NEWSLETTER OF THE AMERICAN SOCIOLOGICAL ASSOCIATION SECTION ON

SCIENCE, KNOWLEDGE and TECHNOLOGY

Volume 3, Number 3 December, 1990

FROM THE EDITOR

Jim Petersen, our Founding Editor and the only Editor this newsletter has ever had, has resigned after getting this publication off to a strong start and producing six excellent issues. Jim deserves the thanks of all members of the Section for a job very well done.

I have been asked by our Chair, Henry Etzkowitz, and the Council, to take over the editorship. Our by-laws provide that the Section's Publications Committee shall have at least two other members (who, in effect, are associate editors although the by-laws do not actually use this term.) With the enthusiastic concurrence of the Chair, I have asked Edward J. Hackett (Rensselaer Polytechnic Institute) and Thomas F. Gieryn (Indiana University) to fill these positions and I am very pleased that they have both agreed.

This is the first issue of the newsletter in which the volume and issue number are specified. The first issue was Spring 1988. I am assuming that each calendar year should be considered a separate "volume," which means that this issue is the third (and last) of Volume Three. We are now able to expand to four issues annually, of eight pages each, which will very likely appear in February, May, August and November, although we can preserve some flexibility in scheduling.

The ASA Section on Collective Behavior and Social Movements calls its newsletter the "Critical Mass Bulletin." The Family Section's newsletter is called "Family Forum," and the Theory Section's is known as "Perspectives." Can anyone think of an equally attractive and appropriate title for our newsletter? If you have ideas on this, or anything else, mention them on the form on the last page of this issue. And, please fill in the entire form and send it to me.

The primary function of the newsletter, of course, is to publish news and announcements of interest to members. In addition, under Jim Petersen's editorship, the newsletter has also published "Op-Ed" pieces, book reviews, course syllabi and other items. I am eager to publish such items and hope they will be submitted.

CONTRIBUTIONS TO THIS NEWSLETTER should be sent to me as follows:

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My E-mail number should be available for publication in the next issue.

CALLS FOR PAPERS

The SKAT Program Committee is calling for submissions for the 1991 meetings. Deadline: December 31, 1990. Papers in any area within the scope of the section are welcome. Special session topics include:

Science, Technology and the Military
Minorities, Science and Technology

Send papers to Susan E. Cozzens, SKAT Program Chair, Department of Science and Technology Studies, Rensselaer Polytechnic Institute, Troy, New York 12180-3590. Please include telephone and fax numbers where you can be reached in January.

Studies in Technological Innovation and Human Resources is a series of books being published by de Gruyter (Berlin and New York). Contributions are being sought for volume four, Women and Technology. Deadline for submission of papers is October 1, 1991. To obtain details or to discuss your topic contact Urs. E. Gattiker, Editor, Technological Innovation and Human Resources, Faculty of Management, University of Lethbridge, Alberta T1K 3M4 Canada, phone (403)320-6966 (Mountain Standard Time), FAX (403)329-2038, Bitnet GATTIKER@HG.ULETH.CA.

ELECTION RESULTS

Congratulations to the newly elected Council members, James C. Petersen (Western Michigan University), Peter Whalley (Loyola University), and Rosa Haritos (student member, Columbia University). The referendum, to increase dues for regular membership from $8 to $10, was approved.

From the Chair:

On Science, Technology and Development

Henry Etzkowitz[1]

I went to Mexico City this October, instead of the 4S meetings in Minneapolis, to attend a conference on "Science and Technology in the Current Economic Context." The three day seminar was organized by the Center for Technological Innovation (CIT) of the National Autonomous University of Mexico (UNAM) and sponsored by the United Nations Industrial Development Organization (UNIDO). CIT is a unigue organization that combines some of the technology brokering capabilities of a venture capital firm with the academic functions of a science and technology policy research unit. Typically, on a campus in the United States these functions would be carried out by two separate entities: an administrative office for licensing intellectual property reporting to the Vice President for Research and an academic Science, Technology and Society program located in the Division of Humanities or Social Science.

UNAM is perhaps the world's first megaversity. It has 200,000 undergraduates and an additional 100,000 students in their last two years of secondary school. The teaching faculties are complemented by a separate tier of research institutes with their own staff. The spacious campus has two separate subway stops and much undeveloped land. It is as if the entire State University of New York system of 50 or more campuses were combined at a single site. As are other research centers at UNAM, the CIT is located on the periphery of the university. The teaching faculties occupy the central campus area. An indicator of the CIT's special status is that its director reports directly to the rector of the university. The CIT is housed in a triangle shaped modern two story structure that was completed in 1987. Offices surround an interior courtyard whose grounds are speckled with volacanic rock and plantings. The three groups within the center (technology transfer, evaluation and academic) face each other from their offices on different sides of the second floor of the enclosed court. The first floor has a library with a good collection of the international literature on management of technology and related disciplines, classrooms and a large seminar room.

The organization of the conference reflected the dual nature of the Center. A session on the philosphical critique of technology was complemented by one on economic development strategies based on technological innovation. The CIT's Director Dr. Jaime Martuscelli, a biochemist and former government official, and I spoke at a session on university-industry linkages. We both focused on the relationship between such ties and public policy: science and industrial in our respective countries. He presented the CIT strategy for technology transfer in a concentrated environment. Basic research is largely carried out at a single university and 80% of industry is located in the Mexico City region, also the home of the university. I discussed the development of a variety of formats for university-industry relations in the United States and how, in the past decade, they have spread throughout a university system comprising schools that traditionally have differing commitments to basic and applied research. In the United States university-industry linkages have been made to substitute for an explicit national industrial policy. In Mexico such linkages replace a policy of direct state involvement in the economy. Convergence upon a common approach may make the experience of each society relevant to the other but significant differences in academic and industrial systems must be taken into account in any comparative analysis.

The conference format was interdisciplinary, international and boundary spanning: across institutional spheres of university, industry and government. Local experience was contrasted to foreign models. Mexican philsophers of technology were joined on a panel by an American, Langdon Winner of RPI. Researchers of university-industry relations were complemented by practioners; social scientists and humanists by engineers; academics by industrialists. For example, Ing. Louis Carcoba Garcia, President

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[1] I wish to express my appreciation to the members of the Centro para la Innovacion Technologica for their willingness to be interviewed at short notice and in a foreign language.

of CONCAMIN, the national confederation of industrial corporations, and head of Resistol, a major Mexican chemical firm affiliated with Monsanto, discussed the university-industry papers.

Until quite recently, in Mexico, economic issues were framed in terms of relationships to developed countries, especially the United States, development of national resources such as oil, and the relationship among capital, labor and the state. Technology was very low on the agenda given the expectation that whatever technologies were needed for local industry could be licensed and imported from abroad. Local markets were protected. There was no pressing need to innovate and a firm's R&D expenditures, when they were made at all, were typically low. The relationship between the traditional elements of the constellation of the economy: capital, labor, the state and technology have recently been revised and a new element added: the university.

The guiding assumption of the conference was that future economic growth of Mexico and other developing countries will be based on science based high technologies such as biotechnology and electronics. A corollary principle was that indigenous scientific research institutions and advanced degree programs will increasingly provide the technical base for future development while lessening dependence on transfer of technology from abroad and foreign training for Ph.D. students. This represents a shift in orientation for Mexico toward utilizing a broader range of its existing academic research capabilities for economic development and expanding that research capacity by producing domestically trained Ph.D's. These new goals have been supported by a significant change of policy at UNAM where teaching and research had previously been conducted by separate staffs. Henceforth, many of UNAM's 6,000 researchers will be required to do some teaching, perhaps one course per year, and the even larger teaching staff will be encouraged to conduct research. This shift in academic policy was part of a broader response to changing economic circumstances that affected the entire society.

In 1982 the debt crisis forced Mexico to take austerity measures. This made it difficult and expensive for firms to buy foreign technology, the traditional path to innovation. It led firms to look to themselves to develop new technology but R&D funding was traditionally low and, under austerity conditions, difficult to increase. Academics also felt the decline of the peso through reduced standards of living and a greater difficulty in obtaining research resources. Under these conditions, some academic research units that had no ties to industry became interested in making connections to help support their research and their researchers. Thus, financial adversity created the conditions for increased academic interaction with industry, a circumstance not unknown in the United States[2] .

The CIT was originally established in 1983, exclusively as an administrative unit to arrange the transfer of technology developed in the university to industry. A staff of young engineers was recruited and trained in intellectual property rights and negotiating techniques. They developed an esprit-de-corps working long hours on projects, socialized together, and shared problems in weekly meetings. Short courses were offered to acquaint university researchers with the services of the CIT. Contacts were made in industry and financial institutions were persuaded to make funds available to companies to support technology transfer projects that they could otherwise not afford. A flow of agreements with firms in Mexico's narrow stream of science based industry followed. 350 contracts have been negotiated to date, ranging from consultation arrangements to transfer of products and processes.

The unique feature of the CIT, its combination in one setting of technology transfer activities and science policy research, was instituted in 1985. Two years after its founding, UNAM upgraded the technology transfer office into a Center. This designation gave the CIT greater status within the university but brought along with it the requirement that, as with all Centers, it have an academic component. Initially this requirement was met by bringing into the center an anthropological research group that had previously been studying various units of the university such as the Veterinary Medicine Faculty. This alliance did not last. The group was still heavily committed to its previous program of research and soon withdrew from participation in the Center.

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[2]William Blanpied "The Emergence of Knowledge Transfer in Mexico" International S & T Insight, August, 1989

Instead, several individual researchers were recruited to pursue a range of studies, some directly related to the centers mission along with others more broadly conceived. These included:

- an organizational study of the CIT conducted through participant observation;
- a sociological analysis of the role of the state in shaping Mexico's science and technology policy;
- an anthroploogical investigation of the reception of university originated technology in several firms, stratified by size and technical level;
- a management of technology analysis of "incubator" facilties (programs offering space, management consulting services and access to academic resources) to facilitate the formation of technical firms at universities.

With the exception of the incubator study that resulted in a proposal to establish such a facilty at UNAM, the researchers are not sure how their results will inform the practical activities of the center, or if they will be used at all. This indicator of internal tension within the CIT is paralleled by issues concerning the relation of the Center to industry.

There are some potential contradictions in the CIT technology transfer strategy. For example, there is the problem of reception of academic research into Mexican industry. Only a relatively few firms maintain R&D laboratories that operate on a comparable level to the university's relatively well developed system of research institutes. In one instance, the CIT's technology transfer officers assisted researchers in making arrangements to have their research carried forward in Italy where the necessary sophisticated research equipment was available. Thus, transfer of technology may mean transfer out of the country although the CIT's purpose is to facilitate transfer inside Mexico. However, if the requisite technical base does not exist locally then foreign partners must be found. This can be advantageous to the university if royalties flow from abroad. It can also be in the interest of the academic researchers who are seeking funds to suport the continuation and expansion of their research programs. It matters little to them whether the source of funds is foreign or domestic as long as they receive research support.

Nevertheless, since a major goal is to infuse science based technology into Mexican industry it is important to the CIT's mandate to find domestic partners. The imbalance between the University's high tech potential and the lower technical level of much of Mexican industry, despite the existence of biotechnology and electronics firms, is perhaps one impetus to the university's interest in creating its own industrial sector by adopting the "incubator" model. Certainly, such a strategy has historical resonance with Stanford University's involvement in creating an electronics industry adjacent to its campus in order to provide a context for its engineering school. In the case of UNAM, it can be expected that the firm founders will be drawn from among its own technology transfer "project managers" at the CIT as well as from academic staff. After being part of numerous negotiations to assist others in arranging technology transfer; these engineers are likely to want to try it themselves. Indeed, at least one project manager has used her skills to help start a technical firm in her spare time while working at the CIT. She expressed the classical outlook of the entrepreneurial academic saying that, "I like academic life but I also like money."

A CIT anthropologist found in her fieldwork that most innovation (and she reports considerable innovation activity at the firms in her sample) resulted from workers and managers making improvements in products and production processes. Innovation at these firms typically comes out of experience with production processes rather than through formal R&D structures that the firms often lacked. When such a structure was put in place in one firm it was sometimes counterproductive in stifling innovation arising from outside the formal structure.

Even when a firm has formal R&D capabilities it may not necessarily establish a research relationship with domestic universities. The Resistol chemical firm spends a total of 8 million dollars a year on R&D (a low sum by international standards but a significant expenditure in Mexico) and has serious research capabilities in areas such as polymers. When its U.S. partner gave up production of a particular industrial product; the Mexican firm faced a difficult decision. Could it afford to continue production itself and maintain a sufficient R&D effort to support the product line? Resistol is seeking partners to share the cost of R&D in two South American companies, who are also related to the same U.S. company. These firms

also produce the product but conduct no R&D in the product area themselves. There is also the possibility of seeking alliances with firms not related to Monsanto or with academia. Resistrol supports training programs at the masters level at two Mexican universities but has not yet established a research partnership within the Mexican academic system. The firm has an R&D operation capable of dealing with academic researchers. It has expressed the need for R&D partnerships. There is the example of its U.S. counterpart firm, a leader in making such connections. However, the firm is supporting a 2 million dollar R&D project (in addition to its regular R&D budget) at a spinoff company from an American university, with expectations that a 50 million dollar business may result from the collaboration.

The CIT is jointly supported by funds from the university, by UNIDO and, recently, by monies earned from its own technology transfer activities. The CIT model represents a significant shift in strategy for UNIDO, toward high technology from its previous focus on intermediate technology. UNIDO pioneered a concept of intermediate technology, located in between Ivan Illich's notion of low technologies and the latest high technology. Intermediate technologies were often medium scale production process that had been discarded by industrialized countries but were relatively simple and could be adapted to the requirements of local resources. For example, medium scale paper making plants utilizing jute or comparable raw materials exemplified UNIDO's intermediate technology approach. Central to this strategy was the expectation that developing countries would transfer technologies among themselves, adapting them from one country to another. In addition, UNIDO assisted countries in forming research institutes to improve intemediate technologies. UNIDO also produced a series of reports on a number of industrial sectors in which intermediate technologies had proved successful in many countries.

Oriented to high tech, the CIT model is largely irrelevant to firms without relatively sophisticated research resources. The CIT approach is even less likely to relate to firms that are based on intemediate level technologies where innovations are typically made through craft techniques. In Mexico, and even in the United States, most employment is not based on high technology. Therefore, a diversified approach to technological development is warranted. An alternative to the high tech model exists utilizing an "extension agent" approach to technology transfer. In this model, traditionally common at U.S. land grant universities, researchers start from the problems of the users, taking them back to university laboratories for examination. The technology transfer agent translates the university originated solution into terms that the industrial firm without formal R&D capabilities can understand and utilize. Indeed, even when such a user oriented approach is not available, it has been reported that workers at Mexican firms have, on their own, rebuilt university originated technologies, transferred by the CIT, to fit their firms' production processes.

To supplement the CIT model, an alternative approach would likely require the establishment of new research institutes oriented to the needs of particular local industries. MIT proposed to establish such a laboratory for New England industrial firms during the 1930's and regional Mexican universities might take similar steps today. The lesson to be learned from the history of university-industry relations is not to rely on a single strategy but to put in place a variety of approaches, relevant to a range of university and industry capabilities and needs. Indeed, over the years it appears that the CIT has broadened its approach from the transfer of university originated technologies to high tech industries to a model in which the pros and cons of a several possibilities are weighed, together with the researchers. Alternatives include: small scale production on campus with marketing handled by an existing firm, total transfer to an existing firm, and establishment of a new firm by the academics to produce and market the technology.

Just a few years ago, an article in the ASA Footnotes called for sociologists to analyze university-industry relations. In a future issue of Science, Knowledge and Technology I hope to to report upon an international workshop that I am helping to organize on research about such linkages, conducted by scholars from the first, second and third worlds. Participants will include the co-convenor of the conference, Andrew Webster, of the Anglia College of Higher Education in Cambridge, England and Elsa Blum of the CIT. She is also a Ph.D. candidate in sociology at the New School for Social Research and expects to be in the United States during 1991, dividing her time between MIT and the New School while completing the dissertation.

NOMINATIONS SOUGHT FOR TWO NEW AWARDS:

At the 1991 ASA meeting, SKAT will initiate two annual awards:

(1) Hacker/Mullins Student Award and (2) Robert K. Merton Professional Award. The student award is named in honor of Sally Hacker and Nicholas C. Mullins, both of whom made distinguished contributions to teaching. The award selection is based upon an article from the dissertation or an article based upon the dissertation. The award carries a modest monetary prize ($100), a year's membership in the section and a place on the program.

The professional award, named in honor of the founder of the specialty, is an award of honor and prestige. Selection for this award is based on a piece of work published within the past five years. The award is based on the work, not the person (it is not a career or service award). The awardee should be a member of the section in the year in which the award is made. The recipient of this award will receive a plaque. It is significant that this ASA award is the first to honor Merton. Both awards will be presented at the business meeting.

An awards committee comprised of Willie Pearson, Jr. (Chair), Thomas F. Gieryn and Adele Clarke will select the winning candidates. Send nominations and supporting documents by March 16, 1991 to Willie Pearson, Jr., Department of Sociology, Wake Forest University, Winston-Salem, NC 27109, FAX (919) 759-6074.

SKAT SECTION RENEWALS: ASA membership renewal notices were mailed out several weeks ago. If, in returning your renewal form, you inadvertently forgot to renew your membership in our section, it is not too late! Just fill in the special form below, and send it to the ASA office with your check. If you did renew your section membership, please give this form to a colleague or student who might be interested in joining us. Our section has exciting prospects, and ASA members with interests similar to ours should want to join. And, the more members we have, the more things we can do.

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APPLICATION
SCIENCE, KNOWLEDGE AND TECHNOLOGY SECTION MEMBERSHIP

Please enroll me for one year (1991) as a member of the ASA Section on Science, Knowledge and Technology. Enclosed is my check for

____ $10 regular member
____ $ 8 low-income dues member
____ $ 5 student member

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.....

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SEND TO: AMERICAN SOCIOLOGICAL ASSOCIATION
1722 N Street N.W., Washington, D.C. 20036

Please provide information below for possible publication in a future issue of the newsletter. Attach an extra sheet if you need more space. Thank you.

NAME:

TITLE:

ADDRESS:

RECENT PUBLICATIONS AND PRESENTED PAPERS (Include all details. No "forthcoming" publications or papers please.)

RECENT AWARDS, HONORS, ACHIEVEMENTS, PROFESSIONAL ACTIVITIES, NEW POSITIONS:

The following is not for publication but is sought for use by the editors.

SUGGESTIONS FOR IMPROVING THE NEWSLETTER. (Mention here, among other things, any new features you would like to see.)

CONTRIBUTIONS (including "op-ed" pieces and reviews) THAT YOU MIGHT LIKE TO WRITE FOR THE NEWSLETTER:

YOUR PHONE NUMBER(S) AND E-MAIL NUMBER:

Mail to Maurice Richter, SKAT Editor, Department of Sociology, University at Albany, State University of New York, 1400 Washington Avenue, Albany, New York 12222.