that ERDA's request for proposals required SERI to "accept ERDA direction and work surveillance over the work program" while the draft contract required SERI "not to assign or remove any [key personnel] without the prior written consent" of ERDA. Thus, when the Californians submitted their proposal, they complained that "the tenor and, in many respects, the provisions of the draft contract are such that SERI cannot be effective as a contractor-operated study and research organization."

Craig told *Science* he believes the ERDA decisions on SERI are "exactly what would be expected of an organization given a mandate which it does not wish." He said ERDA has structured an institution "so captive as to dissuade anyone committed to excellence"; he predicted that the satellite facilities will "dilute the organization by making it coordinate a number of regional areas determined by geography, not technological needs"; and he called the low rank of the official to whom SERI reports "clear evidence of an intent to downplay the whole thing." He also suggested that the MRI proposal may have been picked because it was "the least threatening one strong enough to be defensible." Craig is vulnerable to a charge of voicing a loser's "sour grapes," but it should be noted that the Californians were complaining even before they formally entered the competition.

The man who will direct SERI for the MRI team shares a few of the misgivings about potential problems but is basically optimistic that all will work out well in practice. He is Paul Rappaport, 55, who is currently director of the process and applied materials research laboratory at RCA's David Sarnoff Research Laboratories in Princeton, New Jersey. Rappaport, an expert in photovoltaics and solar cells, was a highly popular choice to head SERI. (Craig calls him "an excellent person.") No fewer than eight different competitors for SERI asked Rappaport to head their teams, and he agreed to let himself be listed as director on the entries from three states—Colorado (the eventual winner), Arizona, and New Jersey. Rappaport's deputy director at the Colorado site will be Michael C. Noland, who is currently director of MRI's engineering sciences division.

Rappaport told *Science* he feels strongly that the regional components must relate to and report through the central SERI. "Otherwise I would not take the job," he said. "I would be very upset if we ended up with four SERI's that competed and overlapped." However, Rappaport called the regional approach "not a bad idea" because it allows many states to feel they are taking part. Rappaport also acknowledged some "concern" about ERDA's desire to retain detailed managerial oversight, but he recognized that SERI must be "responsive" to ERDA and national needs. "If I come to feel too restricted—so that we cannot bring in the right kind of people—then we'd have a major problem and I'd have to do something about that," he said. Rappaport added that, while some ERDA officials initially seemed skeptical that SERI could have much effect, virtually all officials now seem to consider it "a valuable thing."

Negotiations are under way between ERDA and MRI on a 5-year contract to establish SERI. Costs are estimated at $4 to $6 million for the first year and are expected to rise toward $20 million in the third year, if the regional components are included. The initial staff will include up to 75 professionals at the central site. ERDA has been saying that SERI's initial role will include analytical and assessment work and certain research activities with a potential for quick payoff. But Rappaport says his personal hope is that perhaps 60 to 70 percent of SERI's effort will be "hard R & D" with the remaining 30 to 40 percent devoted to such "soft sciences" as analysis and assessment, environment, and marketing.

Meanwhile, Beattie, the assistant administrator in charge of solar programs at ERDA, pooh-poohs fears that SERI is being downgraded or diluted. "The new Administration looks on SERI with kinder eyes than the previous one," he says. "The climate for solar energy is good."—PHILIP M. BOFFEY

Stevens Institute of Technology: After the Strike, Still Unsettled

Hoboken, N.J.—On 10 February, striking faculty at Stevens Institute of Technology voted to return to work. Their 18-day strike was the longest in the annals of their union, the American Association of University Professors (AAUP) and is thought to have set a record for higher education. But it produced no significant movement toward agreement on a contract.

Negotiations have continued, but the firing of two tenured faculty members during the strike—the administration argued that it was exercising a right to protect its legitimate interests by hiring replacements including permanent replacements—has led to a protest action before the National Labor Relations Board and a court case, and has added a major issue to the dispute.

Stevens, a private institution with a good regional reputation, has 1300 undergraduates and 950 graduate students. After World War II the institute expanded its research activities and amplified its curriculum to include programs leading to degrees in science and in technology and society in addition to its traditional engineering degrees. But it is still perceived as primarily an engineering school, and about 85 percent of its undergraduates take engineering degrees.

The strike punctuated Stevens' first experience with collective bargaining. The AAUP was designated as bargaining agent in an election in late spring 1975 decided by a single vote, 51 to 50.

Unionization at Stevens seems to have been precipitated by a financial recovery plan announced by the administration in 1974. Like many other institutions of higher education, Stevens was under heavy pressure from inflation and was experiencing operating deficits. The administration responded with a 3-year plan which, among other things, called for no raises last year and a 5 percent increase during the current academic year. The faculty objected strenuously to the salary restraints at a time when living costs were rising rapidly and Stevens salaries were falling behind those at comparable institutions. Pay, then, was a primary issue, but the plan developed by the administration also affected such things as tenure procedures, faculty workloads, and rules on consulting, and stressed "management rights" in general.

Money and power, therefore, are

dominant themes as they often are, but the issues transcend those in the usual campus labor-management dispute. There has been a note of intransigence in the negotiations which does not seem to be attributable simply to this being a first attempt at collective bargaining. Detached observers say it does not help that the administration and board of trustees are convinced that the faculty is trying to take over the school, and the faculty is equally sure that the administration is out to bust the union.

The fundamental conflict at Stevens, however, appears to be over the roles of administration and faculty and over the relationship between them. And the roots of this conflict are deep in Stevens' special history and present circumstances.

Stevens developed as a freestanding private institution without a direct connection to a university. Stevens compares itself to other technical schools such as Rensselaer (RPI), Illinois Institute of Technology, Worcester Polytechnic Institute, and to institutions such as MIT, Carnegie-Mellon, Rice, and Caltech.

After World War II, however, Stevens did not push into big-league research along the path taken by Caltech, for example, which remained a relatively small institution but established itself in scope and quality as a technical university. Stevens continued to pride itself on turning out good engineers, and was successful in doing just that.

In New Jersey, Stevens' natural competitor was the New Jersey Institute of Technology, formerly Newark College of Engineering. In the past, Stevens' faculty and students tended to view the Newark school with a somewhat patronizing air. It was known as Stevens' "summer school" because the word was that a Stevens student who flunked a course could make it up at Newark without undue exertion. Now, with the recent buildup of public higher education in New Jersey and the takeover of the Newark school by the state, the terms of competition have altered. NJIT offers a broader range of subjects and its faculty salaries now top Stevens salaries. An AAUP compensation survey for 1975–1976 shows, for example, that the salaries for professors at Stevens were $26,900 a year compared to $30,800 at NJIT and $27,700 at RPI. MIT professorial salaries topped the list of technical schools at $33,800 with Caltech close behind at $33,100, but NJIT paid top salaries for associate professors ($23,800) and assistant professors ($19,000). The Stevens' salaries for these ranks, $19,300 and $14,800, respectively, do reflect the salary freeze of the past 2 years but are nonetheless substantially lower.

The main point to be made perhaps is that at a time when growth in higher education enrollment has tapered off and is demographically destined to decline, private schools such as Stevens face stiff competition from publicly supported institutions such as NJIT which can charge substantially lower tuition to students and pay higher salaries to faculty.

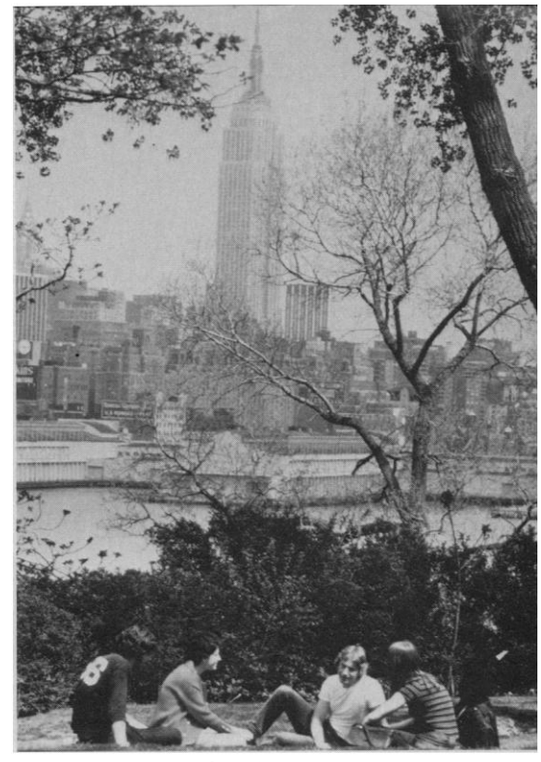
The Stevens adminstration, in approaching the bargaining table, might be said to have a hidden agenda, although, in fact, administration officials, are perfectly willing to discuss their aims. The administration position, in brief, is that to ensure the future success of Stevens it is necessary not only to balance the budget, but to move the institution further toward the model of research-oriented technical institution which government funding has been instrumental in creating since World War II.

A forceful advocate of this policy is the Stevens' provost Luigi Z. Pollara. A former chairman of the chemistry department, Pollara is a veteran of the academic putsch at Stevens in the 1950's, which installed major programs in the physical sciences (until about 1957 the only bachelor's degree there was in engineering) and expanded graduate education and research.

The import of the argument made by Pollara and others who share his view is that what makes a national and international reputation for a technical school is accomplishment in research. Good students and able faculty are attracted by a research reputation, and in the highly competitive conditions now prevailing it is necessary for Stevens to emphasize research.

Although the administration sees no need for any apology about the research now being done at Stevens, the view, as one administrator put it, is that "research potential exhibits itself unevenly across campus." What this means is providing greater incentives and rewards for those who are successful at attracting research support and producing useful research results. And the corollary, as the faculty reads it, is to get rid of people who don't perform.

By this analysis the institution suffers from a "phase lag." To a marked degree this can be explained by Stevens' history and traditions. The school was founded in 1870 through a bequest by Edwin Stevens, himself an inventor, whose resourceful family had been responsible, for example, for the first American railroad and the ironclad warship. The institute soon established itself as a leading mechanical engineering school and Stevens remained fixed, perhaps fixated, on this specialty through much of the first half of the 20th century at the cost of some missed opportunities.



The view from Stevens.

As Pollara suggests, World War I was a "chemical war." Work on such things as explosives and poison gas, and the German synthesis of nitrates, gave great impetus to the postwar chemical industry. Stevens did not expand its programs in chemistry and chemical engineering in the way other technical schools did. And during the interwar years, the Depression put a lid on expansion and development at the institute. World War II was in a significant sense a physics and electronics war, and again Stevens lagged. Instead of becoming a military research center as did other technical schools, Stevens ran Navy programs for training personnel, a job it did very well.

Stevens was different in ways that went beyond choices of program to matters of institutional tradition. As a self-contained engineering school it did not fully share the academic values and style of the universities. Well into the 20th century it maintained a 19th-century reverence for hard work, self-improvement, and individual initiative. To a great degree, life at Stevens was "uncorrupted" by the metropolis. An honor system was instituted early in this century which was a model of its kind, and its physical education program, involving virtually all students, seems to come as close to the *mens-sana-in-corpore-sano* ideal as one can expect in a collegiate setting. Ste-

vens was small enough for the place to operate with a sort of "family" atmosphere in the old days, but it was family life with more than a touch of puritanism and parochialism. The president and the board ran things on a tight rein, and many of the professors were cast in the mold of the martinet.

Stevens came out of World War II lacking the momentum of its institutional peers. The effort to catch up in the 1950's was led by the physics department. Energetic new people were brought in and the department took off, particularly in plasma physics and the related areas of solid-state and low-temperature physics. The young turks were successful in bringing in federal grants, they pushed through curriculum changes which integrated physics into engineering, and they promoted federal funds for the building program which transformed, but did not disfigure, the very pleasant 55-acre campus spectacularly situated on a bluff on the Hoboken waterfront.

There was a clash between the old and the new. The physicists were seen by their critics as without loyalty to Stevens' traditions, and as rather self-seeking careerists looking for personal recognition in the national competition for publication and research grants. The chemists followed the same path as the physicists, forming a combined department of chemistry and chemical engineering and allying themselves with the physicists in their expansionary ways.

The process continued through the 1960's with the slow expansion of research and additions to the Stevens program including the establishment of a management science department. But a more-than-symbolic event occurred with the naming of Kenneth C. Rogers to the Stevens presidency in 1972. Rogers was chairman of the physics department at Stevens when he was appointed president. His accession and the later appointment of Pollara as provost was seen as capping the rise of "the scientists" to the top posts which had traditionally been held by engineers.

The legacy of the transition period was a coolness between the science and engineering faculty. It would be an oversimplification to say that engineers represented the old teaching tradition and that the scientists were research oriented. Some engineers have major research credits and national reputations for their professional activities. And by no means all physical scientists are productive researchers. Over the years, however, physicists and chemists, on balance, were considerably more active in research than the engineers. (The squeeze on research funds which began in the late 1960's did affect the pattern. The research budget in the current year at Stevens is about $3.2 million in a total operating budget of about $14 million. This is about $1 million below the highest annual figure Stevens recorded for research. The downtrend in research funding has been arrested and the total appears to be increasing again. Research in the physics department this year amounts to about $253,000, down from approximately $1 million at the peak, but the figures there and for other departments are probably somewhat misleading since there is now more interdisciplinary research, particularly applied research, which is not listed departmentally.)

It is clear that the engineers as a group feel that they carry an unfair burden of teaching and regard the scientists as generally being better paid and having more time for research. Unquestionably, the engineers felt they were slighted in the 1960's. As one of them put it, "the president was gung ho for science." And they point out that mechanical engineering occupies the original institute buildings—the American Society of Mechanical Engineers was founded in a room there in 1880. And although the building has a Victorian solidity and charm, the teaching facilities and equipment are very much what they were 30 years ago. The engineers themselves concede that they did not spend as much time promoting research funds and money for new buildings as the scientists did. They saw their job as the traditional one of turning out good engineers and thought the administration should handle development matters. As for relations between scientists and engineers, the comment by one engineer that "the two groups are not close at all," seems fair.

Departmental Alignments

Faculty orientation can be traced at least roughly by comparing the reaction of various departments to the strike. The scientists, by and large, crossed the picket lines. Only 3 of 15 members of the chemistry department and 3 of 19 in the physics department joined the strikers. At the other extreme, all but one of 11 faculty members in the management science department and three of a dozen mathematicians went out on strike. The electrical engineering and mechanical engineering departments split roughly down the middle. In all, more than 60 of the 100-plus faculty classed as full-time regular faculty went on strike, and union membership is now put at about 65.

The faculty had no history of acting in concert. Stevens' location is probably a factor. Hoboken is now undergoing something of an urban renaissance, but for most of this century it was a grimy, quietly decaying Hudson River town run by an old-style Democratic political machine. Faculty tended to live in New York or in the far-flung New Jersey suburbs and keep commuter schedules. The tradition of a strong board and administration dominated governance. There was no faculty senate in the familiar mode and no system of committees exercising strong influence on policy matters. During the period of student and faculty protest and unrest elsewhere in the 1960's the Stevens campus was quiet, but a more activist spirit seems to have germinated in the 1970's in a sort of delayed reaction. A study of governance involving students and faculty as well as representatives of the new administration is regarded by some as a beginning of demands for more participation in decision making by the faculty. When faculty income and career prospects became directly affected by the administration's recovery plan the scene was set for the ensuing confrontation.

Negotiations began a year ago when the AAUP unit presented its contract proposal to the administration, but it was not until September that the administration completed its counterproposals. The union, in addition to demanding salary increases higher than the administration offer, submitted proposals on working conditions which in general follow the policies of the parent AAUP. The administration's proposals held to the 5 percent raise offer for this year and hewed to the line on management rights developed to implement its recovery plan.

The union, for example, asked that department heads be elected by their departmental colleagues for 3-year terms. The practice at Stevens has been for department heads to be appointed by the administration. Prior to the vote on unionization there had been a conflict over whether department heads should be counted as part of the faculty bargaining unit or excluded as being part of management, as the administration insisted. The NLRB declared the department heads to be management, a decision which had its ironies since the consensus is that if the department heads had been eligible to vote the union would not have been voted in at Stevens.

Other disputed points were on tenure, sabbaticals, and workload. The details of the differences are complex, and on a number of points the faculty seems to have objected mainly to the administration's insistence on unusually broad discretionary powers. The clash on tenure,

however, is a sharp one. Stevens has a high percentage of tenured faculty—perhaps 70 percent. The administration, in effect, wants to set a quota on tenured faculty by rank and to make it possible to extend the probationary period up to as much as 16 years.

On sabbaticals, the union proposed making such leave a right while the administration sought to hold broad discretionary authority. On workloads the administration wanted to set 12 contract hours as a norm. The two sides do not seem to be too far apart on definitions of what constitute activities to be counted—teaching, labs, advising, and so forth, but the faculty objects to the administration's setting standards unilaterally. The union also balked at an administration proviso that faculty be on campus 5 days a week and that consulting be limited to 2 days a month except when more is permitted after consultation with a department head.

Faculty members active in the union see the administration as imposing a "cost-effectiveness analysis" on the academic program in a way that will injure the program. One member of the union negotiating team said, "We don't disagree with a lot of their objectives, but we resent their doing it by fiat."

According to this same professor, "the trustees and the administration do not conceive of the institution as in the mainstream of higher education. They want to run it as a factory, a productive machine. They had a plan and saw the union as thwarting their objective."

The board and administration seem to have worked in close accord throughout the development of the financial recovery plan and the period of collective bargaining. The board's chairman and most influential member is Frederick L. Bissinger, a former vice-chairman of the Allied Chemical Corporation. There has been little direct contact between the faculty and the board, and union members have the impression, as one activist put it, "Bissinger is calling the shots."

Whatever the reasons, negotiations moved at a glacial rate last autumn and, in November, the union voted that it was prepared to strike in January if no substantial progress was made. Late in the year a federal mediator was called in at union behest, but the subsequent meetings witnessed no advances on what either side regarded as essential points. Then the union affirmed its vote to strike and went out on 24 January. The basic reason for the strike decision, says one union negotiator, was that "We were going nowhere very slowly."

The effectiveness of the strike is in dispute. It did not close down the institute—nonstriking faculty continued to meet classes and administration members and part-timers pitched in. The union claims that in the early days of the strike about half the students did not go to class. But the extent of the student boycott was limited and students returned to class in increasing numbers as the strike lengthened.

The students' attitude toward the strike was not quite "a plague on both your houses," but their major concern was clearly about the effect on their own work in the spring term. At one point, the students asked for binding arbitration of the strike. The union decided to accept this proposal, but the administration ultimately rejected it on grounds that vital decisions would be taken out of the hands of those responsible for implementing them.

Stevens students are, by and large, highly motivated, bright, and career oriented. Most of those who go to the institute are at least initially interested in engineering because of the school's reputation, even if they later shift to science or the technology and society program. In the past, Stevens had many second-generation ethnic students who used the institute as a springboard to professional status. The mix of students has changed—Stevens has an increasing number of students from abroad—but many students still come from middle-income and lower-income families and are acutely concerned about costs.

Timing of the Strike

The faculty resents the implication that the strike damaged the school or was unfair to the students. They point out that the strike was set for the beginning of the term when it would have the least possible impact. They pledged that work lost during the strike would be made up. When the strike lasted more than 2 weeks, striking faculty concluded that it would be difficult to make up work for a longer period and voted to return to work.

The firing of two faculty members by the administration during the strike obviously sobered the union members. The two were Richard S. Barrett, a professor of psychology in the management science department and Francis B. Clough, an associate professor of chemistry. The administration announced that it was permanently replacing Clough and cancelling all of Barrett's classes. (Their salaries would be paid to the end of this academic year.) Institute officials argued that its obligations to the students and right to protect the institution gave it legal grounds to do so. The matter is now the subject of a complaint to the NLRB and of a court case brought by Barrett and Clough with AAUP support. The Stevens union has voted not to ratify a contract unless the two faculty members are reinstated, and the national AAUP is taking the dismissal of tenured faculty as a serious matter. The union action in bringing the NLRB complaint and the court case appear to have hardened the administration's attitude.

Two negotiating sessions were held after the strike and a third one has been thrice postponed. As this was written, the third session was scheduled and there appeared to be some cautious optimism about prospects of progress, although no specifics are discussed.

The slow progress in negotiations at Stevens is not really unusual. The average time to reach agreement on a first contract in higher education has been more than a year, according to the AAUP. Most collective bargaining on campus has involved public institutions; a pattern of fairly generous settlements has prevailed, but public authorities recently have been stiffening their stands. Stevens is the first of the private engineering schools to be unionized, and such institutions have had a reputation for conservatism which seems to extend to the bargaining table.

For both sides, the delay has its disadvantages. The administration is prevented from giving raises, including raises to loyalists who did not strike, and from putting into effect measures in its recovery plan. The union is working without a contract and with the uncertainties which the last year has bred.

The issues involved are not unique to Stevens. Financial difficulties, competition from public institutions, and the need to adapt to the new realities of the 1970's are afflicting virtually all private institutions. What is different at Stevens is that it is all happening in a compressed time span and a very highly charged atmosphere. Most difficult, it is necessary to alter the social contract, so to speak, under which the faculty and administration have long been operating.

It would be unfortunate indeed if the attitudes harden into an impasse in which the administration asserts that any deviation from its plan threatens the survival of the institution, while the faculty believes that what is at stake is its professional status. To an outsider, the conflict between faculty and administration might be likened to ships bound for the same destination which collide because they are on different courses and have poor communications.—JOHN WALSH.