INDUSTRY-UNIVERSITY JOINT RESEARCH PROJECTS

OUTLINE OF AGREEMENT ESSENTIALS

1) The University agrees to a research program described as an attachment

   a) Starting and ending dates are designated.

   b) The commercial partner agrees to a funding level and schedule.

2) The ownership and/or licensing rights to patents arising directly from the research are designated.

   a) The duration of licensing or other commitments are specified.

   b) Royalties and commercial partner commitment to active developing and marketing are specified.

   c) The terms of third party licensing are specified.

   d) Options for first refusal of patent and/or licensing rights to unplanned technological developments are specified.

   e) The University is given royalty-free use of the technology for further on-campus research and development.

3) Obligations are specified concerning the exchange or confidentiality of information shared as part of the project.

4) Use of the University's name is protected.

5) Rights to terminate the project are specified for both parties.

6) Parties agree to hold each other harmless from any liability arising from the research project or the developed technology.

7) The agreement is specified to reflect the full understanding of the parties, and to be interpreted under the laws of the State of Ohio.

1) 90 day to 12 month delays on publications to allow a sponsor to identify patent opportunities or inadvertent disclosure of proprietary information. The need for graduate students to submit theses for degree requirements should be particularly protected, however. Graduate students should be made aware of any confidentiality agreements in a project before associating their thesis work with it, and arrangements for rapid or preliminary screening of thesis material must be made with the outside sponsor so that no delays are encountered in award of degrees.

2) "Best Efforts" to avoid inadvertent disclosure of proprietary information to outside parties.

Examples of commitments the University will seek to avoid are:

1) Lengthy delays of publication or indefinite confidentiality obligations, or granting to outside sponsors unspecified absolute approval rights for publication.

2) Any publication restrictions which would delay graduate students degrees or limit future career opportunities for graduate students.

3) Requirements that graduate students or employees enter into separate individual agreements with outside sponsors to maintain confidentiality. A better approach, which is usually acceptable to sponsors, is for students and employees to sign a statement for the record that they have read and understand the terms of the University-Outside Sponsor Agreement, and agree to comply with its terms.

4) Formal or physical security arrangements which are incompatible with the maintenance of an open and fertile intellectual atmosphere on campus.

C) Indirect Costs: The University regards the federally audited indirect cost rate as a minimum realistic estimate of true indirect costs. The federal rate is designed to reflect required cost sharing by the University in actual indirect costs, and it explicity excludes amortization of capital or infrastructure costs or investment in development for the future. Indirect cost rates must then be carefully negotiated; rates should rarely fall below the normal campus rate, and then only when it is recognized that the true cost will have to be absorbed in another fashion.

D) Third Party Involvement: It has normally worked best for the University to deal directly with developers proposing to manufacture and market our technology, as opposed to those interested in seeking future sublicensing agreements to which the University would not be a party. Control of use of the University's name and reputation is much more clearly guaranteed in this manner.

E) Use of the University's Name: Many commercial patent developers are very eager to associate the University's name with marketing efforts for a product or technology. This needs to be negotiated with care, insuring especially prior University approval of any advertising material.

F) Duration of the Agreement: Because of the changing nature of faculty interests and student participation, we should avoid open-ended or very long-term commitments which might be difficult for the University to fulfill.



1981 Research for Industry
Vice President for Research
304 Park Building
Salt Lake City, Utah 84112
801/581-7236

provisions of the Utah Governmental Immunity Act and Utah Indemnification of Public Officers and Employees Act. Each party agrees to maintain reasonable coverage for such liabilities either through commercial insurance or a reasonable self-insurance mechanism, and the nature of such insurance coverage or self-insurance mechanism will be reasonably provided to the other party.

Article VIII – Compliance with Laws

University agrees that it will comply with all applicable federal, state and local laws, codes, regulations, rules and orders.

Article IX – Assignment

Neither party shall assign or transfer any interest in this contract, nor assign any claims for money due or to become due under this contract without the prior written approval of the other party.

Article X – Patents and Inventions

The University agrees to take appropriate steps to cause all personnel assigned to the research project to disclose any and all inventions and improvements conceived or reduced to practice by any of such personnel in the performance of the research and relating to the subject matter thereof in the form of patent memoranda descriptive of such inventions and discoveries and containing adequate information necessary for the filing of patent applications. The University shall retain all right, title and interest in and to such inventions and improvements and all patent applications therefore which it may file at its election. In consideration of the Sponsor's support of the project, the University agrees to grant the Sponsor or an affiliate, at its request and upon reimbursement for patent expenses, a nonexclusive, nonrevocable, royalty-free license or licenses to practice such inventions and improvements until the University shall have abandoned its rights to the title to said inventions and improvements, applications or patents. If the University shall abandon its rights to such inventions, improvements, applications or patents, the University shall assign to the Sponsor all of its right, title and interest in and to such inventions, improvements, applications and patents.

Article XI – Publication by Sponsor

Sponsor will not include the name of the University of Utah in any advertising, sales promotion or other publicity matter without the prior written approval of the president of the University.

Article XII – Termination

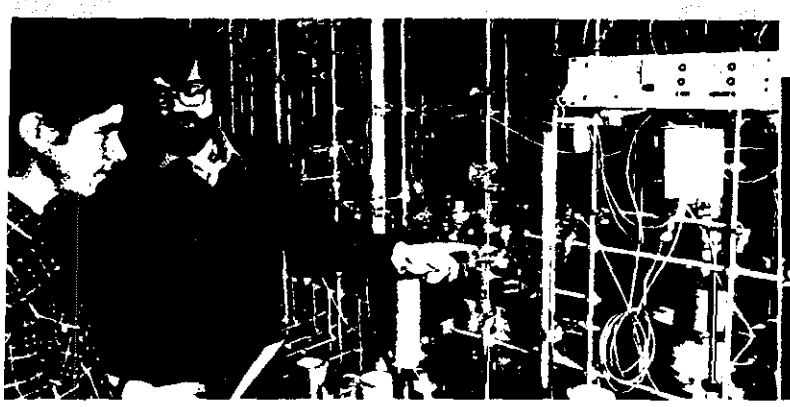
This contract may be terminated by either of the parties hereto upon written notice delivered to the other party at least thirty (30) days prior to intended date of termination. By such terminations, neither party may nullify obligations already incurred for performance or failure to perform prior to the date of termination.

Article XIII – Changes and Amendments

This contract constitutes the entire agreement between the parties. All amendments and/or changes shall be by written instrument executed by the parties hereto.

In Witness Whereof, the parties hereto have caused this contract to be executed as of the date set forth herein by their duly authorized representatives.

University of Utah	Sponsor
_____	_____
By: _____	By: _____
Title: _____	Title: _____
Date: _____	Date: _____





embarrassing second estimate to the sponsor if some costs were inadvertently omitted.

It is University policy to apply the federally approved indirect cost rate to industrial research programs, although a higher rate may be used where appropriate. Negotiated agreements with the federal government do not permit the University to charge a lower indirect cost rate to industrial sponsors than that paid by federal agencies.

The principal investigator may wish to include a technical support charge in the miscellaneous category. This cost element recognizes that industrial research support is traditionally limited in duration and that the sponsor benefits from the research experience of the principal investigator. This cost item is transferred to the principal investigator's development account upon award of the contract. As a guideline, the technical support charge can be on the order of 10 percent of the total direct cost.

Publication Rights
The academic nature of research at a university requires that research results be published in scientific literature in a timely manner. It is appropriate, however, for research results obtained under industrial support to be submitted to the sponsor for review prior to publication. This provision in the Research Agreement protects the interests of the industrial corporation without compromising the principles of academic research.

Patents
The purpose of the University of Utah patent program is to facilitate application of scientific research findings for the public welfare and to reward faculty members professionally and financially for their inventive genius. Income derived from patent commercialization is used to further the research and teaching program of the University.

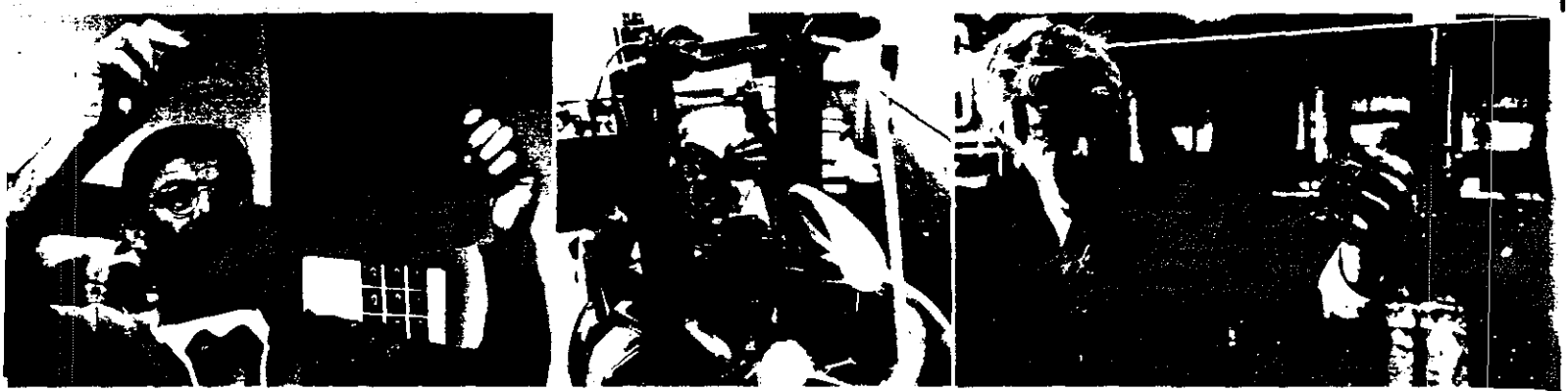
These goals can best be assured by University ownership of inventions, together with appropriate licensing arrangements. The University does appreciate the vested interest of the sponsor in supporting research, and the patent clause in the Research Agreement suggests ways to recognize this interest.

The Office of Research Administration, with the advice of the director of the Patent Office, may negotiate alternate methods of patent ownership, licensing and/or royalty payments suggested by the sponsor and which are consistent with University goals. Comments or questions should be directed to J. Winslow Young, director, University Patent Office, 801/581-7792.

■ [illegible] Department [illegible] ■ [illegible]

Research Performance
Additional provisions inserted in the Research Agreement by the sponsor may call for periodic meetings and periodic technical reports. The principal investigator should be careful about agreeing to such provisions if they appear to conflict with the academic calendar. In all cases, a final report is required even if it is only a simple listing of information previously submitted.

At the close of the program, the sponsor's written statement indicating that the final report has been received and is acceptable is required in order to close the project. The Office of Research Administration will formally request such a statement unless the principal investigator prefers to do it personally.



and hepatology. The availability of the unit has led directly to the acquisition of a National Institutes of Health Master Agreement awarded to Drs. Jack Madsen and Keith Tolman for studies on new antiepileptic drugs.

Computer-Controlled Tumbling Mill

Metallurgical research on the usefulness of mathematical models in improving tumbling mill grinding circuits has the financial backing of 10 U.S. companies, all of which benefit from the findings. The project is headed by Dr. John A. Herbst, professor and chairperson of the Department of Metallurgy and Metallurgical Engineering. He directs a team of metallurgists who use computers for high-speed data collection and automatic control of mining processing operations. The work is important to mining companies because it could help minimize the cost of metal extraction by increasing the efficiency of mineral process operations, where high amounts of energy are consumed.

Solution Mining

Seven companies are jointly sponsoring a study of solution mining and hydrometallurgy as a means of recovering valuable metals from hard-to-reach ore deposits. The project is managed by the University of Utah Research Institute, whose scientists are working in cooperation with experts in the College of Mines and Mineral Industries. The initial study will build a framework for a series of research projects designed to improve solution mining techniques. Scientists are collecting data on solution chemistry, rock chemistry, rock porosity and permeability, rock fracture and rubbilization and fluid flow mechanics.

Tar Sands Pilot Plant

Private industry funding and a special legislative appropriation have led to construction of a pilot plant in North Salt Lake, where a tar sands extraction process developed by University metallurgists will be field-tested. The University of Utah Research Institute (UURI) operates and manages the new plant. Faculty members who developed the hot water extraction process are working closely with UURI scientists and engineers on the larger-scale tests. The initial production goal will be 50 barrels of oil per day, and the long-range target is a commercial operation capable of producing a daily output of 50,000 barrels.

Nuclear Magnetic Resonance Facility

New techniques for defining the structure of solid state organic materials developed by Chemistry Department researchers have spurred companies to request analyses of solid organic materials. In response, the University of Utah Research Institute (UURI) has established a critically needed Nuclear Magnetic Resonance (NMR) Laboratory incorporating a spectrometer especially modified to incorporate advanced analytical techniques. The department carries on its own state-of-the-art basic research, while UURI serves industries, individually or collectively. Several oil companies are jointly funding a project involving the Institute staff, equipment and University faculty who serve as consultants in developing solid NMR techniques.

Testing Services

Typical Utah Engineering Experiment Station (UEES) programs have examined the heat value of coal specimens, analyzed sludge from wastewater lime, performed cylosizer analysis

Representative Industrial Research Projects



The range of industrially supported research at the University of Utah is illustrated by some examples of current projects. These have been selected to demonstrate how academic research is serving industrial interests. Neither the scope of technical areas nor the possible working arrangements are exhausted by these examples.

Data-Driven Computers

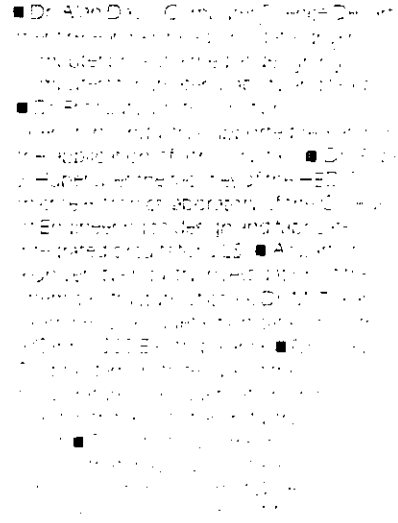
Burroughs Corporation is funding a project to find techniques for building and designing computer systems that are more flexible, less complex and easier to program and use. The work is directed by Dr. Alan L. Davis, assistant professor of computer science. In addition to a $145,000 contract for research on data-driven computing, Burroughs has given the Computer Science Department an unrestricted grant of $40,000. The contract gives the sponsor title to any inventions the research may produce plus patent and publication protection and access to the University's computer facilities. Students assigned to the project receive hands-on experience in an unique area of computer research.

Optical Properties of Materials

Years of research by Dr. Fritz Luty, professor of physics, are reaping benefits for his graduate students and current industrial sponsors. Dr. Luty's reputation in optical properties of materials attracts major funding from an engineering firm which supports research activities as well as training for post-doctoral and graduate students. This study of optical properties of ionic crystals is confidential and students work only indirectly on the practical applications, but they do profit from the experience. Luty points out that it is important to secure funding for students. Students establish direct contacts with the sponsor, and graduates looking for positions have access not otherwise available to them.

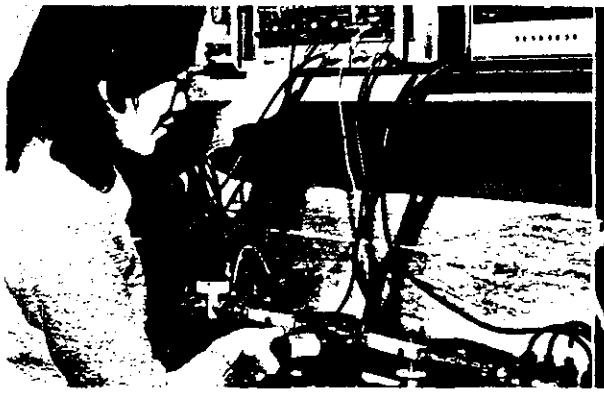
Integrated Circuits Laboratory

General Instrument Corporation is sponsoring a large research project in the area of semiconductor electronic devices. The work is directed towards two goals. Kent F. Smith of the Computer Science Department is exploring systematic methods of designing very large scale integrated circuits (VLSI). Since it is now possible to build integrated circuits with as many as one-half million active devices on a single silicon chip about one millimeter square, the circuit design problem is immense. Dr. Smith's group is investigating new ways to complete the actual design work by computer. A second aspect of the research project is under the direction of Dr. Robert J. Huber of the Electrical Engineering Department; his concern is computer

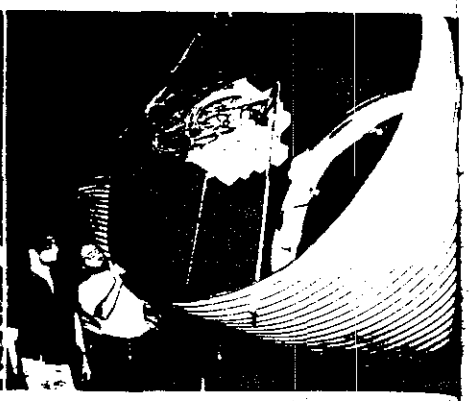


modeling of the actual semiconductor devices incorporated into the integrated circuit. The University works closely with General Instrument's research laboratory in Chandler, Arizona, and provides students with hands-on experience and access to the advanced technology available in this industrial setting.

Industrial Support Arrangements







The general approach to research and education project support by private industry at the University of Utah offers a broad scope of arrangements between principal investigators and private corporations. The University strongly encourages faculty members to seek industrial support for their research and graduate students. It is necessary, of course, that each research and educational service program be consistent with the academic purposes of the University, while also serving the needs of the sponsor.

Faculty Research Contracts

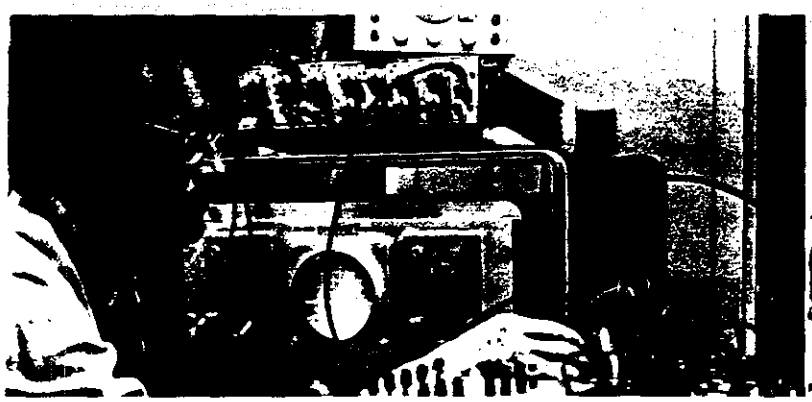
The most common arrangement for industrial research support is acceptance by the University of a contract from a company on behalf of a faculty member. This derives from a formal research proposal prepared by the faculty member and submitted to the sponsor by the Office of Research Administration. Generally, the technical scope, duration of the effort and graduate student participation are agreed upon in advance through informal communications between the principal investigator and the potential sponsor.

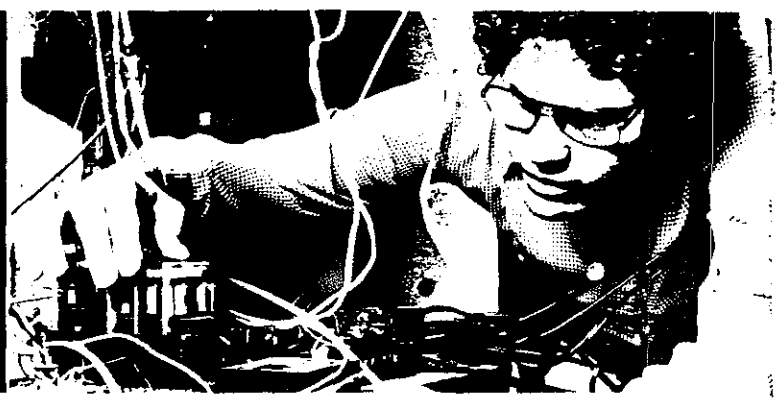
Industrially funded research programs must focus on the research needs of the sponsor. The research interests of industrial corporations are more difficult to ascertain than those of federal agencies, as no organized program of information dissemination concerning research interests exists. However, Linda W. Van Orden of the Research Program Information Office, 801/581-8607, does maintain information about general technical activities of major corporations supporting research at universities in the United States.

Jointly Sponsored Programs

Because of the uncommitted nature of most academic research, it often proves possible to attract simultaneous support from a number of companies interested in developing a body of new information which can be used in their individual research efforts. The advantage of such an approach is that a major effort can be mounted without a large financial commitment on the part of each sponsor. Also, corporations need have no concern about charges of monopolistic practices when such research programs are organized and directed by the University.

■ Researchers have access to an array of equipment, like the Electrical Engineering Department's millimeter wave testing device, used to study microwave radiation effects. ■ Tennyson lived a record [illegible] days with the Jarvik-5, an artificial heart developed by Dr. Robert Jarvik; the improved Jarvik-7 has FDA approval for human use. ■ The Physics Department's Fly's Eye, a unique astrophysics observatory for cosmic ray research, has gained world-wide recognition. ■ Dr. Donald J. Lyman directs the Biomedical Engineering Center for Polymer [illegible] in fabricating polymers [illegible] compatible with living systems. ■ The University of Utah Research Institute [illegible] [illegible]

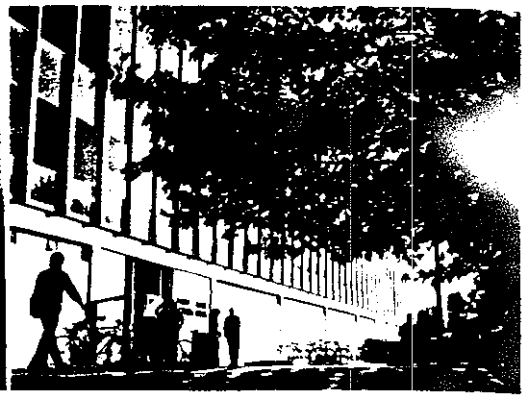




■ Dr. [illegible] ■ Graduate [illegible] of Lerch, Van Ost [illegible] Dr. [illegible] Baer of the Chemical Engineering Department has [illegible] valuable [illegible] organic components [illegible] ■ The Physics Department [illegible] facilities for research [illegible] ■ Dr. William C. [illegible] Center [illegible] FDA [illegible] ■ Dr. [illegible]







■ Dr. Franz R[illegible] left: professor [illegible] growth [illegible] conducts both [illegible] and [illegible] ■ Dr. D[illegible] Western [illegible] and novel technique for measuring the amount of oxygen critically [illegible] consume in intensive care. ■ Merr[illegible] Engineering Building provides [illegible] and research facilities for engineering [illegible] computer science with laboratory [illegible] ■ Dr. D[illegible] [illegible] studies [illegible] ■ B[illegible] engineer Dr. [illegible] ■ C[illegible]

On The Front Cover ■ Chem[illegible] [illegible] account for [illegible] ■ The C[illegible] Department is well known for [illegible] graphics and computer-aided [illegible] geometric objects and [illegible] ■ The University of Utah [illegible]

employees on University time and using University facilities.

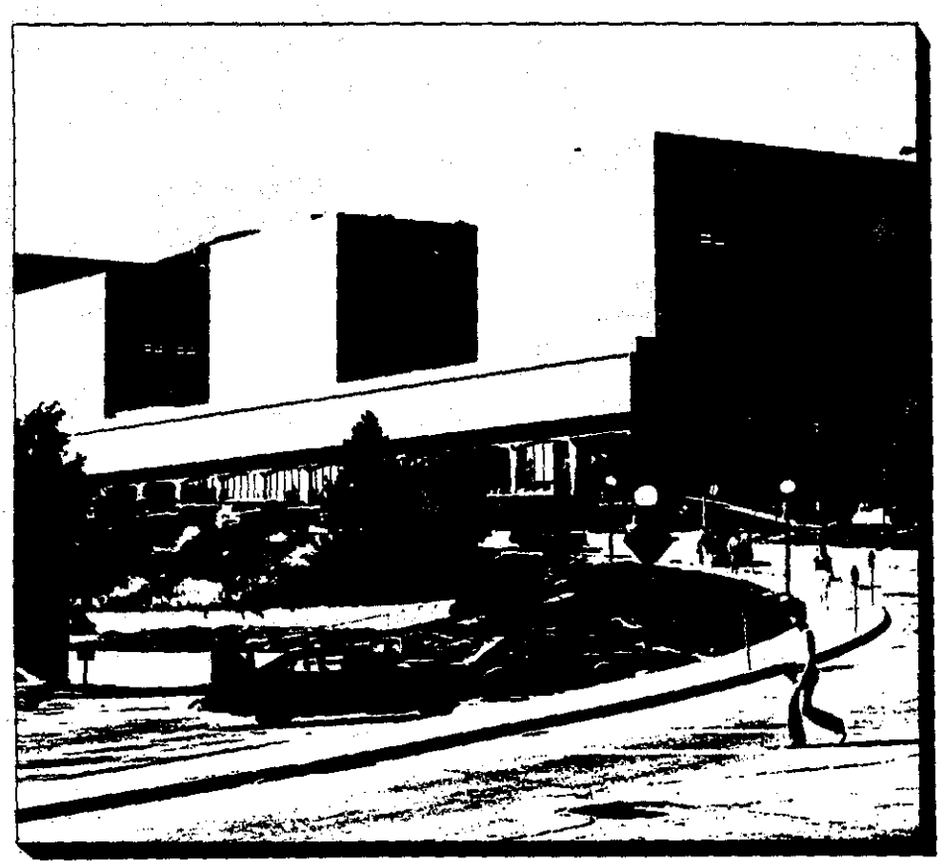
The office helps determine whether a market exists for a certain development and whether commercial production is financially feasible. If the idea or product has promise, the office will advise on whether a patent should be sought. The office itself may file applications and negotiate the scope of the patent with the U.S. Office of Patents and Trademarks. Or it may refer the inventor to a private patent attorney. In some cases, an inventor or company independently assumes responsibility for patent applications in partial exchange for a license from the University for rights to a development.

Patent and Product Development actively recruits firms to license University technology. For instance, the office contacted some 250 companies about an anti-acne preparation developed in the College of Pharmacy. It brought 24 companies to campus to discuss the product.

Sometimes, the office advises inventors to start their own company. Generally, the office gives preference to Utah-based operations with which the University can maintain an ongoing relationship.

The final step is negotiating the actual license. Because of the pace of technology, the product ultimately marketed may be an advanced version of what was developed at the University. Consequently, the office increasingly is seeking both royalties on products and an equity share in companies expected to grow substantially as a result of taking over University work.

The office's policy is to give the licensee broad rights in return for fair compensation. This increases the prospect of profits for the licensee, which in turn increases the chances of a good return for the University. "If anything has been established in this department, it's an attitude of 'can do,'" says Director J. Winslow Young. "We consider ourselves partners in the success of the ventures we license."



Research in the University health sciences complex has generated many high tech/industry applications.

A mix of strong support in related services

University of Utah
304 Park Building
Salt Lake City, Utah 84112

Dr. James J. Brophy
Vice President for Research

Native Plants produces petrochemicals, fibers, waxes, an oil for cosmetics, a coating material used on pharmaceutical capsules and even a thickener for ice cream—all from plants.

Among 150 employees are more than 25 scientists with advanced degrees in agronomy, horticulture, forestry, range management, biology, ecology, genetics, cellular biology, molecular biology and other fields. "We could staff a major university biology department," notes Alder.

Not surprisingly, the company and its scientists maintain close relationships with corresponding University departments and professors. The company and the University Biology Department have a joint luncheon seminar group that meets twice a month.

Recently, Native Plants, the Department of Biology and the Department of Cellular, Viral and Molecular Biology sponsored a one-week minicourse, open to any University student, in plant biology. The course included explanations of many of the company's technologies. In addition, Native Plants helped bring in special lecturers from Belgium, Hungary and major United States universities.

Such a project, besides benefiting the University, seems entirely consistent with the general character and approach of Native Plants. The company was started and is heavily staffed by basic scientists. Yet, as a recent corporate report explains, the firm stresses developing practical and financially effective products and services for "a world of diminishing natural resources."

University Research Park
505 Wakara Way
Salt Lake City, Utah 84108

Dr. Mark L. Money, Director

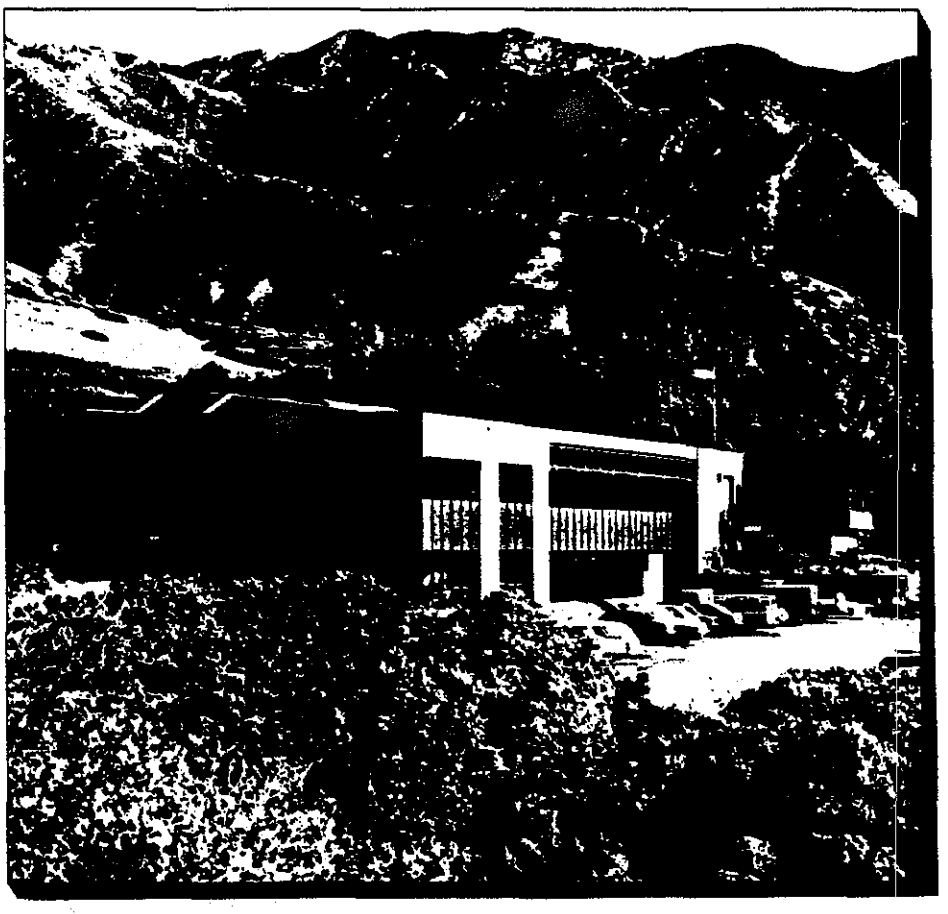
A 300-acre Research Park was established adjacent to the campus in the late 1960s to provide a site for private research and development activities that may involve interaction with the University.

The park is about one-fourth developed. It houses 30 companies in 15 buildings. Two other buildings are under construction. Research Park operations employ about 3,000 persons.

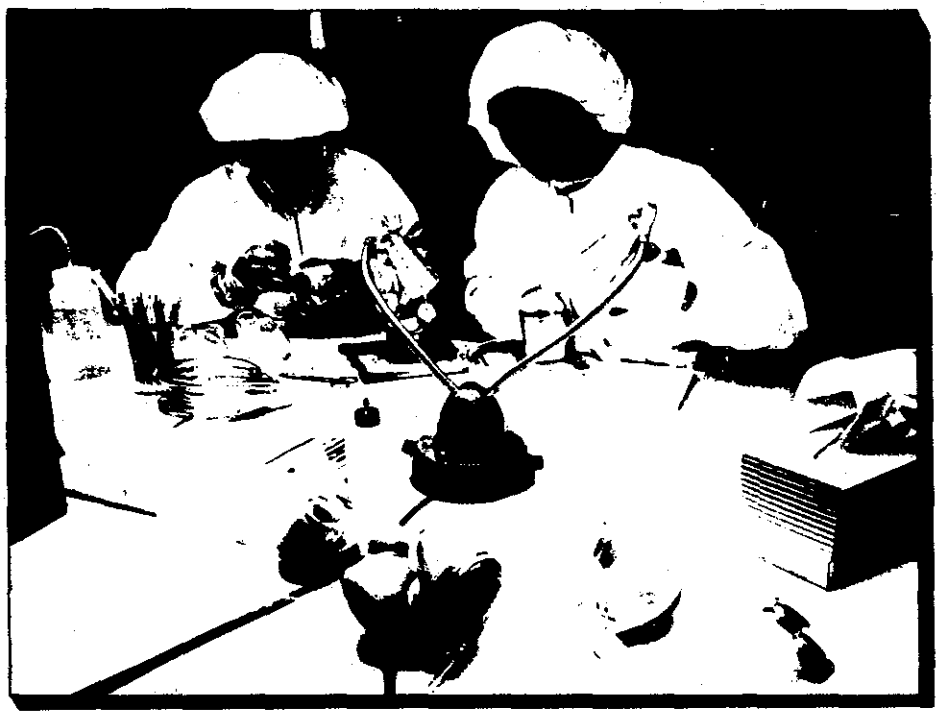
A master plan and restrictive covenants protect the park-like atmosphere of the development. They also provide for clustered buildings, large open spaces, wide streets and ample parking.

Companies in the park must be conducting on-site research and development work. In selecting occupants, the University considers the kind of beneficial relationships which are likely to develop between the University and the company, such as consulting opportunities for faculty or research opportunities for graduate students.

Building sites may be leased by developers for approved tenants or by companies themselves. The University Research Park office and advisory board coordinate and approve all design and



The 300-acre Research Park adjacent to the University currently houses 30 companies in 15 buildings



The artificial heart implant in Dr. Barney Clark at the University Medical Center was a first step toward mass production of artificial hearts by Kolff Medical Inc.

Engineering; Dr. Robert K. Jarvik, one of the inventors of the artificial heart; and Dr. Donald B. Olsen, director of the artificial organs animal laboratory.

There was no full-time administrative officer until Moeller joined the company in August 1982. "It's the spirit of cooperation between the University and business – the constructive, healthy environment – that brought me here," says Moeller, who has an MBA from Harvard and was president of a New York medical devices firm before coming to Utah.

That spirit, says Moeller, was manifest in licensing negotiations. It was clear, he says, that the University wanted the researchers themselves to profit from their inventions. That attitude, Moeller notes, is what motivates innovative work.

The University makes it a practice to redistribute a portion of licensure royalties to persons who played an important role in an invention. Thus, some of the royalties Kolff Associates pays for the artificial heart and hearing technology will be returned to various major contributors.

Of course, the University itself played an essential role in development of the heart. It provided a setting for creative work and administered the $7 million in research grants, mostly from the National Institutes of Health, that financed the project.

Under the licensing agreements, the University will receive royalties on future sales of artificial hearts. More important, Kolff Medical has given the University more than $600,000 worth of company stock. This stock could increase in value in coming years and thus help finance future University research and education programs.

Over the past several months, a major thrust of Kolff Medical has been to attract more capital so the company can begin building its business organization and accelerating development of its products.

Moeller estimates it will cost $20 to $30 million over the next five years to launch production of the artificial heart and artificial hearing device.

The company's top priority presently is developing a portable heart driver so a patient will not have to be attached to the heart's present, 375-pound driver and control unit.

The company also will be participating with the University in six more implants that have been approved by the FDA. Those surgeries will probably occur over the next two years. Knowledge gained will be used to modify and improve the artificial heart and drive system.

Soon, Kolff Medical expects to construct its headquarters in University Research Park. The facility will contain administrative offices, laboratories and a facility for small-scale manufacture of artificial hearts.

If artificial heart technology is successful, the firm anticipates building a major manufacturing plant somewhere in the Salt Lake Valley. Such a plant, notes Moeller, could end up employing "hundreds or even thousands in the community."

"If we want to create jobs," adds Moeller, "what we really need is ideas." Those ideas often come from researchers at the University. The University makes a major contribution to creating jobs when it works to facilitate transfer of the ideas to private industry.

Computer graphics has become a true art form

Evans and Sutherland
580 Arapeen Drive
Salt Lake City, Utah 84108
David C. Evans, President

The founders of Evans and Sutherland, manufacturer of computer graphics equipment, used the University of Utah as a base for their early research.

But the firm – which is now 14 years old, employs more than 750 persons and has annual sales of more than $50 million – has ended up giving back to the University far more than it took away.

The founders' research thrust the Computer Science Department into international prominence in computer graphics. Commitments from the company helped enable development of University Research Park. In 1982 alone, the firm donated more than $200,000 worth of computers to the University.

David C. Evans and Ivan E. Sutherland met in the mid-1960s on a computer consulting assignment. At the time, Evans, who had received his doctorate in physics from Utah in 1952, was a professor at the University of California at Berkeley. Sutherland taught at Harvard.

Their interests meshed. Evans had worked to develop computers that could be used by persons not specifically trained in computer science. Sutherland was director of "Operation Sketchpad," a Defense Department-funded study into the possibility that computers could be used to draw and manipulate pictures for engineering design work.

Both believed development of computers with graphic capabilities could increase the uses of the computer and the number of persons able to work with them. They recommended computer graphics to major computer companies. But no company acted on the advice. Finally, the two decided to launch their own firm.

By then Evans had become chairman of the University's Computer Science Department. Sutherland moved to Utah, where he became a part-time faculty member and chief executive of the new company.

Assisted by graduate students, Evans and Sutherland began formulating and patenting basic computer graphics technologies. Today, the entire computer graphics industry worldwide is based on early research at the University of Utah.

Evans and Sutherland incorporated the company in 1968. The firm set up headquarters in a World War II barracks on an outer corner of campus. The founders interested the Rockefeller family of New York in putting up the original



Founders of Evans and Sutherland, pioneering firm in computer graphics, used the University as a base for early research. The company now manufactures engineering design stations and jet pilot simulators.



Bunnell Biomedical Inc. is developing a new type of respirator for infant intensive care units

company was making just about enough to meet its expenses.

About the same time, clinical trials began on a perfected version of the human respirator Bunnell had begun developing earlier.

BBI's next step will be marketing the ventilator. After that, the company hopes to develop a "full feature" pediatric ventilator incorporating both high frequency ventilation, the air pressure monitor and standard ventilating techniques. Eventually, it plans to develop a high frequency ventilator for home use.

The products could help hundreds of thousands of children and adults who suffer from emphysema, pulmonary fibrosis, asthma, chronic bronchitis, acute respiratory failure and other conditions.

It would have been tragic if Bunnell's research had simply been shelved. The Utah Innovation Center, implementing the University of Utah's commitment to commercializing beneficial technology, averted that consequence.

Digital recording, an entrepreneur's ...mpon.

Digital Recording Corp.-Soundstream Inc.
2505 Parley's Way
Salt Lake City, Utah 84109
Robert D. DeForest, President

Dr. Thomas G. Stockham has come full circle in his career as a scientist-businessman.

He began as a faculty member and researcher–first at the Massachusetts Institute of Technology and later at the University of Utah. He pioneered audio digital recording, a method of using computer technology to make musical records that almost perfectly duplicate the original sound.

He established a company, commercialized his technology and ultimately merged his firm with another company interested in a related technology. At that point, he phased out his administrative involvement with the business. Now, much to the delight of the College of Engineering, Stockham has returned to the University as a full-time professor of electrical engineering.

Af[illegible]oining the Utah faculty in 1968, Stockham became the principal investigator for $5 million in University research contracts on methods of converting both sounds and pictures into computer information.

By the early 1970s, the cost of digital recording of sound was getting so low and the quality so high that Stockham and his collaborators began seeing that it might be possible to build a recorder that could be commercially useable in the recording industry. In 1975, Stockham left the University and founded Soundstream Inc.

Backed mainly by venture capitalists, Stockham and his colleagues built a prototype recorder. Later, they also developed an editing device that enables artists at a computer terminal to mix,

The sophisticated arm [illegible]
to lean on

Motion Control Inc.
1005 South 300 West
Salt Lake City, Utah 84101
Thomas A. Wiita, President

The elbow bends. The hand grips. The wrist can be rotated. Experts agree that the "Utah Arm," developed by the University of Utah's Center for Biomedical Design, is one of the biggest advances in prosthetics in 20 years.

The arm reflects the knowledge of physicians, of prosthetists and of engineers specializing in control systems design, electronics, machine design and computer technology. Such a range of expertise is probably only available in a university.

However, it would not be appropriate for a university to market artificial arms. So as various phases of the arm's development have been completed, production has been taken over by a private firm, Motion Control Inc.

Motion Control was founded in 1974 by Dr. Stephen C. Jacobsen, director of the Center for Biomedical Design, and Dr. Willem J. Kolff, director of the Division of Artificial Organs. Jacobsen, who is now chairman of the board of the company, continues to work full time as a University professor.

Anticipating the need for a marketing entity for the arm, Jacobsen began approaching prosthetics firms about the time he and his team started working on the device. But those firms were dubious about his ambitious plans.

"They were all so conservative that I decided to start my own company," he explains. Operating capital has come from about 20 investors, including individuals and a medical devices manufacturing firm.

Jacobsen and his team, through collaboration with medical researchers including Dr. Robert L. Stephen, have developed two other biomedical devices – the "phoresor," which enables medication to be passed through the skin without use of a needle, and the "subcutaneous peritoneal access device" (SPAD), which is implanted in the abdomens of diabetics and enables insulin to be administered at a steady rate.



The Utah Arm is being developed in University laboratories and manufactured by Motion Control Inc

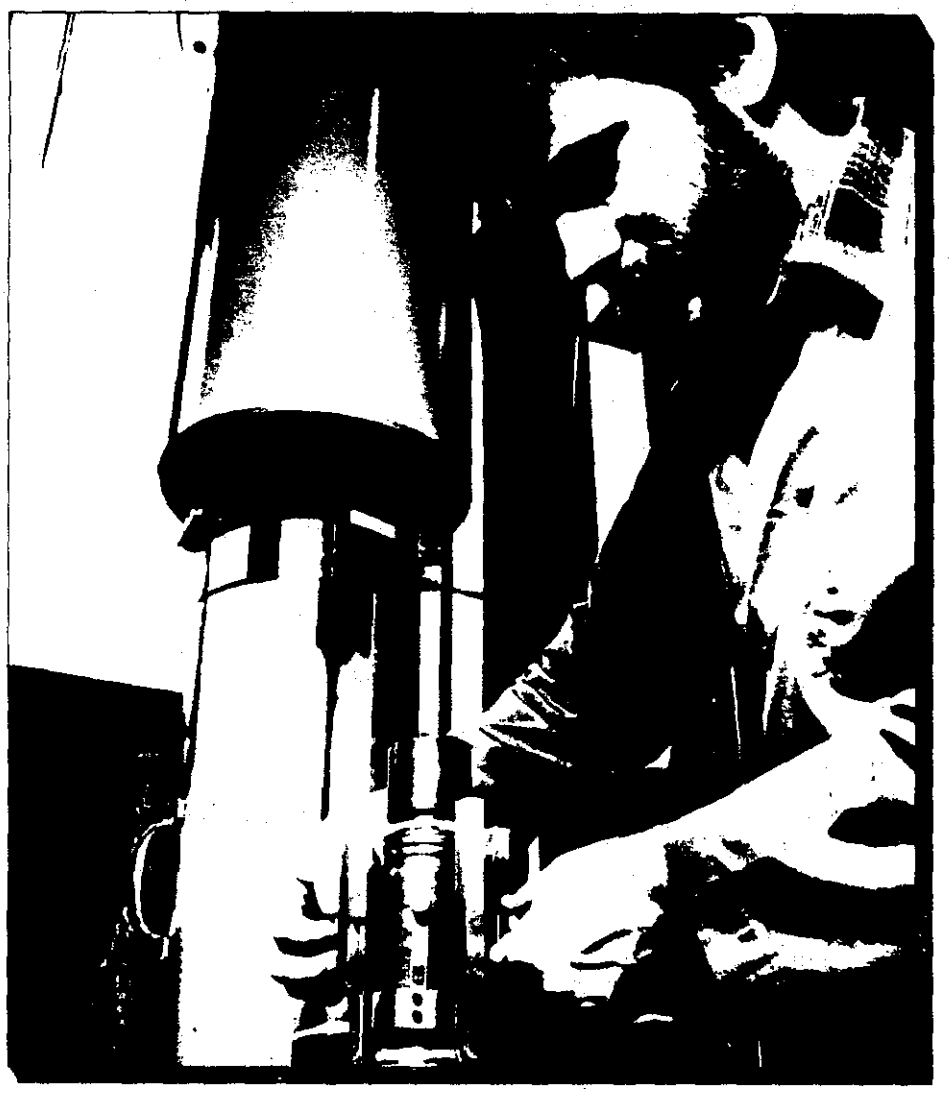
The University retains the patent and other rights to any inventions. However, Motion Control has licensed the patents on all three items and pays royalties on sales to the University. "Money flows back to the University for the work it does, and the University sees technology put to use," explains Motion Control President Thomas A. Wiita.

The chief advantage of the Utah Arm over previous models is its ability to move in response to electronically processed muscle signals. It uses highly sophisticated circuitry and has motors and drive components originally developed in the aerospace industry.

Motion Control started moving into full operation three years ago. In 1980, the company sold its first two arms. Since then, it has trained and authorized prosthetists in about 30 locations and fitted 50 patients in the United States and Europe. The company now has

A specialized product with a diverse [illegible] of uses

Ceramatec Inc.
163 West 1700 South
Salt Lake City, Utah 84115
Dr. Ronald Gordon, President



Terra Tek, which operates a $7 million facility for test drilling on rock samples, evolved from research in the University Mechanical Engineering Department.

sold to help the operation spin off as a separate company. This company becomes a partly owned subsidiary of Terra Tek. As outside interest in the new company increases, Terra Tek may become a minority shareholder, and the company may become an affiliate of the parent firm.

Such a progression is both good management and good business, says Green. As companies branch into their own specialties, different kinds of management are needed and the parent firm has less technical expertise to offer. Moreover, says Green, Terra Tek's philosophy is that the officers and employees of each company should own a sizeable percentage of the company's stock. That way the staff will be motivated to make the operation succeed financially.

The University of Utah's relationship with faculty researchers may pass through several stages during the time a new technology is being studied and ultimately converted into marketable products.

An example is Ceramatec Inc., which develops ceramic materials, particularly those with electrical conduction properties. The company's products eventually could be used for components of electrodes used in electrochemical plants, to manufacture metal products from sea water and in batteries to power nongasoline vehicles.

Ceramic engineering involves taking basic chemical powders, compacting and shaping them, and then firing them into tough, heat- and corrosion-resistant materials. Scientists have long known that certain ceramics can have electrical properties, "but they haven't known what to do with that knowledge," explains Dr. Ronald S. Gordon, co-founder and president of Ceramatec.

In the 1960s, Ford Motor Co. laboratories began investigating the potential of ceramics in automobile batteries. Batteries using such materials store more energy per pound than the present lead-acid car batteries and often last five years or longer.

In 1973, Ford let a subcontract to the University under a National Science Foundation contract to develop ceramic materials with even greater electrical conductivity properties as well as an economical process for manufacturing the materials.

In 1976, the Department of Energy awarded further funds for the Ford

Utah Innovation Center Inc.
391 Chipeta Way, Suite G
Salt Lake City, Utah 84108

Frank P. McNeil
General Manager

A scientist or engineer, or even a small company, may have an idea for an innovative product yet not know how to get the idea tested or the product produced.

Utah Innovation Center Inc., a private firm that developed from an innovation center at the University of Utah, makes a business of aiding such individuals and companies.

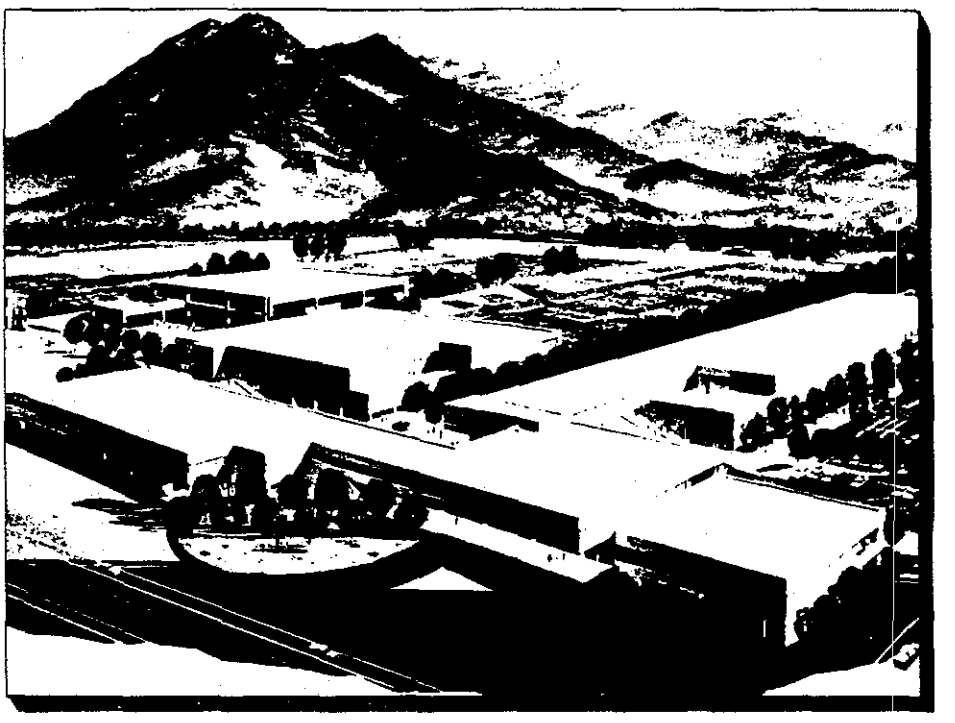
UICI takes an equity position in its clients' companies. Or UICI may help sponsor specific research and development efforts. The company's earnings come from income on the equity or from sharing a proprietary interest in technology growing from the R & D projects.

The original, nonprofit Utah Innovation Center started in 1977 when the University of Utah, Carnegie-Mellon University, the Massachusetts Institute of Technology and the University of Oregon were chosen for a federally funded National Science Foundation program aimed at stimulating technological innovation.

The United States "does not compete effectively in the world market with products that are labor intensive," explains Dr. Wayne S. Brown, president of UICI who is also professor of mechanical engineering and former dean of the College of Engineering.

The government recognized that if the United States was to remain economically strong in the context of an increasingly international marketplace, "we must maintain our lead in high technology," he says.

With National Science Foundation funds, the original Utah Innovation Center and the University's colleges of business and engineering sponsored a two-quarter course for University students working on potentially marketable inventions. Ideas ranged from an automatic bicycle transmission to a programmable breadboard of electronic circuits for use in electronics designing. The University Innovation Center also made research and development loans to established scientists.



UICI will be housed in a portion of the four-building complex shown, the first phase of which is nearing completion. Native Plants Inc. and fledgling companies being assisted by UICI will share the facilities.

In 1982, federal funding of the nonprofit Utah Innovation Center ended. The same month, UICI incorporated. About 20 Utah business and professional persons invested about $1 million in startup capital. The change was consistent with NSF hopes that funded centers would evolve into self-sustaining, private entities.

UICI's main activity is identifying viable technologies and entrepreneurs. When a person has an idea or technical skills but lacks business experience, or if an innovator's technology is incomplete, UICI will help bring the appropriate people together to launch a company.

The ambitious young operation has planned a four-building complex in University Research Park. The first structure, in which UICI owns a 30 percent equity, has just been completed.

UICI occupies 15 percent of the initial 77,000-square-foot building. Firms and individuals that are being assisted by UICI will be housed in Innovation Center facilities "until they are viable