawn and the vice president for academic affairs and research, Gerard Fonken, both pointed out in interviews that researchers of the caliber of Weinberg and Wheeler would not be attracted to Texas unless the university already had a solid base. They resent the suggestion that UT is simply buying its way into the top echelon of research universities. Several UT programs, such as botany, linguistics, German, Spanish, and geology, had good national reputations long before the oil revenues began to flood in during the 1970's, for example. (Indeed, UT's botany department was rated the strongest in the country in the recent Academy study.)

But UT's oil wealth is a major attractant. Not only are top recruits offered high salaries (typically in the $80,000 to $100,000 range) and the opportunity to bring in other researchers, but they are also frequently given flexible support through individual endowments. Starting in September 1981, the university launched a major effort to bring in private funds to endow individual chairs and professorships, and it announced that it would match private gifts with cash from the available fund. The effort has been spectacularly successful: some 450 of UT's 2200 faculty positions now have their own endowments, totaling about $60 million.

The way UT is going about building up some of its science programs is well illustrated by what it is doing in geophysics and nuclear fusion. In both areas, top researchers have recently been recruited and substantial university funds are being expended.

Because of its links to the petroleum industry, geology has long been a strong suit at UT, but a few years ago university officials decided to give more support to oceanography and geophysics. The impetus is said to have come from Flawn, a geologist, who became president in 1979. To head this expansion, Arthur Maxwell was recruited from Woods Hole.

Maxwell, who says he has been "overwhelmed by the support I have had from the regents, through the president and on down," has hired half a dozen researchers in the past 18 months. "I want to build up one of the best groups in geology and geophysics in the country here, and we are well on our way," he says.

In addition, Maxwell has equally ambitious plans for research facilities. As a first step, he has worked out an agreement with Texas A & M to combine the two universities' research operations at Galveston, a move that should result in a major center for oceanographic research. Further down the road, Maxwell says he has "a moral commitment" from the university to build a new research vessel.

One of the top people Maxwell has hired is John Sclater, a geophysicist from Massachusetts Institute of Technology. Sclater, whose appointment was announced last month, says he was attracted to Texas because it is "the only place in geophysics where we are going to see any expansion in the next 5 years." Sclater will occupy a position with a 5-year endowment from Shell Oil amounting to $750,000, and he says he has been given a commitment to bring three young researchers with him.

UT's leap to the top ranks of fusion research has all the hallmarks of a Texas-style operation. The university has a long history of fusion studies, having built a small tokamak in the early 1970's with private support and a more powerful machine that began operation in 1981. But in 1980 it achieved a major coup by snaring a $5-million contract from the Department of Energy to create the U.S. Institute for Fusion Studies, a think tank designed to bring together some of the best brains in the country to work on fusion theory.

Texas was selected over the Massachusetts Institute of Technology, the University of California at Los Angeles, New York University, and Yale University. Its trump card was to hire Rosenbluth from Princeton, offer to match DOE's grant dollar-for-dollar, and promise to provide ten faculty positions for the institute (*Science*, 11 April 1980, p. 158). As a result, UT now houses one of the world's leading centers for fusion theory.

UT's main building

A less abrasive but no less bold move is being attempted in astronomy. Texas is planning to build a 300-inch telescope at its McDonald Observatory, without the use of federal funds. The university has already raised about $1 million for the design studies, and it it hoping to finance the construction with a combination of state, private, and university money. The total cost is now estimated to be about $50 million. If the venture is successful, UT would own the world's largest telescope.

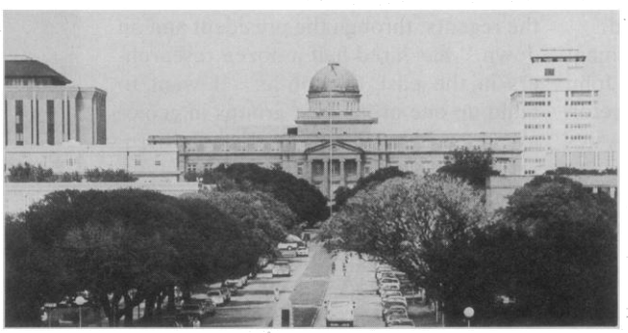
According to Harlan Smith, the observatory director, verbal pledges have been made for most of the funds, and the university is ready to place a $17 million contract for construction of the primary mirror. The whole package, however, appears to be hanging on a $5-million request to the state legislature. If that is approved, some of the checks from private contributors should start coming in, and the UT board of regents is expected to approve the use of university construction funds for the project. Smith says he hopes to dedicate the telescope by May 1989, the 50th anniversary of the observatory, which itself was founded with a bequest from a wealthy Texas banker.

The University of Texas at Austin thus seems to be well on the way to securing a place for itself in the top echelon of U.S. academe. But there are a few problems

Accelerating Research at Texas A & M

College Station, Texas. Twenty years ago, Texas A & M University was a small land-grant college whose students all wore military uniforms, lived in Cadet Corps barracks, and usually went on to be farmers or engineers. Today, it is a huge university with 36,000 students (one-third of them women) and ambitions to become the MIT of the Southwest.

People here like to talk in superlatives. A & M (for agricultural and mechanical) is the fastest growing university of its size in the country. It has the largest undergraduate engineering enrollment in the non-Communist world. It has the biggest single campus of any university in the United States (55,000 acres). And it has more National Merit Scholars than any other public university in the country. Yet, for all its size and ambitions, Texas A & M remains better known for its football aspirations than for its research prowess. "We are not among the great land-grant universities yet," admits deputy chancellor Perry Adkisson, "but we are much better than many people give us credit for." A & M has a one-third share in the proceeds of Texas' $1.8 billion higher education endowment, however, and like its arch football rival the University of Texas, it is using the money to build itself a scientific reputation. "In 15 years' time, we should be among the top five research institutions in the United States," predicts President Frank Vandiver with a bit of Texas confidence.



In transition from agriculture college to research university

Texas A & M has received a lot of attention recently for its assiduous courtship of Sheldon Glashow, the Harvard theoretical physicist who shared the 1979 Nobel Prize with Steven Weinberg and Abdus Salam. According to rumors, Glashow was offered $250,000 a year, but university officials say no offer has been made and no figure even discussed. They concede, however, that a sum of that magnitude might be available to lure a top researcher and two or three junior colleagues. In any case, Glashow will spend part of next year at A & M on sabbatical with no commitments beyond that. In addition, the university is talking with Norman Borlaug, who won the Nobel Peace Prize for helping develop high-yielding varieties of wheat, about a possible faculty position. And football is not being neglected. Last year, the university hired a new coach in a deal that will give him $250,000 a year. (He had a bad first season.)

A new management team has also been brought in. It includes Arthur Hansen, former president of Purdue University, who was appointed chancellor of the Texas A & M system last year; Gordon Eaton, former associate chief geologist with the U.S. Geological Survey, now vice president for academic affairs; and Robert Stone, former director of the National Institutes of Health, who was named dean of A & M's new medical school in 1978.

The university moved up a few notches in scientific standing last month when it snared the contract to manage the Deep-Sea Drilling Program (*Science*, 15 April, p. 287). Part of A & M's attraction was that it promised to put up $3.5 million for a facility to house the deep-sea core repository and offered a low overhead rate to the National Science Foundation, which funds the program. Winning the contract "will bring all the world's investigators to our door," says Eaton.

Texas A & M's oil money is also giving it a leg up in nuclear physics. The university is building a cyclotron with $6.3 million of its own money and $1 million from a Texas oil foundation.

But its most ambitious goal is to become the site for the next big U.S. particle accelerator. Faculty members are now drawing up a proposal for a 10-teraelectronvolt (TeV) proton accelerator—already nicknamed the Texatron—which would have a circumference of 100 miles and, they hope, be built on the Texas plain adjoining the campus. The proposal, which will involve scientists from the University of Texas, Rice University, and the University of Houston, will be presented at a meeting in Woods Hole this summer that will attempt to set a course of U.S. high energy physics for the 1990's.

Building such a machine in Texas would be expensive. It would require perhaps $250 million to buy the right-of-way alone, according to Eaton, which makes putting it in the desert or on federal land a more attractive proposition. Undaunted, university officials have already begun to explore the possibility of raising money for the right-of-way through a combination of state, university, and private funding. In that respect, an idea developed by Glashow could be important in getting the attention of the oil industry. Last month, Glashow proposed using a high-energy neutrino beam from such an accelerator for geological exploration, including looking for oil and gas.

If Texas A & M were to build the Texatron, the university would certainly be firmly on the scientific map. But can it become a major research university in its own right? "About the only thing that's going to stop us is lack of vision among people in administration like myself," says Adkisson. But there are some other problems.

One drawback is that the university is starting from a relatively low point. Only one program—chemistry—was rated in the top 20 graduate programs nationwide in a recent survey published by the National Academy of Sciences. Another is that College Station lacks the cultural amenities of many academic centers, which could be a bar to recruiting. A third problem is that the proportion of graduate students is relatively low, and faculty members carry a heavy undergraduate teaching load.

Finally, Texas A & M's share of the proceeds from the endowment fund may soon have to be spread over more institutions. But the university is hoping it will soon have a source of oil revenue of its own. Last month, it leased part of its campus for oil exploration.—**C.N.**

that threaten to put at least a minor dent in UT's plans. The most conspicuous of these is the recent drop in oil prices.

This is having a two-pronged impact on the university's finances. It is slowing the growth of the permanent fund and playing havoc with state revenues, which in turn could mean smaller increases in appropriations for higher education.

Last year, university officials were predicting that the permanent fund would climb to more than $4 billion by the early 1990's, and that it would yield over $300 million a year in income—more than double the current available fund. If oil prices remain depressed for a few years, the fund will grow more slowly, but it is still expected to reach $3 billion by the end of the decade.

That level scarcely suggests that UT is entering a period of financial hardship. But the problem is that just as the growth rate of the permanent fund is tapering off, more claimants are clamoring for its resources. Under the state constitution, only certain units of the UT system can now use construction money generated by borrowing against the permanent fund, but a bill before the legislature would make the entire system eligible for a share in the pot. (The units that would be added are mostly those parts of the system that have been established in the past decade or so.) As a result, construction funds are likely to be stretched more thinly. The university has therefore proposed that the borrowing limit be raised from 20 to 30 percent of the value of the permanent fund. That would increase the total available for construction, but it would also mean that more of the income from the permanent fund would be tied up in paying off the debt.

A trend that may bring some relief from these difficulties is a slowdown in the growth of students entering higher education, which means that the demand for new classrooms, dormitories, and similar buildings will ease. In the past 4 years alone, the student population at UT Austin has expanded from 40,000 to 48,000. But, thanks partly to tighter admission requirements, last fall's enrollment leveled off.

Even if oil prices remain depressed and the resources derived from the permanent fund are spread more thinly, however, UT has clearly got itself into an enviable position. "We are part of the general economy, and I don't expect we can go entirely unscathed," says Flawn. But, unlike many other public universities that are having to cut back to cope with budget shocks, UT now has a substantial cushion.—**COLIN NORMAN**

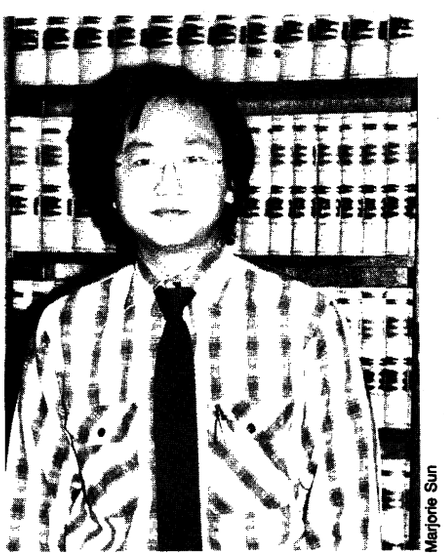
Scientists Settle Cell Line Dispute

But question of claiming ownership based on family ties to cell donor is sidestepped

San Diego—In July 1982, Ivor Royston, an oncologist at the University of California at San Diego, learned a bit of news, disclosed in passing at an office party, that he says "blew my mind." Royston was told that a visiting Japanese researcher had carried off part of a promising new cell line without permission. Hideaki Hagiwara had taken the cells back to Japan, hoping eventually to treat his mother, who was dying of cervical cancer. The cell line was a hybridoma, which is a fusion of two cells and a type of gene-splicing product of enormous scientific and commercial interest.

In the months to come, Royston, an associate professor, and Hagiwara, a young postdoctoral fellow, became embroiled in a debate over rightful ownership of the hybridoma, and proper credit for the research. The controversy was considerably complicated by another factor: the hybridoma was derived from cells taken from Hagiwara's mother. In an unusual argument, Hagiwara claimed ownership of the cells because of family ties. Last month the dispute was finally settled.

The cell line had a rare combination of properties that the researchers had not seen in other hybridomas. Researchers hope to use the monoclonal antibodies made by hybridomas as a possible cancer treatment. The hybridoma in dispute was a fusion of lymphocytes from Hagiwara's mother and human cells called UC 729-6, an established cell line developed at San Diego. In preliminary tests in Royston's lab, this hybridoma produced a monoclonal antibody which did not react with samples of normal cells, such as blood and fibroblasts. The test results were encouraging and an indication that the antibody might not cause side effects if administered to a cancer patient. Furthermore, the antibody did react with cancerous cells from the cervix, lung, colon, and prostate. According to Royston, no other human-human hybridoma has shown similar behavior.



Marjorie Sun

Hideaki Hagiwara

Carried the cell line to Japan

Hagiwara and Royston contested ownership of the cells, each claiming the more significant contribution to the project. Hagiwara, in addition to arguing a familial relationship, said it was he who proposed the idea of the fusion and that Royston's lab had simply carried out the technical task. Royston, however, maintained that his group actually created the hybridoma. Hagiwara "didn't realize the art and expertise involved," Royston says.

As details of the case unfolded, Royston became increasingly suspicious that the Japanese scientist had spirited away the cells to exploit them commercially. He learned, for example, that Hagiwara's father, a physician, is owner of the Hagiwara Institute of Health and president of Japanese Pharmaceutical Development Company, Inc., a health food concern. He discovered that Hagiwara had written a manuscript about the hybridoma that had not included Royston's staff as coauthors. Further-