AGRICULTURE AND LIFE SCIENCES

news

A Statutory College of the State University of New York, at Cornell University, Ithaca, NY

NOVEMBER 1978

New Dean Appointed

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He had been acting dean since mid-July, when College faculty approved his recommendation by President Frank Rhodes. "We are pleased to have found within Cornell a candidate for the deanship who is intimately familiar with all aspects of the University — its teaching, research, and public service," said Rhodes.

Call succeeds W. Keith Kennedy, who became Cornell Provost on July 18.

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Call received the B.S., M.S., and Ph.D. degrees in agricultural economics from Cornell. He was an assistant [illegible] economi[illegible] versity and visiting pro[illegible] in the Department of Food Science at M.I.T. He has written numerous articles for popular and professional publicati[illegible] consulta[illegible] trade associations, and private corporations.

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David L. Call

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To aid in the dissemination of such Extension information, Call played a major role in establishing Media Services, a separate depart-

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"I am delighted that Keith Kennedy has agreed to become provost," said President Frank Rhodes in announcing Kennedy's selection. "He brings to this important assignment the strongest possible credentials. He has earned the respect and trust of faculty members in all colleges, and he has served Cornell with great dedication for many years."

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Don't Blame Uncle Sam for Rising Food Prices

With the price of food always on the rise, consumers have the tendency to blame government for the fact that their wallets seem lighter. But federal policies influence only a small fraction of food costs, while marketing expenses and the weather are the real culprits, according to Kenneth L. Robinson, Liberty Hyde Bailey Professor of Agricultural Economics.

"The prices of coffee, orange juice, and lettuce were high early in 1978 because of adverse weather in important growing areas," says Robinson. "There is little the government can do about this. When you eliminate the commodities over which the government has little or no control and set aside marketing costs, which account for about two-thirds of what the consumer [illegible] food, it is clear that the [illegible] of the government on food prices is, in fact, quite modest."

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"When there is a freeze in Brazil or a drought in West Africa, there is little importing countries can do, short of rationing, to limit price increases," Robinson explains. "The best way to hold down prices on some imported foods is for the consumer to refrain from buying items in short supply and switch to substitutes."

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Soil Tells of Mayan Fall

Falcon Lives it up in Baltimore

Integrated Pest Management

Field Research in Beginning Biology

Homes to Sport New Solar Panels

...and more

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The H. E. Babcock Professor of Food Economics in the Graduate School of Nutrition (now the Division of Nutritional Sciences) from 1962 to 1973, Call was the youngest professor ever to hold an endowed chair at Cornell. His research centered on the analysis of government food and nutrition programs, factors causing changes in nutrition and food consumption, and the acceptance of meat "extenders" such as soy products.

Call received the B.S., M.S., and Ph.D. degrees in agricultural economics from Cornell. He was an assistant professor of agricultural economics at Michigan State University and visiting professor in the Department of Food Science at M.I.T. He has written numerous articles for popular and professional publications and has served as a consultant with farm organizations, trade associations, and private corporations.

From 1969 to 1970, Call was chairman of the White House Conference on Food, Nutrition, and Health. He was asked by former governor Nelson Rockefeller to serve on commissions to revise State social service laws and study living costs and the economy. He was also a member of the Food and Nutrition Board of the National Academy of Sciences, consulting economist with the U.S. Office of Management and Budget, and a member of the National Advisory Committee to the Commissioner of the Food and Drug Administration.

As director of New York State Cooperative Extension, Call was at the helm of an organization with offices located in each of the State's 57 counties and the five boroughs of New York City. He led a field staff of some 500, plus about 200 faculty members in the College of Agriculture and Life Sciences and College of Human Ecology, who devote at least part of their time to Extension activities.

Call's approach was innovative. In addition to the more traditional Cooperative Extension programs, a number of new ones were started during his tenure as director.


David L. Call

In 1976, with a special federal grant, he brought the vast resources of the State's land grant university to disadvantaged city dwellers through the New York City Urban Gardening Program. With instruction in vegetable gardening and nutrition, they grew rows of tomatoes, lettuce, and corn in vacant lots, and even learned how to preserve the harvest. Last summer there were 450 urban gardening sites and about 2,000 gardens.

He was also instrumental in the development of the Integrated Pest Management Program, a system to deliver knowledge about pest control to fruit growers. Through Extension, the research of Cornell entomologists, plant pathologists, and chemists is used to establish precise methods for the management of diseases and insects and is then communicated via computer to fruit farmers throughout the State.

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To aid in the dissemination of such Extension information, Call played a major role in establishing Media Services, a separate department within the College of Agriculture and Life Sciences with facilities to produce materials in both the print and electronic media. Their award-winning book *Save Energy, Save Dollars*, as well as almost two dozen "Energy Factsheets," are now available from every Extension office. The advice contained in these publications is also sent to most newspapers in the State for use in special supplements.

These programs not only serve to inform the public, but have the added benefit of attracting attention to some of the outstanding research conducted at Cornell, resulting in significant financial support and prestige.

Call's dynamic character has already earned him wide support throughout the State and the University. There is every reason to believe that he will bring these same qualities of strength and vision to the office of dean.

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Kennedy has been a member of the University faculty since 1949. In addition to being dean for the past six years, he has been vice-provost of Cornell, associate dean of the College, director of the Agricultural Experiment Station, and director of research. Prior to that, he was a professor of agronomy.

He has served on many University committees and received more than a dozen special assignments and awards during his Cornell career.

Don't Blame Uncle Sam for Rising Food Prices

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Many imported commodities, however, do not fall under government control and their prices fluctuate according to world market conditions. Robinson says it may be possible to enter into international agreements whereby prices could be stabilized, but experience has shown them to be ineffective.

"When there is a freeze in Brazil or a drought in West Africa, there is little importing countries can do, short of rationing, to limit price increases," Robinson explains. "The best way to hold down prices on some imported foods is for the consumer to refrain from buying items in short supply and switch to substitutes."

The farmer, should not bear the full blame for steady inflation in food prices. The farm value of commodities produced in the United States accounts for only one-third of market basket costs, and that includes food purchased at restaurants and fast-food chains.

In fact, the cost of labor off the farm actually exceeded the value of the food for the first time in 1977. The future doesn't look brighter.

"It is likely that the recent 15 percent increase in minimum wages, which affects *to page 2*

Food Prices

from page 1 low-wage labor employed in food processing plants and restaurants, will have a greater impact on the total cost of food in years to come."

The commodity that has suffered the most noticeable price increase is beef, which is estimated to have gone up all of 37 percent over the past year. It is often thought that if the government would relax its restrictions on beef imports, which now make up about 7 percent of our supply, prices would decline. Robinson believes, however, that easing such quotas would mean only a 3- or 4-cent saving per pound.

"Changes in the number of animals held by U.S. cattlemen will have far more influence on beef prices over the next few years than will changes in import restrictions," Robinson maintains. He says beef prices will rise for a couple of years mainly because so many animals were slaughtered in 1975 and 1976 when feed costs were high. "There simply are not enough cows around to sustain beef supplies at the high level enjoyed during the past two years," he says.

One food commodity that has increased in price because of federal policies is dairy products. It has been argued that high price supports for these products are necessary to improve the income of dairy farmers and that unless prices are raised, many farmers would stop milking cows.

Support prices for dairy products were set higher than would have been necessary to assure adequate supplies in 1977 and 1978. The government will again acquire surplus dairy products, according to Robinson, although fewer than in the preceding year.

Grain supplies are also abundant. Since 1974, the U.S. has produced more grain each year than has been consumed. The surplus at the end of this year is expected to be equal to that which existed before the "Russian Wheat Deal" of 1972, and may be slightly larger.

"With ample supplies of grain and relatively low prices, there is now more incentive to feed livestock," Robinson observes. "This will help hold down the cost of meat over at least the next two years despite some reduction in the availability of beef."

Indeed, because so much of our food supply is based directly or indirectly on grain reserves, prospects for the future are favorable, Robinson believes. "We are among the very few countries in the world with a grain supply that exceeds one metric ton per person," he says. "This enables us to maintain a livestock diet, to earn foreign exchange from grain exports, and to provide additional food aid in the form of grain if it is needed.

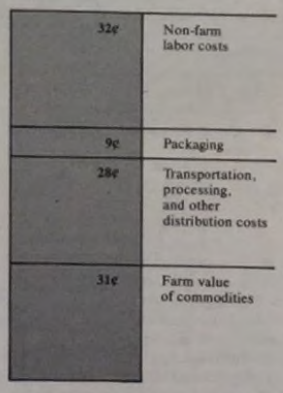
In contrast, the populations of some countries are forced to subsist with 0.2 to 0.25 metric tons of grain. Since about half of our current annual grain production is used to feed livestock, there is a comfortable margin that could be diverted to feeding more people, if necessary, Robinson explains. "Food aid could be doubled or even tripled over the next few years, with very limited adverse effects on domestic consumers," he says.

Despite the quantity of food produced in the U.S., costs will continue to climb, generally at the same rate as inflation for other commodities. This is mainly because about two-thirds of what consumers spend for food is tied up in marketing, processing, and transportation costs.

"The best way for the consumer to control food costs is to eat foods that require the fewest services to prepare," says Robinson. "This means eating out less and eating fewer processed foods. If you want to see what the cost of processing can mean, just compare the cost per ounce of some of the fancier cereals with the cost per ounce of plain oatmeal."

He also advises Americans to change their diets to include less meat, which is expensive, and more eggs, which are still an excellent buy and contain a comparable amount of protein. They could also eat more grains.

What with our abundant stock of grain, the U.S. is placed in a position of great responsibility. "With less than six percent of the world's population," Robinson remarks, "we produce approximately one-fifth of the world's grain supply and account for around half of all grain that moves in international trade. Unlike most other nations, we have the problem of deciding how our abundance will be shared."



Cost components of each dollar spent by consumers in 1977 for domestically produced food.

Source: U.S.D.A. Agricultural Economic Report #398

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Dear Alumni and Friends,

To be asked by President Frank H. T. Rhodes to be the ninth dean of the College of Agriculture and Life Sciences is undoubtedly the high point of my career. Much of my life--as a student and professionally--has been devoted to this College and to Cornell University. I am greatly honored to follow in the footsteps of those deans who have set such high standards of leadership for which the College has become known the world over. You may be assured that I will do my best to provide the same high quality of leadership. I am especially fortunate in having as my associate dean Dr. Joan Egner, formerly associate director of the Experiment Station and prior to that a distinguished faculty member of the Department of Education.

Many challenges face the College and must be addressed in the next decade. A key concern will be maintaining the quality of this institution that has made it outstanding in the nation and, indeed, the world. Many unique characteristics distinguish this College of Agriculture and Life Sciences and account for its strengths. Certainly a top priority of administration will be to preserve and build upon these unique characteristics. One of these unique qualities is the multiple relationships it enjoys with Cornell University, the State University of New York, and the citizens of New York State. These are important relationships requiring continual attention.

Obviously one of the major strengths of this College is the superior quality of its faculty. The College has attracted outstanding teachers and researchers because it has long been noted for the stimulating environment it provides for these activities. A prime objective of the College's administrative team will be to preserve and nurture this environment. Fortunately, this past year we were able to secure support for faculty salaries which has allowed us to remain competitive in this area. We will do our best to recruit the most able people to our faculty and to retain the present members who are making major contributions to the mission of the College. We will remain constantly alert to any factors or trends which might diminish the excellence of our faculty.

The quality of the student body has been another of the College's major strengths, and the nationally projected decline in total college and university enrollments presents a great challenge to the College administration. In the past we have been able to attract the very best students to our undergraduate and graduate programs. We do not intend to sacrifice quality and will do our best to continue to fill our student ranks with the most capable and highly qualified students from New York State and the nation.

A continuing challenge is that of maintaining a strong technology transfer system. Such a system takes the knowledge of the College to the people of the State to enable them to make better informed decisions regarding their lives, their businesses, and their communities. Cornell's Cooperative Extension program has evolved and is meeting this challenge. In the future we will continue to adjust and refine this system to meet the future needs of traditional and new audiences.

A tremendous strength of this College has been the active participation of alumni, friends, and those benefiting from its programs. We hope that anyone with an idea that would benefit the College will communicate with us. We welcome your comments and suggestions. I look forward to meeting many of you in the future.

Sincerely,

David L. Call
Dean

Soil Tells of Mayan Fall

A view of the Central Acropolis of Tikal

For some time it has been thought that the way to unveil the mysteries of ancient civilizations was to study their ruins and dig for time-worn artifacts. For all the painstaking efforts of archaeologists, however, questions often remain surrounding the demise of cultures that, on the one hand attained technological superiority, and on the other, quite suddenly gave up the ghost with an enigmatic sigh.

To Gerald W. Olson, associate professor of agronomy, the answers may well lie in the soil that supported these age-old societies. During the past 10 years, Olson has gone on four short expeditions to Central America and Turkey and has returned each time with the opinion that some civilizations unwittingly brought about their own fall by abusing their environment.

"Although the final fall of a civilization can sometimes be attributed to a critical war, it has always seemed more logical to me that a society may already have weakened itself with ecological practices that forced landslides, droughts, and famines," says Olson, who also spends much time advising county agents about correct soil conservation practices.

Perhaps the most revealing of his journeys was to the University of Pennsylvania's excavation site at Tikal, the most important settlement of the Yucatan Mayas. Tikal's history is about 2,500 years old, but it was some 1,500 years ago that this city, located in northern Guatemala, reached its pinnacle.

Great vestiges of this civilization remain. Magnificent temple walls still rise above thick vegetation. More than 3,000 ruins at Tikal have withstood the forces of nature, and others dot the lowland jungle for many miles before they end at the Caribbean Sea.

Now, only these pay homage to the Mayas. In approximately 900 A.D. all building seems to have come to a stop. Structures stand unfinished, intimating the onslaught of a sudden catastrophy.

"A variety of theories have been proposed to explain the mysterious Mayan decline," Olson says. "Our investigations have supported the idea that the land itself was unable to support a population expanding to well over 10,000 inhabitants."

The Mayas sustained themselves chiefly by raising maize, sweet potatoes, squash, and cacao beans, grown both for consumption and for trade. As the civilization expanded, it became necessary to progressively clear dense forests to make way for more and more crops. Most of this was done by hewing the trees with stone axes and burning the remains.

The newly cleared soil was rich, but it was also very thin, extending only a few inches in depth in places. The quality of the land suffered a dramatic decline in some essential nutrients. The amount of organic matter, nitrates, and soluble salts decreased sharply, mainly because of the erosion that ensued without the strength of tree roots to restrain the soil's movement.

"The Mayan method of 'slash and burn' agriculture was so wasteful of soil fertility resources that, in time, an increase in population accelerated Tikal's decline," Olson explains. Also, in order to feed more people, it became necessary to intensively cultivate the land more often, without letting it lie fallow long enough for the soil to renew itself.

"After a forest is cleared and planted in corn, yields will be cut by 25 percent or so each year, if fertilizer is not added," Olson emphasizes. "So, if fields are not cared for properly, it is easy to see how once-fertile soil can be depleted in a short time. Ideally, after five years of cultivation without fertilizer, planting should cease for 10 years to bring about good soil regeneration."

Mayan farming methods, however, were not entirely to blame for the land's deterioration. Many acres of the city were paved, with little regard for proper drainage. Heavy tropical rains caused these areas to flood, sending torrents to strip the farmland below of its fertile topsoil.

The clues Olson followed to arrive at his theories were right under his feet. Time after time, he found layers in the soil that seemed to reveal the history of the region.

At a depth of about one meter, he discovered a dark band of soil that contrasted vividly with the color of the virgin earth beneath it and the light brown topsoil that now exists. The black layer was rich in phosphorus, a mineral normally associated with human civilization since it is concentrated in decaying bones and trash. Along with the presence of this element were flood deposits containing the nutrients essential to plant growth. Erosion in the uplands obviously exhausted the Mayan fields.

In Tikal's reservoirs, Olson found almost 30 feet of sediment, documenting the devastating effects of erosion. The deposits indicate not only a decline in agriculture, but the fouling of the water supply.

Although the Mayas fell about 1,000 years ago, Olson stresses that modern civilizations would do well to learn from the ancients' mistakes. Some Mayan soils still have not recovered their original organic matter content, he remarks.

"Tikal's erosion situation is analogous to the problems created by the construction of many of today's large shopping plazas," he says. "When inadequate drainage facilities are built for these centers, heavy rainwaters often strip the surrounding area of fertile soil, move great quantitites of earth, and may even destroy building foundations."

The environmental havoc reaped by neglecting soil conservation is realized slowly but surely. Many parts of the world, particularly Haiti and some of the developing nations of Africa, are beginning to feel the effects of inefficient farming practices and the insidious erosion they cause.

Even in the United States soil conservation is frequently forgotten. Upland forests that protect centers of population in the drainage basins below are often cut to make way for highways, coal mines, and logging operations.

Careful planning is needed to avert catastrophies like the one that befell the Mayas, according to Olson. Detailed surveys that show soil composition are now available for much of North America and are constantly being improved. For the first time, the United Nations has published a general map displaying soil classes in every part of the world.

"Careful land management and the prosperity of world cultures are closely related," says Olson. "The experience of the Mayas shows that the security of nations is not always dependent on armaments, but on how they manage their resources for the future."

$30,000 Gift Supports College Research

The College of Agriculture and Life Sciences has received a $30,000 gift from Mrs. Frances C. Reilly, president of the RA-PID-GRO Corporation of Dansville, N.Y.

Known as the Thomas and Frances Reilly Fund for Teaching and Research in Plant Nutrition, it honors Mrs. Reilly and her husband, Thomas P. Reilly, founder of the RA-PID-GRO firm and pioneer advocate of foliar feeding.

Income from the gift will be used in the College's Department of Floriculture and Ornamental Horticulture to support research on feeding plants by applying nutrients to the foliage and other parts above the ground.

Foliar feeding or foliar nutrition is under investigation in the laboratory by Harold B. Tukey, professor of floriculture and ornamental horticulture.

Tukey explains that nutrients applied directly to the foliage are absorbed rapidly and may reduce the need for conventional fertilizers.

In addition to Mrs. Reilly's personal gift, the College's research program on foliar nutrition has been supported by a $7,000 grant from the RA-PID-GRO Corporation every year since 1975.

Thomas P. Reilly started the company on a shoestring. As a young man he worked in his father's fruit tree nursery in Dansville. There he had the idea of producing a highly concentrated soluble fertilizer that could be applied to plants through the leaves.

After years of trial and error with various chemical formulations, he was finally able to market the product under the name of RA-PID-GRO Plant Food.

At that time, in the early 1930s, foliar feeding was not well known. But Reilly persisted and his firm grew. In 1959, he received a special citation from the American Horticultural Society for his innovative work in foliar nutrition.

"The story of the Reillys is typical of the great American dream," says Tukey. "A young man of immigrant stock in a small town in Upstate New York conceives a 'crazy' idea. Without formal education or financial support and against the advice of most scientific minds, he develops the idea into an important and prosperous business.

"Now through the generosity of his wife, the business aids the education of young people and supports basic research at a university. This will lead to a more efficient and environmentally sound way to grow and maintain ornamental and other economically important plants."

Rochester Area Families to Look for Sunny Days this Winter

It may seem that the use of solar energy in the Northeast is a long way off. But to eight families near Rochester, N.Y., it will soon become a reality.

Come winter, eight homes in the New Hope Village housing development in Sodus will have been fitted with solar hot water heating devices to provide at least 50 percent of the energy needed to heat water in each of the households.

This will be similar to a joint federal project by the Department of Energy and the Department of Labor to get solar space and hot water heating equipment put into the homes of about 1,000 low-income families throughout the nation and, at the same time, train hundreds of currently unemployed workers to install it.

"In addition to the benefits this program will offer to the disadvantaged, it will provide us with tangible models with which to test the efficiency and reliability of solar hot water heating in this area," says David M. Stipanuk, program leader of the New York State Food and Energy Council in the Department of Agricultural Engineering. "Whereas before, we only had computer models or working models in controlled situations, we will now be able to evaluate the systems with real-world people in real-world houses."

Stipanuk and other energy experts from the College were asked by Community Action and Self Help (CASH), a State organization through which weatherization funds are dispensed, to recommend the systems that will be used and the procedures to be followed to insure proper installation.

He is quick to emphasize, however, that this project is not considered experimental. "We don't want to impose uncertain technology on anyone," he says. "There is no doubt that if these systems are sized and installed correctly, they will work."

Workers employed through the Comprehensive Employment and Training Act (CETA) are being taught by the system's manufacturer and through various State training programs to assemble and install the collectors according to specifications. It is hoped that through this experience, CETA laborers will have better employment prospects and even small business opportunities.

The houses on which the collectors will be placed are single-family dwellings prefabricated in New Hampshire and are not specifically designed for solar heating. Stipanuk and his colleagues have, therefore, been especially careful to select systems that could easily be adapted to most existing structures. "One of our main concerns is to maintain the architectural integrity of the housing project," he explains.

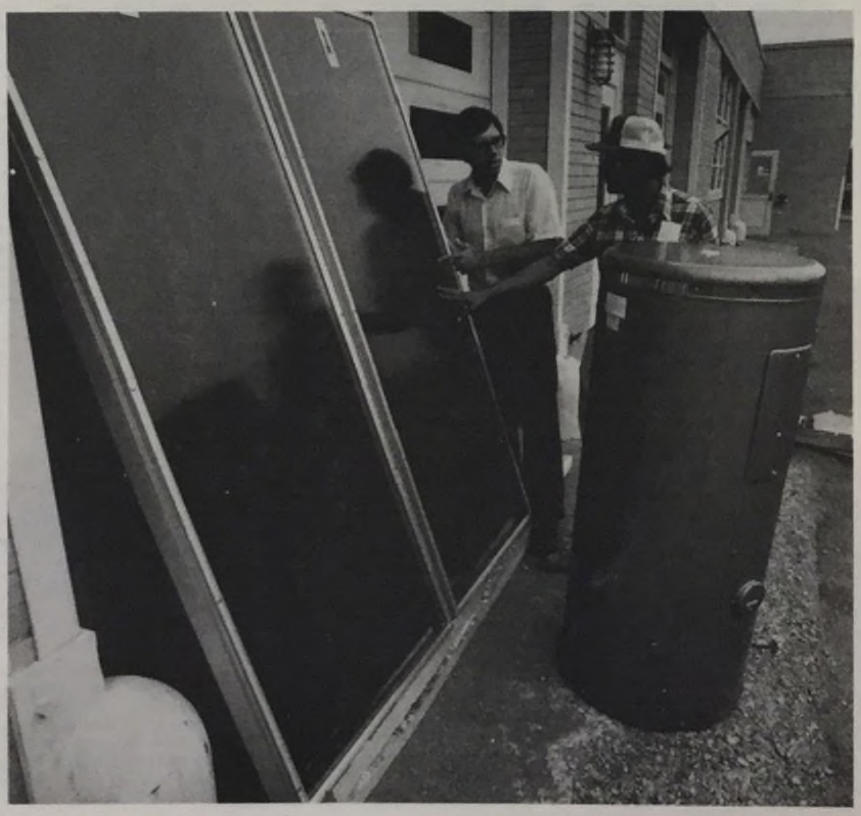
The heating units will save each family about one-half of their normal hot water costs. The average family of four with a conventional electric system uses approximately 500 kilowatt hours of electricity per month to heat water. At current prices in Rochester this would cost about $228 a year, including tax. With the help of the solar collector, the total bill from the utility company should amount to about $115.

The systems themselves cost around $2,000 each for the hardware, installation, and shipping. For the Sodus project, however, this figure will be reduced somewhat because of the quantity purchased. At today's electricity costs, the entire system should pay for itself in 10 to 15 years, according to Stipanuk. If the price of electricity goes up, which is highly likely, then the pay-back period will be shorter.

Cooperative Extension is also involved in this project because it will be observing the problems of installation and the efficiency of the Sodus systems. Most of Extension's work in this field has been theoretical, and they are now starting to fit collectors on buildings that can be closely monitored.

Extension personnel, as well as Cornell agricultural engineers, will return to Sodus frequently over the next three years to check on how well the systems are functioning. Also, a videotape will record their installation, advising viewers of the various pitfalls to be considered before choosing solar heat. What with the knowledge gained from experimental projects and the know-how acquired from practical applications like the one in Sodus, Cooperative Extension will have comprehensive information about solar hot water heat to share throughout the State.

David Stipanuk (left) discusses the problems of installing a solar collector and its accompanying hot water storage tank with Research Technician C. J. Solat.



Save Energy, Save Dollars

The New York State Cooperative Extension consumer manual "Save Energy, Save Dollars" is now in its second year of publication. Acclaimed by the New York *Times* as a complete and useful guide, this booklet contains hundreds of hints on how you can conserve energy in your home, in the way you dress, and in your general lifestyle.

"Save Energy, Save Dollars" is a product of research conducted by members of the College of Agriculture and Life Sciences and the College of Human Ecology.

It costs $1.50 and is available at local N.Y.S. Cooperative Extension offices or through:

Cornell University
Mailing Room 7E
Research Park
Ithaca, New York 14853

save Energy save Dollars

Open House Slated for Mid-November

by
MARY MAXON
Communication Arts '79

High school juniors and seniors will have the opportunity to visit Cornell University on Saturday, November 11. The New York State Colleges of Agriculture and Life Sciences and Human Ecology in cooperation with their alumni associations are sponsoring an open house.

An annual event, the open house begins with registration at 8:30 a.m. in Bailey Hall. Films, tours of academic departments and campus facilities, and contact with students and staff will fill the daylong program. Groups will also discuss programs of study, career opportunities, and admissions policies.

Animal nutrition, natural resources conservation, business management, and rural sociology are just four of over 50 specialities in the College of Agriculture and Life Sciences. Prospective students will be able to see firsthand the diversity and academic strength of the College, as well as educational and career opportunities that will arise should they attend.

Through such projects as the open house, the College seeks to maintain a high level of enrollment by encouraging qualified students to apply.

Editor's Note: Mary Maxon is Vice-president of the Agriculture Positive Action Council (Ag PAC).

Land Planners To Be Aided by Floppy Disc

Research at the College of Agriculture and Life Sciences has long been devoted to finding more efficient ways to use the land. Traditionally, this has meant deciding what crops to put where or what acreage is best to use for cultivation, pasture, or woodland.

In the past decade, however, widespread concern for the quality of the environment has extended the study of land use beyond the farm into the community. Politicians and planners are subject to public outcry if errors are made in locating roadways, powerlines, areas for garbage disposal, and above all, nuclear power plants and waste dumps.

Landscape architects in the Department of Floriculture and Ornamental Horticulture have started to use computers as a tool in land use management. And although data processing has been employed before for this purpose, College designers under Peter J. Trowbridge, assistant professor of landscape architecture, have devised a system that is easier to use. Rather than depend on centrally located computers, accessible only in large cities and universities, planners will now be able to obtain the same information from the small desktop models available in retail stores.

The federal government, as well as other public and private institutions, has amassed a tremendous amount of information about geography, economy, and population. The problem of finding and using it accurately, however, has been almost insurmountable for small municipalities. The Land Use Information Retrieval System (LUIRS) developed by Trowbridge will allow officials of outlying communities to sort this data, even if they have had no experience in computer programming.

"Small rural communities face a dramatic change as urban and suburban areas encroach upon what was once farms or unused land," says Trowbridge. "Through LUIRS, we hope to provide information and techniques for resolving problems such as site selection for those who have had limited access to the necessary facts and figures."

Most small computers store data on what is known as a floppy disc. Similar in size to a cassette tape, this device is capable of receiving sufficient information for most land use management applications. In most cases there are 400 different pieces of data for every acre of land studied. Trowbridge will program these discs so that these facts can be retrieved by the user on command.

The printout will show light and dark areas representing different land characteristics. A map of the area being studied can then be superimposed on it, providing an easy reference to roads, bodies of water, and other physical features.

The discs will be sold at cost and accompanied by a manual that explains the system in detail and instructs the user on how to adapt the complex programs to the needs of the individual community.

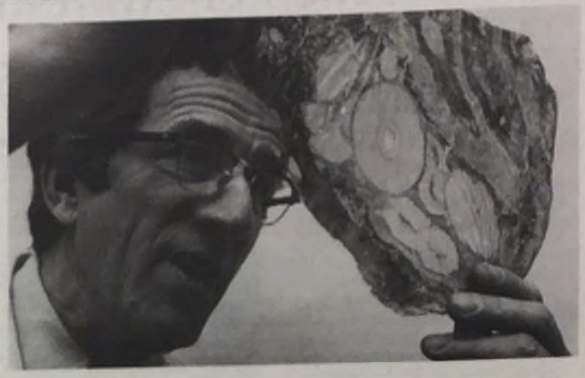
"We have now assembled 40 categories of land use information that can be put on the discs," Trowbridge explains. "They include physical, social, and cultural characteristics, such as transportation systems, depth to bedrock, and even the incidence of trailer parks."

LUIRS will also be a valuable classroom tool. Students of landscape architecture, anticipating the increasing importance of computer technology in their field, will be able to design models through which to make hypothetical planning decisions.

LUIRS is now being tested by graduate students to make sure all the bugs are out. Trowbridge says the system should be ready for community use by early next year.

A typical computer printout from the Land Use Information Retrieval System, this one indicating water capacities. Each symbol represents 10 acres, with the lighter areas referring to lower water tables, and the darker to higher. A map can be superimposed to show specific land features.

Harlan Banks: *He's No Old Fossil!*



The "Invasion of the Land Plants" may sound like the title of the next disaster movie. But to Harlan Banks it represents his life's work.

For more than 40 years, Banks, the Liberty Hyde Bailey Professor Emeritus of Botany, has been sifting throught the sands of time to find the answer to one question: How did plants make their way from the water to the land?

The quest has taken him back 4.7 billion years, give or take a few hundred million, to when the earth first took shape. He has split rocks containing the earliest evidence of life, dating back about 3.1 billion years. He has studied South African shale deposits with the fossils that show the first signs of photosynthesis and examined flint formations from Ontario containing petrified blue-green algae whose very life, it is thought, helped imbue our atmosphere with oxygen.

The plants that really interest Banks are a mere 345 to 405 million years old — from the Devonian period. That is when some plants made their exodus from the sea and invaded the land.

"It's all a lot of fun," says Banks, who after 31 years at his alma mater, the College of Agriculture and Life Sciences, retired on August 31. "Nobody knows, at least I certainly don't, how simple algae evolved into the sophisticated plants we know today. When did they start and how did they change?"

It is believed that the first land plants were green algae that thrived in fresh water but could also survive on land. They may be the likely precursors of green plants because their chemical makeup is similar.

These algae were followed by the appearance of vascular plants, which had simple stems capable of carrying nutrients. Over millions of years, these became more sophisticated and could transport larger quantities longer distances, allowing for the development of leaves, flowers, and eventually, fruits.

Throughout this process, plants became more streamlined so they could function more efficiently. Whereas primitive flowers had many complicated parts, an advanced flower may have just one, like the pussy willow, whose flowers each consist only of one ovary. This pussy willow's lineage, though, is bound up in the deliberate, almost imperceptible march of evolution.

"I'm not one of these scientists who can go on TV with astounding discoveries," says Banks with a wry smile. "I just do basic research. Whether it will be to our advantage or lead to an astounding discovery someday, I can't say."

Banks may never appear on the "Tonight Show," but he was charismatic enough to convince the National Science Foundation of the importance of his work. He is also the only paleobotanist currently receiving USDA funding for research not directly related to agriculture.

He is the author or co-author of 116 papers and the book, *Evolution and Plants of the Past*. In 1975 he was named honorary vice-president of the 12th International Botanical Congress in Leningrad. He has served on the editorial board of several respected journals and is a past president of the Botanical Society of America.

A good part of Banks's schedule at Cornell was devoted to teaching, which he says he still loves. His enthusiasm is clearly contagious. In 1963 he was chosen by College seniors for the Professor of Merit Award as the most outstanding teacher and adviser. He received the State University of New York Chancellor's Award for "excellence in teaching" in 1975.

"I will probably never be able to figure out how land plants got here," admits Banks. "But, who knows, maybe one of my students will."

Students who want to follow in Banks's footsteps not only have to study botany, but geology as well. The composition and age of certain kinds of rock have to be determined before fossils can be dated.

Banks explains that his job was made much easier by a British geologist who discovered the law of superposition. In the early part of the 19th century, William Smith found that the deeper beneath the surface a rock layer lies, the older the rock within it is.

"This is really very simple," says Banks. "But, who knows, if Smith had not discovered it we still might not know it today. Sometimes the simplest things are the hardest to discover."

In some cases, however, the youngest rocks are not found on the top. Because of shifts in the earth's crust, some layers tilted almost 90 degrees, putting the younger rocks in southern regions and the older in northern.

Because of this, most of the surface of southern New York State is composed of rocks formed in the Devonian period, the era in which the land plants developed.

"If you draw a line from Albany to Buffalo," says Banks, "the exposed rock below the line is Devonian. So, I have not had to go very far to get some of my specimens."

Now that he has retired, though, Banks will be travelling frequently, taking field trips to various parts of the world to study more Devonian rocks and their fossils. And he will continue teaching by accepting more invitations to give seminars.

Retirement certainly does not mean Banks will stop researching the evolution of land plants. "If I can figure out how they got here — and I'll have more time without a heavy teaching schedule — then perhaps we can figure out how plants will change in the future.

"And maybe," he explains, "I can finally get the weeds out of my garden!"

Intermediate Technology In Developing Nations

by J. K. CAMPBELL
Associate Professor,
Department of Agricultural Engineering

The term intermediate technology is often used to describe the level of industrial and agricultural technology required in "less developed countries" (LDCs). It refers to simple, low-capital processes that poor farmers and entrepreneurs are able to buy or construct. It is technology that falls between low-capital, labor-intensive methods, on the one hand, and high-capital, automated technology on the other.

The concept of intermediate technology was popularized by the late E. F. Schumacher in his 1973 book *Small is Beautiful, Economics as if People Mattered*. But to be successful, intermediate technology must usually be site-specific, because if technology is to be beneficial, it must fit within the constraints of available materials, agricultural systems, religious taboos, and social customs.

"Intermediate technology" became immediately popular in the developed countries. But foreign aid workers soon discovered that LDC leaders who were educated in the West saw intermediate technology as "second best." Because of this and because of the fact that the level of intermediate technology varies according to the situation, the fuzzier term "appropriate technology" was substituted.

Appropriate technology does not indicate the level of technology. For example, appropriate technology for threshing rice on the crowded island of Java would be a simple threshing frame. On newly developed lands in the Solomon Islands, however, it may well be a combine harvester. Despite the equivocal nature of the term, most foreign aid workers tend to think of appropriate technology as intermediate technology, since that is the level most applicable to LDCs requiring aid.

But why should an LDC that probably has a number of underemployed or unemployed citizens adopt any technology, even if it is intermediate technology? Won't it displace workers? These are logical questions to ask because in the U.S., we do use technology to displace labor.

There are, however, unique characteristics of technology, other than saving human labor, that make it useful in improving agricultural practices in developing countries. Before considering how appropriate technology can help upgrade food production in LDCs, it is necessary to eliminate the North American notion that an agricultural year consists of a five-month growing season. Most of the developing nations are in the tropics, where there is sufficient sunlight and heat to grow crops year round, assuming the availability of water.

Even where water control in the form of dams and irrigation systems is not available, appropriate technology can be used to break bottlenecks. In areas with definite wet and dry seasons, for instance, farmers using the water buffalo or man as a source of power must wait until the rainy season has commenced before beginning tillage. From the standpoint of maximum efficiency, it would be better to have the fields prepared at the onset of this season so the crops could benefit from the most rain.

Unfortunately, men with hoes and poorly fed draft animals are unable to prepare the hard soils that exist at the end of the dry season. In this case, appropriate technology could well be a tractor or perhaps hardier draft animals having sufficient power to plow hard, dry soil. It might also be a system whereby herbicides would be applied in a program of minimum tillage.

Appropriate technology increases food production primarily by providing timeliness of operation over a large area of land. For example, a 125-day variety of irrigated rice yielding approximately 2,700 pounds per acre means an average of 21 pounds of rough rice is realized per acre for each day from seeding to harvest. Thus, each day spent preparing land for the next crop can be viewed as a loss of 21 pounds of rice per acre.

The time required to prepare the land will depend on the power level available. Furthermore, although there may be underemployment throughout the year, there is quite often a labor shortage during the tilling and harvesting operations.

To plow an acre of land for rice planting demands 50 hours when done by a man with a hoe, eight hours by buffalo using a simple plow, five hours with a five-horsepower pedestrian tractor, and one hour with a 45-horsepower tractor equipped with a rototiller. To determine which of these methods can be deemed appropriate technology, a mix of agronomic, economic, and social conditions must be considered.

A pedestrian tractor in a rice paddy in the Philippines.

A good example of appropriate technology is the International Rice Research Institute's (IRRI) axial-flow thresher. It was developed in the Philippines for local conditions and is designed to be constructed and repaired with simple tools.

The thresher uses a spike-tooth thresher cylinder because this type is simple to manufacture and does not required the close tolerances or higher level of manufacturing know-how needed for the rasp bar cylinder used on North American combines. The spiked teeth have a longer life and can be used with more crops than the wire-loop cylinders on Japanese threshers.

This serves to emphasize that appropriate or intermediate technology does not simply pull designs from the archives of "developed" countries, although it certainly is useful to build upon inventions of the past. A good appropriate technology design will utilize whatever current advances conform to the requirements and constraints of the location at which the device or process is to be constructed and used.

A good test of appropriateness is whether or not a system is copied, modified, and produced by local entrepreneurs. Since the IRRI axial-flow thresher was first manufactured in 1974, for instance, more than 3,000 machines have been built and sold by small businesses. Incidentally, a Cornell alumnus, Fred Nichols (Agricultural Engineering '61), played a major part in the development of the IRRI axial-flow thresher.

Citizens whose taxes support faculty at land grant colleges may well ask what benefits they receive from overseas work in appropriate technology.

From a moral viewpoint, there is always the responsibility to help the less fortunate. But appropriate technology is not simply a case of all give and no take. Ideas conceived in devising appropriate technology flow to the United States.

A solar-powered ultra-low-volume sprayer now being developed in Nigeria, for example, may provide some insight into sprayer development in the U. S. In fact, it may well be directly applicable to some farmers in New York State.

It must be emphasized, however, that if agricultural technology is to be appropriate, it cannot be built with an eye solely toward technological features. It must be amalgamated with adequate markets, good agronomic practices, an efficient credit system, stable government, and a social system acceptable to those within it.

Threshing rice with an IRRI axial-flow thresher.

Kelly Named Professor of Merit

William C. Kelly, professor of vegetable crops, was presented the Professor of Merit Award by 1978 graduating seniors. It was given in recognition of his outstanding teaching and counseling.

Kelly teaches courses in vegetable crops physiology, research methods in applied plant science, and organic gardening. He also advises 25 undergraduates and 7 to 10 graduate students each year.

Kelly is now chairman of his department's teaching committee and of the plant science curriculum committee. He has served on a number of College and University bodies involved with student affairs.

Kelly's work with graduate students was recognized in 1972 by the American Society for Horticultural Science, which presented him with the M.A. Blake Award.

He is co-author of the textbook *Vegetable Crops* and has written extensively on his research dealing with fertilizers, mineral nutrition, and the vitamin content of vegetables.

The Professor of Merit Award is presented each year by College seniors to the professor they hold in the highest esteem. The election is coordinated by Ho-Nun-Da-Kah, the College honorary society.

William Kelly

Falcon Lives It Up In Baltimore

A Cornell program aimed at reintroducing rare Peregrine falcons into the wilds they once freely roamed has met with a strange twist. One of these lordly and independent birds has abandoned the marshland and heath for the excitement of urban penthouse living.

Ornithologist Tom Cade, along with interested onlookers from 35 floors, are delighted that a young Peregrine has decided a Baltimore skyscraper is just as appealing as a craggy peak.

Named Scarlet, the falcon is one of approximately 365 Peregrines bred in captivity and released throughout the country during the past few years in an attempt to bring this majestic bird back from the brink of extinction.

The Peregrine falcon, whose supreme skill and grace has long fascinated ornithologists, was abundant in the skies of most of North America until the early 1960s. Environmental contamination caused these birds, that are capable of plunging after their prey at speeds of 200 miles an hour, to dwindle in number.

"Man's destruction of their natural habitat and the pervasive use of the pesticide DDT, which causes eggshell thinning and lowered reproduction rates, have drastically reduced the Peregrine population," says Cade.

Now that the use of DDT and other such harmful substances is regulated in the United States, the Peregrine Fund at Cornell's Laboratory of Ornithology is striving to restore the falcon population by releasing young reared in captivity.

The process is difficult, sometimes involving sophisticated artificial insemination techniques, but Cade is the first to have consistent success breeding the birds in the laboratory.

In 1975, the National Audubon Society, the Colorado State Division of Wildlife, and federal agencies including the Department of the Interior, joined the effort, expanding Cade's project to western states and allowing him to introduce Peregrines into national lands.

"These agreements enabled us to undertake a long-term management scheme for Peregrines in the West and enlarge our program in the East," explains Cade. "The natural Peregrine populations nesting in the southwestern and western states are the most severely depleted in North America, with the exception of the eastern population."

The main difficulty in rearing these birds in captivity is that the young are extremely dependent on their parents or other supplier of food for up to six weeks, while they develop their flying skills.

This problem of extended parental care has been solved by allowing the young falcons to be reared for four weeks by adults also held in captivity. By this time, the nestlings are able to tear and eat their own food.

They are then taken to sites where falcons used to nest or to man-made towers in areas where they will not be disturbed and there is an abundance of natural prey. They are protected by attendants who guard the site around the clock against predators such as owls and raccoons.

Baby Perigrines bred in captivity

At six weeks, the Peregrines are released through hacking, a process whereby they are conditioned to return for food. Small radio transmitters are attached to their legs so that the attendants can monitor their travel and see to it that they all come back to eat.

The falcons gradually wander further and further from the hack site and soon become self-sufficient.

"To date we have raised 368 Peregrines, of which 220 have been released," Cade says. "This takes on considerable meaning when one considers that 200 young represent more than the natural annual production of the entire population of Peregrines that used to breed east of the Mississippi."

The falcons have been introduced in 12 states, including California, Colorado, and New Mexico; Massachusetts, New York, and Maryland.

Cade's project has been followed closely by scientists and laymen alike. The program's annual budget is $175,000, half of which comes from private contributions.

It stands to reason, then, that when Cade was informed by the U.S. Fish and Wildlife Service in June 1977 that he could no longer release his Peregrines, there were numerous protests.

The Service objected to the fact that, in addition to using three North American species in breeding, Cade used two European falcons as well. "The question was whether I should be involved in establishing a new species in an area where the native species has become extinct," he explains.

Letters started to pour in from all over the country and overseas expressing great dismay at the Service's decision. Smithsonian Institution Director S. Dillon Ripley condemned the objections as ridiculous and compared them to arguing about how many angels could dance on the head of a pin.

After some deliberation, the Wildlife Service upheld its decision, but conceded that an exception could be made and the European subspecies could be released.

So the Peregrine Fund continues in its effort to establish a natural breeding population of falcons in the wild. "Already we have had several of our Peregrines return as adults to the locales where they were released. And one — Scarlet — has acquired cosmopolitan tastes. We are sure it is just a matter of time until we have Peregrines nesting again in the East and some new eyries established in the West."

Two fluffy young falcons look with envy at the wingspan of a more mature bird held by Tom Cade.

Stimming Scholarship Established

A $500 scholarship honoring the late William H. Stimming, a leading New York State florist, has been established at the College of Agriculture and Life Sciences.

To be awarded each year to a student majoring in floriculture and ornamental horticulture, it will be known as the William H. Stimming Scholarship and will be financed by the Kenneth Post Foundation.

John G. Seeley, professor of floriculture and ornamental horticulture, and secretary of the foundation, said that students will be selected for the award on the basis of character. Other considerations will be financial need, academic ability, and promise of future leadership in the field.

Stimming, who died in 1977, was the founder of Stimming Flowers, Inc., a prosperous greenhouse business. He grew about 3.5 million bulbs annually, including the tulip, iris, narcissus, and lily. He also cultivated many assorted potted plants, especially chrysanthemums.

Christmas Decorations *Bulletin* Available

Instead of rushing about in an eleventh-hour search for elaborate and expensive Christmas decorations, why not plan in advance this year to get together with family and friends and make your own handsome expression of the Christmas spirit?

Whether it be a Danish wheat star, a graduated wreath of hemlock and white pine, or an elegant centerpiece, a new, inexpensive Cornell University publication tells how you can make these and many other decorations yourself and still get professional results.

Called "Christmas Decorations," the 20-page guide offers easy-to-follow directions and includes a series of attractive photographs. The author is Prof. Raymond T. Fox of Cornell's Department of Floriculture and Ornamental Horticulture.

Available for 75 cents per copy, "Christmas Decorations" is a publication of Cooperative Extension and is available from: Mailing Room A, 7 Research Park, Cornell University, Ithaca, N.Y. 14853. Ask for Information Bulletin 134.

Animals Earn Their Keep at the T & R Center

When we buy meat or dairy products at the supermarket, it is second nature to expect great variety in plentiful quantities and high quality. It is just as easy, however, to forget the amount of muscle and research that goes into producing these staples of the American diet.

Animal scientists must constantly seek feeds that maintain health and vigor at the lowest possible cost to the farmer. Precise breeding schedules must be developed. Plant breeders must strive to introduce grain varieties that can withstand adverse weather and persistent pests. Moreover, efficient ways of conserving energy and natural resources have to be tested, while soils long abandoned are rediscovered and bothersome, disease-bearing insects are controlled.

Such practical research, and more, is always in progress at the Animal Science Teaching and Research Center of the College of Agriculture and Life Sciences.

"The center is designed to provide space for experimentation in any discipline within the College," says Samuel T. Slack, professor of animal science and center coordinator. "Any department can use it if necessary."

The center was established in 1973 on 2,500 acres of fertile valley and hillside land near Dryden, about 15 miles from the Cornell campus. It now houses some 850 head of dairy cattle, 450 beef cattle, and 900 sheep. About 600 acres of corn are planted and ensiled each year. The same amount of a variety of grasses is also grown and either processed in the same way as the corn or stored dry.

The center's newest addition is a 50,000 square-foot "L"-shaped barn that can accommodate up to 600 beef animals. One section of the structure is used primarily to develop feeding systems for beef cattle and to measure the quantity of feed consumed by individual animals.

There is another wing that contains 14 large pens designed for observing growing cattle. By allowing calves to choose from bins that hold different feed combinations, it is possible to learn whether the rations they find the most palatable also induce the best growth. From a control panel in this area, feeds are mechanically mixed and delivered to all parts of the barn.

A 100-acre field adjoining the new structure is used, among other things, to test which grasses, planted singly or in combination, are best for New York State pastures.

In addition to trying to find new feeds that stimulate the highest production, animal scientists at the Teaching and Research Center are experimenting with an old one with an eye toward saving energy.

For almost a century, farmers have been using dried brewer's grains. These by-products of the beer industry have been proven a valuable source of protein for both dairy and beef cattle. They are composed mainly of malted barley, corn, and rice and can replace some feed concentrates, such as corn and soybean meal, as well as some forage. Since beer is such a popular drink, there is no shortage of brewer's grains. In fact, many large breweries have built elaborate systems by which to dry and sell them as commercial feed. They have found a profitable way to dispose of a substance that would otherwise be of no value.

It has been estimated, however, that up to 500,000 BTUs of heat is needed to process 100 pounds of dry brewer's grains. As the cost of energy rises, it is likely that breweries will find this too expensive.

Researchers led by Larry E. Chase, assistant professor of animal science, have been using the Teaching and Research Center as a proving ground for the use of brewer's grains that are left wet, with a water content of up to 80 percent.

"Our biggest concern," says Chase, "is to find out what the farmer needs to do to make wet brewer's grains as much a part of the ration as dry is now. If the wet grains become more available, as they probably will, we have to find the best way to use them."

Using by-products from the Schlitz and Miller breweries in nearby Syracuse, Chase has been including varying amounts of wet grains as part of daily feed rations. He is seeking precise information about how much of the wet feed each animal can consume per day, while determining its true protein and energy value.

"Once we get these factors better defined, breweries will be able to more effectively market wet grains directly to the farmer, saving both money and energy," he comments.

The results of Chases's research are not complete, but the outlook is good. When grains are heated during drying, some of their protein is made unavailable to the animal. It is probable, therefore, that wet brewer's grains will be a better source of energy and protein than dry grains.

"Including wet brewer's grains in the ration seems to have worked well with our general stock," Chase says. "But some questions must be answered before their full feeding potential can be achieved."

Ultimately, Chase hopes to develop practical guidelines that farmers can follow to use the feed effectively. If successful, the cattle farmer may not be the only one to benefit. Feed costs could be kept down by using a by-product that requires no processing. This could well mean stable meat and dairy prices, a more efficient use of energy, and possibly less land used for livestock feed and more for the production of food for direct human consumption.

Beef cattle in a T & R Center feed lot.

She won't bite! Empire Farm Days, June, 1978, at the T & R Center.

Sisler Receives National Teaching Award

At a time when students at major universities often complain that professors would rather conduct research than teach, a College educator has been singled out by his peers and by his students for the enthusiasm and charisma he brings to the classroom.

Daniel G. Sisler, professor of agricultural economics, has been given the 1978 Distinguished Undergraduate Teaching Award by the American Association of Agricultural Economics.

"I cannot imagine the Agricultural Economics Association finding anyone in any field, not just agricultural economics, who has made a more significant contribution to his department, college, or university," said June M. Fessenden-Raden, former Cornell vice-provost, in supporting Sisler's nomination.

Considered an authority on international development and trade, Sisler receives an almost constant stream of invitations to speak outside the University. He is a consultant to the presiding bishop of the Episcopal Church of the United States on world hunger problems.

Despite his busy schedule, however, Sisler remains a dedicated teacher. His main course, the economics of agricultural geography, has an enrollment of 500. Yet, students have continuously lauded his accessibility and deep interest in both their academic and personal development.

In 1964, three years after Sisler first stood before a classroom, he was named Professor of Merit by the senior class. For 30 years prior to Sisler's election, no other professor had received this honor so quickly.

In 1975, Sisler was recognized again when the State University of New York presented him with the Chancellor's Award for Excellence in Teaching.

Dan Sisler

Integrated Pest Management Gives Farmers a Scientific Edge

An apple a day may keep the doctor away. But if enough of those apples have worms inside, the economic health of hundreds of fruit farmers will suffer.

The job of keeping apples pest-free requires constant attention through intensive management. This means careful monitoring of the entire orchard plus the judicious use of chemical pesticides.

For some time, researchers at Cornell and many other institutions have been seeking methods to help farmers develop and maintain a scientific approach to pest control. These programs took a great leap forward in 1973 when the U. S. Department of Agriculture gave seed money to about 20 states to establish concentrated pest management systems.

This funding enabled scientists from many disciplines within the College of Agriculture and Life Sciences and the New York State Agricultural Experiment Station at Geneva to put their heads together and develop a pest management system that could be shared with growers statewide through Cooperative Extension.

Now, for example, College entomologists study insect biology and the effects of pesticides, while plant pathologists look into plant diseases and the effects certain sprays have on them. Chemists try to find ways to synthesize compounds that attract and trap insects before they can do any damage, and atmospheric scientists research weather patterns to see how they affect the life cycle of pests.

Even computer scientists play a part in this project by devising computer programs to store and release the great volume of data for the use of county agents. "The challenge of Integrated Pest Management has been to assemble as many pertinent facts as possible, analyze those facts, and render them back to growers so that they can make intelligent, day-to-day decisions concerning crop protection," says James P. Tette, project manager.

The first Integrated Pest Management (IPM) project in New York State was directed toward apples, the State's most important fruit crop. Consumers are particularly sensitive to cosmetic flaws in apples, making it essential that they be free of external defects, as well as internal infestations. Pesticides, therefore, may sometimes be used prolifically to reduce the chances of crop loss.

"The main purpose of our program is to arrive at more efficiency in pest management," says Tette, who is also a research associate in the Department of Entomology. "We are not trying to eliminate the use of pesticides completely because there is no doubt that they are a valuable tool. There are, however, many new approaches that are equally or more effective than simply spraying on the same date year after year."

By carefully observing patterns of infestation, IPM researchers have been able to accurately predict when diseases such as apple scab will become most potent. Plant pathologists found, for instance, that this fungus will cause the most serious infections when leaf wetness and temperature reach a certain level.

They watch these factors closely, along with others related to disease growth, and are able to advise farmers when to apply the fungicide.

In 1976, similar methods were used to predict when to spray for European red mites. Because of weather conditions, these insects did not hatch at the time growers usually sprayed.

IPM personnel recommended that farmers wait about two weeks. Those who did greatly reduced the red mite population by spraying only once. On the other hand, farmers who did not follow the advice had to apply insecticide twice, a process not only expensive in dollars, but in its toll on the environment and energy consumption.

Perhaps the most bothersome insect to attack New York State apples is the codling moth, which characteristically leaves cavernous tunnels in its wake. This pest has been brought under control by meticulously timing pesticide applications.

The technology necessary to arrive at this precision was developed by IPM chemists and entomologists. They used pheromone traps, which can take an accurate census of the moth population.

When the female codling moth is ready to mate, she emits a chemical that attracts the male. This pheromone can be synthesized and placed in traps containing a sticky substance. The male prefers the manufactured sex pheromone to the real thing released by the female.

By using these traps, growers can monitor the presence of the male codling moths and thereby deduce the female population. If the trap is inspected weekly, they can plan the amount of insecticide to correspond exactly to the threat the pests pose.

Innovations in pest management are constantly sought by IPM researchers. But perhaps the most important aspect of the project is getting the information to the fruit grower. New York State Cooperative Extension has, therefore, developed two programs for this purpose.

Enlarged view of injury inflicted by a codling moth larva in an immature apple.

Farmers can participate in the Farm Advisor Program at a charge of $12 per acre. Extension advisers work with these growers throughout the year to plan personally tailored pest management strategies. The orchards are closely surveyed for pests as well as the beneficial organisms that feed on them. The weather is monitored, spray equipment is calibrated, and disease and insect detection devices are installed and their results evaluated. "This program represents the ultimate possible in management practice with available technology," Tette says.

Another Extension project seeks to acquaint county agents with pest control information that can be applied to individual growers' problems. The Pest Management Assistant Program employs three assistants who observe selected orchards in the State. The information they receive is transmitted daily by computer to county agents who, in turn, advise fruit growers.

The results of these programs have been encouraging. In many cases, the use of pesticides has decreased and apple production has either remained the same or even increased. One farmer was able to cut his spraying expenses by as much as 44 percent per acre, while increasing the amount of clean fruit from his orchard by 1 percent.

The success of Integrated Pest Management extends far beyond the apple orchard. In New York State, the program now encompasses all tree fruits. Throughout the country, IPM methods developed in as many as 30 states have benefited such crops as alfalfa, potatoes, corn, and soybeans.

IPM also can be applied in urban areas since industries, as well as home gardeners, use pesticides. There is little doubt that overuse of these chemicals could present health hazards. IPM does not do away with such chemical pesticides but provides ways to use them more prudently. Its ultimate contribution may well be assembling and disseminating sufficient knowledge to enable farmers, businessmen, and homeowners alike to make more intelligent and efficient decisions about pest control.

Geneva Station Leading Apple Breeding Institute

by R. E. KRAUSS, Geneva Experiment Station

Since its inception in 1882, the New York State Agricultural Experiment Station at Geneva has had a large apple breeding program. Today, it is recognized as a leader in the development of high quality dessert and processing varieties. To date, the Station has named 56 new apple cultivars.

New York State produces approximately 22 million bushels of apples annually on more than 70,000 acres of land. The value of the raw product is estimated at $75 million. This is surpassed only by the State of Washington.

Breeding a new apple variety for cultivation is a long-term project, to say the least. Many thousands of seedlings from controlled crosses must be grown over a period of years. Unlike annual crops that can be evaluated every year, apples must be tested at much longer intervals.

Even after introduction, it is difficult for a new cultivar to gain commercial acceptance. It must first prove itself indisputably superior in many ways.

Four cultivars introduced by the Geneva Station deserve special mention. Empire was released for commercial planting in 1968. It is a medium-sized, dark red apple of excellent eating quality, and its fruits and trees closely resemble those of both McIntosh and Delicious.

Empire fruits are whitish-cream in color with a firm flesh that is very crisp, tender, juicy, and aromatic. It is the most widely planted apple in new orchards in New York State.

The Cortland is perhaps the most well-known apple ever developed at the Geneva Station. The fruits are large, ranging up to 3¼ inches in diameter. Skin color is 90 percent red.

Because the fruit flesh does not turn brown, Cortland is a favorite salad ingredient.

The third cultivar, Jonamac, originated from a McIntosh and Jonathan cross made in 1944 and was introduced by the Geneva Station in 1972. It was selected in 1955 from a population of 2,474 seedlings.

Jonamac is an early fall dessert apple that has a very attractive dark red blush, usually with a small amount of striping. Eating quality is considered very good, superior to McIntosh.

Like most crops, apples are extremely sensitive to damage by insects and diseases. Years ago, the Geneva Station began a special apple breeding program to develop new cultivars that are highly tolerant to the most devastating of the apple diseases, apple scab. More diseases were included as the program progressed.

It was, therefore, with considerable pride that we announced the introduction of the Liberty apple in September. It is either resistant or tolerant to four of the major diseases affecting apples. It is thought that during all but the most severe growing conditions, no chemical sprays will be needed to protect this apple.

The flesh of the Liberty is yellowish, crisp, and juicy, and the flavor is good.

This is the first in a series of disease-resistant varieties that the Station will introduce. Some commercial nurseries will have Liberty trees available early next year.

Faculty in Brief

Honors

Michael C. Latham, professor of nutritional sciences, was awarded the Food Cycle Trophy by the government of Tanzania in honor of his eight years of service toward improving nutrition in that country.

Russell E. MacDonald, associate professor of bacteriology, received the H. Julian Award for the outstanding paper resulting from research sponsored by the NASA Ames Research Center over the past year.

Donald B. McCormick, professor of biochemistry and nutritional sciences, was chosen for the Osborne and Mendel Award by the American Institute of Nutrition, in recognition of his pioneering research on vitamins and coenzymes.

Joseph Pullman Porter, professor emeritus of ornamental horticulture, was presented with an inscribed scroll by former dean W. Keith Kennedy in commemoration of his lifelong association with Cornell, which included 40 years of teaching in the College.

Christopher F. Wilkinson, professor of entomology, was awarded $250 by the Food and Drug Research Laboratories as a retirement honor.

The following faculty members were named professor emeritus by the Cornell University Board of Trustees:

Harlan Banks, Liberty Hyde Bailey Professor of Botany
Clifford O. Berg, professor of entomology
Hollis R. Davis, professor of agricultural engineering
Neal F. Jensen, Liberty Hyde Bailey Professor of Plant Breeding
Richard P. March, professor of food science
Robert B. Musgrave, professor of agronomy
H. Brooks Naylor, professor of microbiology
Robert L. Patton, professor of entomology
E. Stanley Shepardson, professor of agricultural engineering
Frederick H. Stutz, professor of history of education
George H. Wellington, professor of animal science
Lemuel D. Wright, professor of nutritional biochemistry

The following faculty members were promoted from associate professor to professor, effective July 1, 1978:

Bill B. Brodie, plant pathology
William S. Bowers, entomology (Geneva)
Leroy L. Creasy, pomology
George C. Eickwort, entomology
Carl F. Gortzig, floriculture
Ronald J. Kuhr, entomology
Joe Kubota, agronomy
Ross J. MacIntyre, botony, genetics and development
Leonard D. Topoleski, vegetable crops
Robert R. Zall, food science

The following were promoted from assistant to associate professor:

George S. Abawi, plant pathology (Geneva)
James R. Aist, plant pathology
Njoku E. Awa, communication arts
Nelson L. Bills, agricultural economics
Lynne H. Irwin, agricultural engineering
George J. Posner, education
M. Anandha Rao, food science (Geneva)
Thomas R. Sinclair, agronomy

New department chairmen since February 1, 1978, are:

A. W. Blacker, botany, genetics and development
William Hansel, physiology
R. P. Mortlock, microbiology
H. T. Stinson, director of the Division of Biological Sciences

New professors in the 1978–79 academic year are:

Randolph Barker, agricultural economics
R. P. Mortlock, microbiology

New assistant professors are:

Bruce L. Anderson, agricultural economics
D. H. Beermann, animal science
Frederick H. Buttel, rural sociology
Dan L. Cunningham, poultry science
E. Peter Greenberg, microbiology
George W. Hudler, plant pathology
Michael N. Kazarinoff, nutritional sciences
John T. Lis, biochemistry
Karl J. Niklas, botany, genetics and development
Steven Schwager, plant breeding and biometry
Mark E. Sorrells, plant breeding and biometry
Jan Sweeney, agricultural economics

The following faculty are on sabbatic leave for the fall 1978 semester:

George Abawi, plant pathology (Geneva) — Univ. of Illinois and North Carolina State Univ. studying different aspects of root rot.

W. H. Everhart, natural resources — travel to Norway and work with fishery program at Utah State Univ.

D. K. Freebairn, agricultural economics — study in Mexico.

W. E. Fry, plant pathology — Univ. of Cal., Davis, completing preparations for a textbook and developing teaching materials and techniques.

L. S. Hamilton, natural resources — teaching and study at Univ. of Waikato, New Zealand.

W. T. Keeton, neurobiology and behavior — visiting at Univ. of Konstanz, West Germany, and other European universities.

A. A. Khan, seed and vegetable science (Geneva) — Agricultural Univ. Wageningen, the Netherlands, to study seed germination and dormancy patterns.

H. E. Moore, Bailey Hortorium — Madagascar and New Caledonia completing generic palm studies.

W. F. Shipe, food science — visiting several labs in the U. S. in preparation of a textbook.

R. P. Story, agricultural economics — Market Order Administration Office.

R. D. Sweet, vegetable crops — travel and writing at three research centers in Taiwan, the Philippines, and Nigeria.

M. J. Tauber, entomology — gathering and reviewing material for a proposed treatise, using libraries at Cornell and Univ. Cal. at Berkeley.

W. G. Tomek, agricultural economics — studying prices and pricing in Washington, D.C.

H. D. VanEtten, plant pathology — research in plant pathology at Univ. of Munster, West Germany.

O. C. Yoder, plant pathology — Stanford Univ. studying fungal genetics.

The following grant awards were reported since February 1, 1978:

Terry E. Acree, food science (Geneva) — Welch Foods, "Grape color and flavor." $30,000

Louis D. Albright, agricultural engineering — USDA, "Heating greenhouses and rural residences with solar energy." $50,000

Richard E. Austic, poultry science — NIH, "Interaction of minerals in amino acid metabolism." $45,811

Robert C. Baker, poultry science — American Egg Board, "Development of new products from spent fowl." $6,600

Donald W. Barton, director's office (Geneva) — N.Y.S. Snap Bean Research, "N.Y.S. snap bean research." $26,000

Eric E. Beamish and **Albert Beilby**, education — SED, "Optimal utilization of resources." $37,345

Arthur L. Berkey, education — SED, "New teacher workshop — Inservice program for teachers of agriculture." $5,760

Harold R. Capener, rural sociology — Rockefeller Fdn., "Strategies of public participation in federally mandated 208 planning procedures." $11,450

Gerald F. Combs, Jr., poultry science — NIH, "Relationship of xenobiotics, selenium and vitamin E." $124,974

Loy V. Crowder, plant breeding — IICA, "Ecuadorian mountain agriculture project." $50,000

Lee M. Day, NERCRD — Treatment and Rehabilitation Center of N.E. Pa., "Energy conservation video production." $10,000

John M. Duxbury, agronomy — NSF, "Soils as a source or sink of atmospheric nitrous oxide." $275,313

LaVerna M. Fadale, education — SED, "Identification of factors associated with sex role stereotyping in occupational education." $50,119

Gerald R. Fink, botany, genetics and development — NIH, "Chemical carcinogens and frameshift mutation in yeast." $314,384

Kenneth V. Gardner, agricultural economics — Agricultural Res. Commission, "A manual for the evaluation of agricultural districts." $15,000

William C. Kelly, vegetable crops — Soil & Health Fdn., "Study of intercropping." $18,000

John T. Lis, biochemistry — NIH, "Coordinate gene regulation in animal cells." $143,472

Richard A. Malecki, natural resources — U. S. Fish & Wildlife Service, "Ecology and management of purple loosestrife." $39,000

Murray B. McBride, agronomy — NSF, "Interactions of metal-organic complexes with clay mineral and oxide surfaces in aqueous solution." $32,400

William G. Merrill, animal science, **Richard W. Guest**, agricultural engineering, and **Robert A. Milligan**, agricultural economics — DeLaval, "Supplemental concentrate feeding of high producing cows in groups." $5,000

Robert D. Miller, agronomy — NIH, "Soil freezing and frost heaving." $93,322

Edward L. Mills, natural resources — U. S. Fish & Wildlife Service, "Monitoring criteria-environmental assessment to precede execution of winter navigation." $42,000

Keith Moffat, biochemistry — HEW, "Calcium transport and binding." $30,533
— NIH, "Calcium binding proteins: Structure and function." $23,258
— NIH, "Oxygen transport: Hemoglobins with modified hemes." $34,020

Harold E. Moore, Jr., Bailey Hortorium — NSF, "Studies toward a genera palarum." $50,000

Henry M. Munger, vegetable crops — Rodale Press, "Edible amaranthus research." $12,000

David Pimentel, entomology — DOE, "Energy use and conservation in food and nutrition systems." $15,736
— Rockefeller Fdn., "Environmental policy analysis for agriculture and society." $30,000

F. Harvey Pough, ecology and systematics — NSF, "Ecology, adaptation and evolution of three sibling species of *Eleutherodactylus*." $100,000

Joe M. Regenstein, poultry science — Monsanto, "Extending the shelf-life of fresh fish." $5,000
— Sea-Land Service, "Extending the shelf-life of fresh fish." $5,000

Milo E. Richmond, natural resources — DEC, "Habitat management and resource value." $20,000

Edward T. Schmidtman, entomology — USDA, "Culicoides as a potential vector of bluetongue disease in livestock." $6,300

Milton L. Scott, poultry science — Eli Lilly, "Effect of tylosin in laying hens." $12,000

Norman R. Scott, agricultural engineering — NIH, "Thermoregulation of the role of vasomotion." $43,581

Richard W. Smiley, plant pathology — Sod Growers Assoc. of Mid-America, "Fusarium blight of Kentucky bluegrass." $15,000

Don F. Splittstoesser, food science and technology (Geneva) — General Foods Corp., "Microbiology of frozen vegetables." $5,000

Bik-Kwoon Tye, biochemistry — HEW, "DNA replication and repair in *E. coli*." $103,626

Ari van Tienhoven, poultry science — NIH, "Role of progesterone in ovulation in the fowl." $128,563

Lyle L. Wicks, education — SED, "Agricultural education curriculum materials development." $34,675

Harold R. Wilson, entomology — Ag. & Markets, "Plant insect and disease detection survey." $10,000

Gene M. Winter, education — SED, "Needs assessment of small businessmen in applied business techniques." $44,246

Milton Zaitlin, plant pathology — NSF, "Plant virus replication." $6,600

Editor's Note:
Because of space limitations only grants of $5,000 or more could be listed.

Students Conduct Field Research in Beginning Biology Course

Biology 101 is one of the most widely attended courses in the College of Agriculture and Life Sciences. It is not only for prospective biology majors, but for aspiring scientists throughout the University as well. Yet, despite its enrollment of almost 850, "Introduction to Biology" not only exposes students to cells, and molecules, and amino acids, but gives them practical research experience both in the lab and in the field.

One of the reasons for its depth is certainly that the lecture portion of the course is taught by William T. Keeton, Liberty Hyde Bailey Professor of Neurobiology and Behavior, and author of one of the most widely used biology textbooks, *Biological Science*. But much of the credit must also go to Jon C. Glase, senior lecturer and lab coordinator, who sees to it that his students are well acquainted with research methods.

"Most students don't realize how tedious scientific experimentation can be," says Glase, who has developed the lab text and supervises the 23 teaching assistants taking part in the course. "Our object is to teach what scientific method is and also what it isn't."

Right from the beginning, Glase and assistant lab coordinator Dick Ecklund require students to participate in full-fledged research projects. They group themselves into small teams and are provided with a subject to explore. They then try to make observations about it.

Students try to collect bottom-dwelling invertebrates in Cascadilla Creek.

At this point the beginning biologists come up with questions they would like to answer through research and make a list of equipment they need to proceed. The next step is actually to do the study and analyze the data. Then they are asked to write a summary of their findings.

After completing many such projects, Glase's students are ready to be sprung from the confines of the lab. Come spring, they select a subject within the general area of ecology or behavior, go individually or in groups to one of the rich natural laboratories in or around Ithaca, and begin to exercise their newly acquired investigative skills.

Research ranges from studying the nesting habits of the gray squirrel to observing the frequency and sequencing of courtship displays in the mallard duck. Each project is described in detail in a final report that adheres to standard scientific format.

Some of the best of these are selected by Glase and his staff for publication in an "in-house" journal. "The whole process of observation, experimentation, reporting, and writing for publication not only exposes students to the rigors of science, but prepares them for the upper-level courses they will take in the future," Glase explains. "It is also hoped that some of these reports will be the basis for additional behavior/ecology studies."

One student, Susan Sörenyi-Sander, chose to study the compass orientation of pileated woodpecker feeding holes. She observed a total of 102 holes in 39 different trees and determined what part of the trees were favored for winter feeding. It was found that most holes are located on the south side at an average height of six meters.

As elementary as this research may seem, a study of this kind had never been done before. Sörenyi-Sander's complete findings are now being considered for publication in *The Wilson Bulletin*, a respected ornithology journal.

Biology 101 is taken by students who plan to major in science. There is no doubt that, with the comprehensive lectures and the challenging research, they are getting the training they will need. "Our main objective in this course is to teach not only the prospects of science, but the process of science as well," Glase says.

CONTACT Seeks Professionals

The academic calendar was changed at Cornell several years ago making intersession last nearly a full month. For many students it is both too short and an inopportune time for seasonal employment. Ironically, it is also too long for most to spend exclusively on vacation. Therefore, many students are left with time on their hands and a feeling of aimlessness. In 1974, the College initiated the Student-Alumni CONTACT Program to fill that period with a worthwhile learning and career experience.

Students are put in contact with cooperating employers, often but not always alumni, in order to arrange a mini-internship in their chosen career field. These informal contacts range from two days to four weeks but average one or two weeks. They are sometimes paid, but often not. The determinant in most cases is the employer's goal. For a producing employee, a wage agreement is necessary; for a learning experience, knowledge is the coin of payment.

Interns observe office routine, discuss objectives, strategies, policies, and problems with the sponsor and often with other personnel. They make field visits, watch sales meetings, assist in research or production, and participate in training sessions. Many sponsors ask for written reports, either about some aspect of the intern's experience or about a specific problem or program. The students are also asked to submit a written evaluation of the experience and submit it to the College.

Alumni support, especially in professions like law, medicine, veterinary medicine, architecture, finance, public relations, and journalism, is crucial to the development of CONTACT. Additional sponsors in agricultural production and food processing are also needed. If you are able to offer an opportunity for a sophomore or junior A&LS student to meet and/or work with you during January, please fill out the coupon below.

Sharing a learning experience is a very positive feeling; become a CONTACT sponsor.

Name _____

Address _____

_____

Telephone _____

Business _____

Robert R. Hopkins
Career Planning & Placement Office

16 Roberts Hall, Cornell University
Ithaca, New York 14853

Ag PAC — A Valuable Link

by A. BRADFORD CARRUTH, Assistant to the Dean

By selling T-shirts emblazoned in Cornell red with the Agriculture and Life Sciences seal, undergraduate students in Agriculture Positive Action Council (Ag PAC) are working to involve fellow students in the work of their College and its alumni and fund-raising groups.

Ag PAC was founded in 1975 in response to former Dean W. Keith Kennedy's request for more student participation in some faculty and administration functions. Leaders of numerous student groups in the College formed the organization to advise faculty and administration on issues concerning curriculum and general College policy.

Now Ag PAC is an important conduit for communication among student groups, faculty, and the administration. The 30 active members represent student organizations that, according to Ag PAC President, Carol Zimmerman, "keep the diverse elements of the College in close contact with one other."

The specially printed T-shirts are being sold throughout the fall semester to foster a sense of commitment and dedication to the College. Besides establishing a way for incoming students to identify with the College and University, the T-shirts should help nurture a feeling of pride in belonging.

Alumni volunteers who have worked for the Alumni Association and College Fund have watched the growth of Ag PAC with great interest. The service the organization has rendered the College has been invaluable. Alumni volunteer leaders hope Ag PAC members will promote participation both in the annual open house for prospective students in November and in the student-alumni CONTACT program which helps students to explore career opportunities.

Ag PAC can also help make students aware of the important commitments of alumni to the College Fund, which provides scholarships and grants for innovative teaching programs of the College faculty.

A student proudly wears her new ALS T-shirt at registration.

I would like to join the Alumni Association of the College of Agriculture and Life Sciences. With this membership I will receive a subscription to the *Cornell Countryman* that will examine and illuminate the vast realm of agriculture and life sciences.

☐ Enclosed is my check for **$4 for one-year's membership** in the Alumni Association of the New York State College of Agriculture and Life Sciences and my subscription to the *Cornell Countryman*.

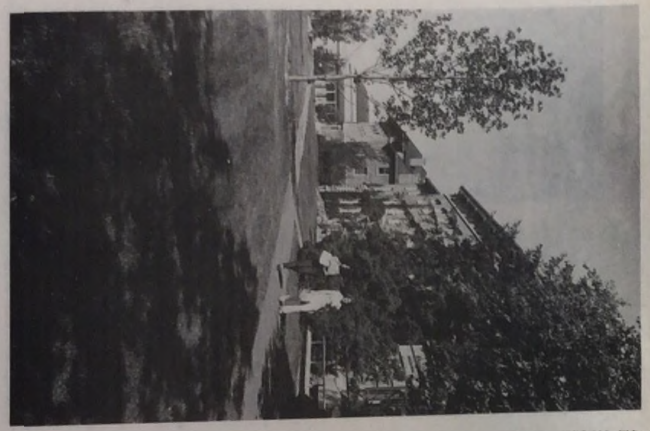
☐ Enclosed is my check for **$10 for three-years' membership** in the Alumni Association of the New York State College of Agriculture and Life Sciences and my subscription to the *Cornell Countryman*.

Name _____ Class _____

Address _____

_____

Alumni Association
The New York State College of Agriculture and Life Sciences
205 Roberts Hall, Cornell University Ithaca, New York 14853



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NOVEMBER 1978

New Dean Appointed

David L. Call

David L. Call, former director of New York State Cooperative Extension, was appointed Dean of the College of Agriculture and Life Sciences by the trustees of Cornell and the State University of New York on September 12, 1978.

He had been acting dean since mid-July, when College faculty approved his recommendation by President Frank Rhodes. "We are pleased to have found within Cornell a candidate for the deanship who is intimately familiar with all aspects of the University — its teaching, research, and public service," said Rhodes.

Call succeeds W. Keith Kennedy, who became Cornell Provost on July 18.

The H. E. Babcock Professor of Food Economics in the Graduate School of Nutrition (now the Division of [illegible]) [illegible] 1962 to [illegible] professor [illegible] chair [illegible] tered on the analysis of government food and nutrition programs. Factors [illegible] in nutrition and food [illegible] ceptance [illegible] as soy [illegible]

Call received the B.S., M.S., and Ph.D. degrees in agricultural economics from Cornell. He was an assistant [illegible] economics [illegible] versity [illegible] Department of Food Science at M.I.T. He has written numerous articles for popular and professional publications [illegible] consulting [illegible] trade associations [illegible] corporations.

From 1969 to 1970 Call was chairman of the White House Conference [illegible] Health [illegible] governors [illegible] serve on commissions to revise State social service laws and study living costs and the economy. He was also a member of [illegible] Nutrition Board [illegible] Academy [illegible] economist with the U.S. Office of Management and Budget, and a member of the National Advisory Committee to the Commissioner of the Food and Drug Administration.

As director of New York State Cooperative Extension, Call saw a number of new ones were started during his tenure as director.

In 1976 [illegible] through the New York City Urban Gardening Program. With instructors [illegible] harvest. Last summer there were 450 urban gardening sites and about 2,[illegible]

[illegible] deliver knowledge about pest control to fruit growers. Through Extension, the research [illegible] diseases and insects and is then communicated via computer to fruit farmers throughout the State.

[illegible] directorship [illegible] now to it that an energy specialist was designated in each Extension office. And he [illegible] the College of [illegible] Sciences and [illegible] ology to bring people the latest developments in energy technology and to provide hints for conservation.

To aid in the dissemination of such Extension information, Call played a major role in establishing Media Services, a [illegible]

Soil Tells of Mayan Fall

Falcon Lives it up in Baltimore

Integrated Pest Management

Field Research in Beginning Biology

Homes to Sport New Solar Panels

. . . and more

Kennedy Appointed Provost

W. Keith Kennedy, dean of the [illegible] Trustees on July 18.

"I am delighted that Keith Kennedy has agreed to become provost," said President Frank Rhodes in announcing Kennedy's selection. "He brings to this important assignment the strongest possible credentials. He has earned the respect and trust of faculty members in all colleges, and he has served Cornell with great dedication for many years.

Kennedy has been a member of [illegible]

Don't Blame Uncle Sam for Rising Food Prices

With the price of food always on the rise, consumers have the tendency to blame government for the fact that their wallets seem lighter. But federal policies influence only a small fraction of food costs, while marketing "expenses" and the weather are the real culprits, according to Kenneth L. Robinson, Liberty Hyde Bailey Professor of Agricultural Economics.

The prices of coffee, sugar, juice and lettuce were high early in 1978 because of adverse weather in important growing areas, says Robinson. "There is little the government can do about this. Where we eliminate the commodities over which the government has little or no control and we note marketing costs, which account for about two-thirds of what the consumer pays, we find that food prices are not [illegible] the government [illegible] food, [illegible] quite modest.

Government price supports apply to only a limited number of commodities, such as sugar, dairy products, and grains. These accounted for no more than 10 to 15 percent of the cost consumers pay. Washington has very little effect on the prices of fruits and vegetables, he says, and he feels that market [illegible] more control and their prices fluctuate according to world market [illegible] Robinson says it may be [illegible] governmental [illegible] could [illegible] has shown them to be ineffective.

When there is a freeze in Brazil or a drought in West Africa, there is little importing countries can do, short of rationing, to limit price increases," Robinson explains. The best way to hold down prices on some imported foods is for the consumer to refrain from buying items in short supply and switch to substitutes.

The farmer should not bear the full brunt for crop failures or [illegible]