EES Report
ENGINEERING EXPERIMENT STATION • GEORGIA TECH

Organ thawing technique sought at Tech

A patient in an Atlanta hospital loses the use of his kidneys. Doctors telephone a national organ bank 2,000 miles away, where kidneys are kept in cold storage. Technicians select an appropriate replacement and send it by plane to Georgia. The shipment arrives within hours of the initial call, is thawed and successfully transplanted into the patient.

Such a scenario might be possible today were it not for a major technological limitation: researchers have not developed a method to thaw large organs without irreparably damaging them. An EES biomedical research team has completed one year of a two-year study aimed at finding a solution to this problem. Scientists in the Electronics Technology Laboratory hope to prove that heat from electromagnetic radiation can thaw human kidneys effectively. Electromagnetic radiation is radiant energy in an invisible form moving through space and matter. It produces heat when absorbed by an object in its path. Practical uses for electromagnetic radiation other than radio communication have increased since World War II and today range from beaming television signals to heating food.

In the past, researchers have approached the thawing problem in several ways, first by placing frozen organs in warm water baths which successfully thaw eye corneas. The water bath technique works for corneas because they are very thin. However, when the method is used on a kidney, the outside tissues of the organ are "dead" by the time the inner tissues have thawed. Scientists subsequently have placed animal test kidneys in microwave ovens, hoping that the uniform rate of heating inner and outer tissue layers would keep the organ "alive" during thawing. These experiments did not work because kidney tissues have varying electrical properties, giving each section of tissue a different capacity to absorb heat. The EES researchers have studied these electrical properties in detail. With the data obtained, they believe it possible to successfully thaw kidneys through application of varying degrees of electromagnetic radiation to the different organ tissues.

Electromagnetic radiation is used to thaw this dog kidney in experiments in Georgia Tech's Electronics Technology Laboratory.

The project began with experiments on rabbits but switched to dogs because the canine kidney has more similarities to its human counterpart. Working with the EES research group is Dr. Armand Karow of the Medical College of Georgia in Augusta. Karow has sent frozen organs of dogs to Georgia Tech for laboratory testing. Analysis indicates that the EES research team now can successfully thaw a dog's kidney. However, they can't be sure of the conclusion until one of these organs is successfully implanted into a dog by Dr. Karow and his staff. This phase of the project should happen within a year. The Tech project is sponsored by the National Science Foundation. The technical outlook for the study appears favorable. Because of current funding restrictions, the EES group may need three to five years to complete its present research.

Solar use by industry urged

Georgia Tech researchers will make the case for solar energy in a series of visits to textile and food processing plants around the state this year. The six-month project is sponsored by the Southern Solar Energy Center, located in Atlanta. In their industrial visits, EES engineers will encourage managers to consider solar systems in future energy program planning. They will tell manufacturers that while short range benefits for solar use in industry may not be economically favorable yet, long-term investments look considerably more promising.

Energy prices have increased 20 percent a year since 1973 and last year costs were up 37.4 percent. If conventional fuel costs continue to rise and the expense for solar systems remains comparable to current prices, the solar alternative will become more and more attractive. Solar energy systems which are not commercially viable for residential heating may be

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Water pump tested for Third World

Georgia Tech is involved in a continuing effort to make clean drinking water more accessible in Third World nations.

Its work in this field began in 1976, when the Agency for International Development (AID) hired the Engineering Experiment Station to test an AID/Battelle hand-operated water pump in Costa Rica and Nicaragua. Engineers from the International Programs Division installed Battelle pumps in the two countries and set up procedures for ongoing analysis of water quality. They concluded the project with a recommendation that the pump design is appropriate for Third World nations.

A similar program began later in the Dominican Republic and ended last year. All EES proposals for improving the AID pump design were incorporated and Station engineers set up field laboratories for water testing near well sites.

EES recently began a large-scale water and sanitation project in Indonesia. The program calls for the Station to have 230 Battelle hand pumps manufactured in Indonesia and to install 180. Thirty-three of the remaining pumps will be given to Indonesian schools at which installation procedures are taught. The last 17 pumps are slated to go into storage as future replacements. The pumps will be tested in eight areas of Indonesia to determine how well they hold up in different environments and how well local people accept them.

Villagers in Indonesia use a water pump tested and approved by Georgia Tech engineers for installation in Third World countries. The pump is designed to ease shortages of available clean drinking water in these nations.

Solar promoted for industries

Continued from page one

used directly in some industrial processes. However, many manufacturing processes require much higher temperatures than these systems presently can deliver.

Technology exists for solar systems with greater heat capability, but only in a few cases are the short term financial benefits good. Nonetheless, when the cost of the solar equipment is compared to the expected expense of conventional energy over the life of the system, the economic picture changes decidedly for the better. However, if industries wait until it's working well and the demand rises, they may have to wait in line to buy a system.

The EES project will send engineers to 20-25 textile and food processing plants. They will assess interest in solar energy and explain to managers the possible advantages of solar systems. The researchers will perform complete energy surveys at participating plants and emphasize processes which could be best suited for solar conversions. Later, the team will select six industrial sites for case studies. Engineers will design solar systems for processes in each plant, then report back to management with their findings.

Tech to design solar system for class

Georgia Tech engineers will design a solar energy system for heating a modular classroom under development. They will complete the system for Madison Industries of Georgia, a Conyers-based firm specializing in construction of prefabricated modular buildings. Madison Industries has a contract from the Department of Energy to prepare the finished engineering design for a modular building with passive solar energy features. The company has subcontracted the solar phase of the work to the Station.

The classroom will be a prefabricated unit which can be disassembled and re-erected at different school sites, as population shifts occur in school districts. The passive solar system will be a standard part of the design. Passive solar devices capture energy from the sun through non-mechanical means, such as natural air flows, shading and movable insulation. Active solar systems use machines like motors, pumps and blowers to collect the sun's energy. The EES design will emphasize passive systems but some elements of an active system can be incorporated if they remain only a small part of the overall design. Solar energy will provide heat and may be used also to ventilate, light and cool the classroom.

EES will use engineers from its Technology Applications and Energy Research laboratories for the project with additional help coming from an advisory committee.

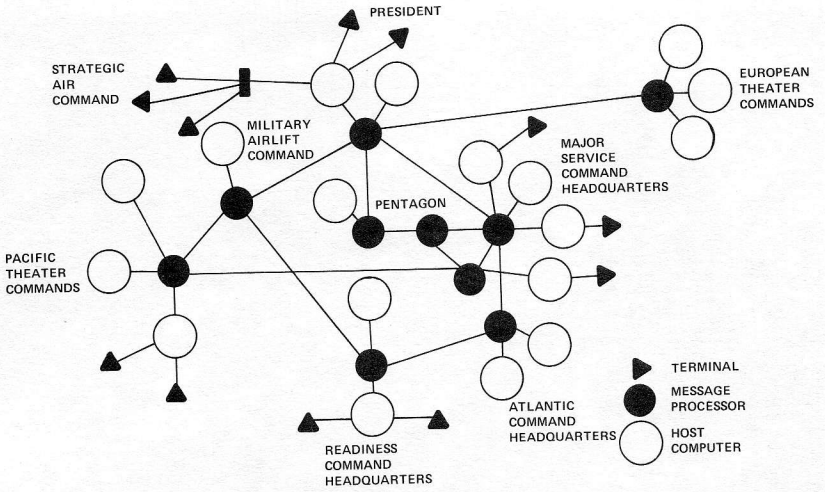
Southcon meeting coming to Atlanta

Southcon, a regional electronics convention for the Southeast, will debut in Atlanta January 13-15, 1981 at the World Congress Center.

Georgia Tech President Dr. Joseph M. Pettit will serve as chairman of the board for the event. Dr. James Wiltse, associate director of Tech's Engineering Experiment Station, will be chairman of the professional program committee. Ray Moore, director of EES research public relations, will chair the publicity committee.

Southcon will become a companion event to the successful Electro, Wescon and Midcon electronics conventions. It will be held in Atlanta in 1981, then Orlando, Florida in 1982. The show will alternate between the two cities in subsequent years. Sponsors of Southcon will be the Georgia and Florida units of the Institute of Electrical and Electronic Engineers (IEEE) and the Electronics Representatives Association (ERA). IEEE is the largest society of professional engineers in the United States.

The establishment of the new convention gives recognition to the importance of electronics in the Southeast, which has the fastest growing high technology market in the nation today. Like the other electronic conventions, Southcon will have three days of exhibit presentations and three days of professional program activities. The program will involve detailed discussion of state of the art technology and procedures in both pure and indirect electronics usage.



This diagram represents the World Wide Military Command and Control System, an information network composed of computers, terminals and message processors. The diagram shows the complexity and size of the system as well as the wide geographic dispersion of the network.

Military computer systems difficult to keep up-to-date

Is the computer network which disseminates critical information during national crises out of date? That frightening possibility was suggested in recent newspaper articles describing temporary breakdowns in America's World Wide Military Command and Control System (WWMCCS).

EES computer scientists believe the system works better than journalistic reports have suggested. However, they agree that some computers in the WWMCCS (pronounced Wimex) network are clearly outmoded. Replacing inadequate hardware has become a major problem in systems like WWMCCS because of the cumbersome purchase procedures which the government uses. From the date a WWMCCS computer is ordered until the day it goes on line, seven years normally will have passed. The result is that computers which are worn out or out of date are used in defense command and control systems much longer than is desirable. And replacement units themselves often have become outmoded by the time they go into operation.

Computer experts in EES' Computer Science and Technology Laboratory are doing research on an alternate method of government computer acquisition known as accreditation. Using this procedure, government purchasers might speed up the replacement process. With accreditation, they would cease their current practice of buying computers to fit highly specified needs applicable to

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EES participates in Bio-Energy '80

EES hosted a tour of its biomass facility for participants in the Bio-Energy '80 conference held in Atlanta April 21-25. The Energy Research Laboratory organized the visit, which consisted of a 90-minute tour of EES' wood gasifier, wood stove exhibit and air pyrolysis unit. Visitors also heard about Tech's newly-developed chemical process for converting woody biomass into ethanol.

Bio-Energy '80 was the first broad international meeting to deal extensively with biomass as an energy source. About 2,000 persons attended the conference at the World Congress Center. Tech representatives played prominent roles in the gathering. Thomas Stelson, assistant secretary of energy, was a featured speaker. Stelson is on leave as vice president for research at Tech. Jerry Birchfield, director of Technology Applications Laboratory, was a panel member at a wood residues seminar and Ronnie Roberts of the Department of Chemical Engineering was to chair a hydrolysis seminar. Daniel J. O'Neil, EES senior staff member, spoke at a seminar on small business opportunities in bio-energy.

EES REPORT

Mark Hodges — Editor

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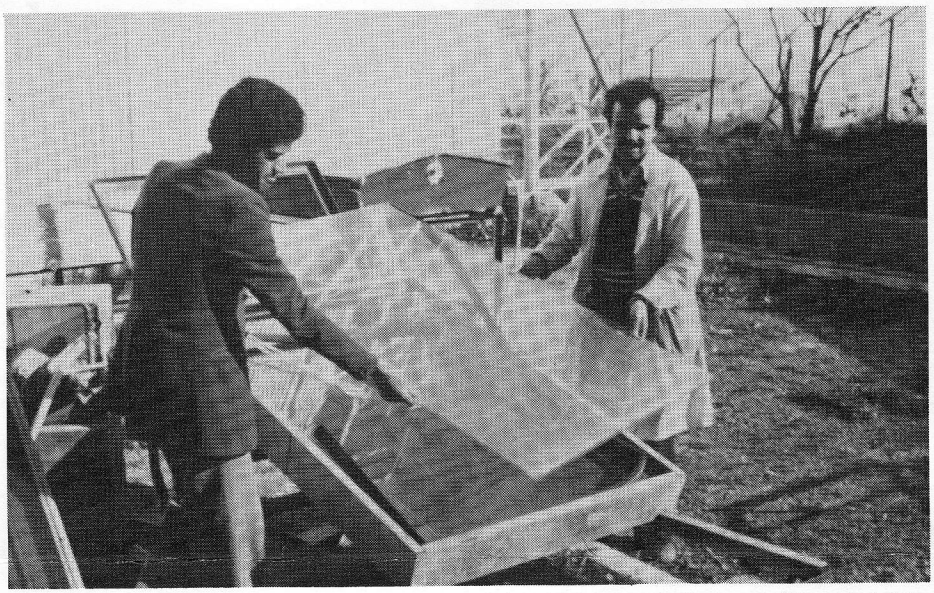

Algerian researchers construct a modified passive solar air heater at the Station de l'Energie Solaire near Algiers. The North African country is starting a crash program to develop solar energy and one of their consultants in the effort is Georgia Tech scientist J.D. Walton, Jr.

Computer System

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one function only within a large network. Instead, government officials would develop a list of readily-available hardware which could perform basic but more general computer functions. Manufacturers whose products were judged most suitable for those tasks would be placed on a prioritized list of accredited vendors.

EES researchers believe that this method not only could cut down on replacement time but also might result in improved computer technology and lower prices. Accreditation would offer an additional benefit, too. The people in charge of coordinating large networks like the WWMCCS could help compile the accreditation specifications.

Researcher helps Algeria develop solar

Algeria expects to run out of fossil fuels in 30 years and a crash program in solar technology may fill in the resulting energy gap. EES scientist J.D. Walton, Jr. is working for UNESCO as one of the key advisors helping the North African nation plan for its energy future. Walton spent the month of February in Algeria, looking for ways to introduce solar energy in rural areas.

The Algerian government plans to build 1,000 new villages, most of them at least partially fueled by power from the sun. The program is an attempt to slow migration from rural areas into Algeria's overcrowded cities — and to build a stronger national agriculture. One of the country's major problems is that it must import nearly all of its food. The government is emphasizing agricultural development, a field in which solar technology is partially useful. Solar energy will be tapped for such vital functions as crop drying and irrigation. Rural communities also can use it to heat water for central baths and bakeries as well as for private homes.

Walton has proposed that the Algerian government import solar technology from the United States until the country learns enough to build and operate its own systems. Algeria's experience with solar is limited largely to single units such as collectors. Walton believes the country needs to learn to use complete systems. He believes that Georgia Tech could provide the technical expertise Algeria needs if his proposals are approved. His February visit was his third to Algeria for UNESCO. Walton is a specialist in high temperature solar systems and acting chief scientist of the Engineering Extension Laboratory.

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ENGINEERING
EXPERIMENT
STATION
Georgia Institute of Technology
Atlanta, Georgia 30332
(404) 894-3411
Dr. D. J. Grace, Director

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Organization
U.S. POSTAGE
PAID
Atlanta, Ga. 30332
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