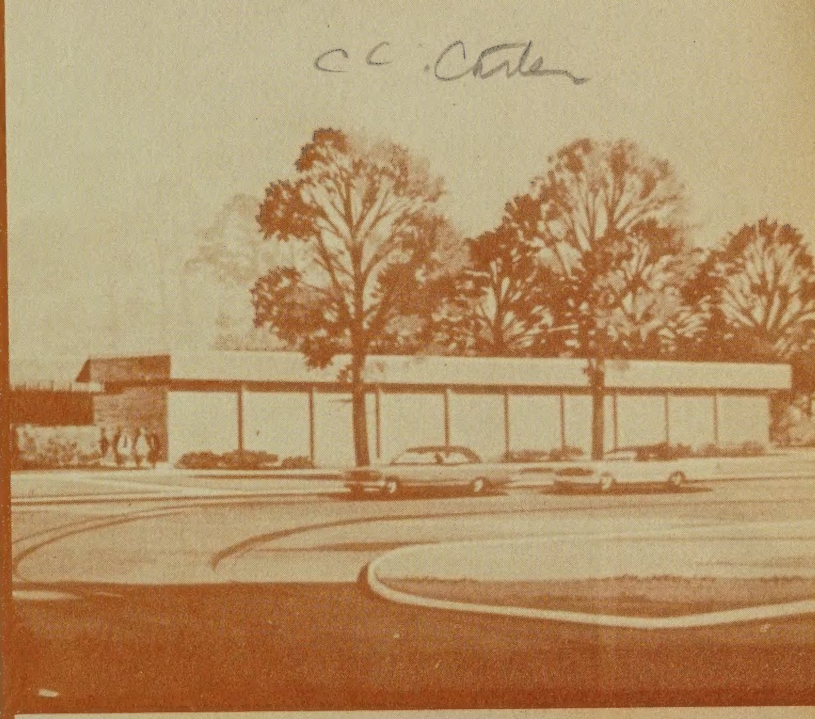
STORED-PRODUCT INSECTS RESEARCH AND DEVELOPMENT LABORATORY

Savannah, Georgia



Agricultural Research Service
U. S. DEPARTMENT OF AGRICULTURE

BIOLOGICA

BIOPHYSICAL RESEARCH

PHYSICAL METHODS OF CONTROL

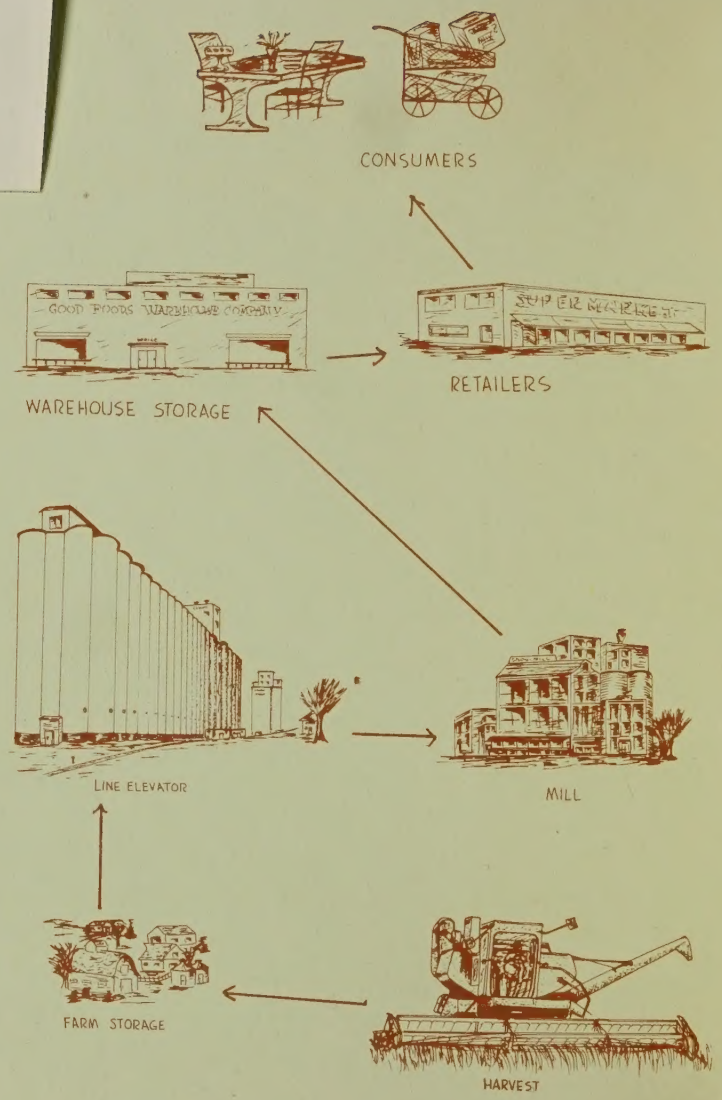
RADIATION RESEARCH

CHEMICAL CONTROL RESEARCH

MOTHPROOFING

INSECT-RESISTANT PACKAGING

PESTICIDE RESIDUE ANALYSIS



STORED-PRODUCT INSECTS RESEARCH AND DEVELOPMENT LABORATORY

The Stored-Product Insects Research and Development Laboratory is an integral part of the Stored-Product Insects Research Branch, Market Quality Research Division, Agricultural Research Service. It is responsible for conducting research to develop methods for the protection of harvested crops from insect infestation and contamination.

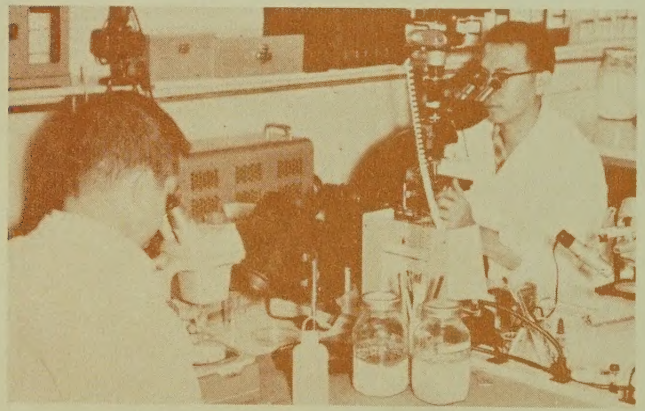
Insects are among the most destructive enemies of agricultural products. They damage these goods at every step from harvest to consumption—during storage, in transit, in processing plants, in the wholesale grocers' warehouses, in the supermarket, and finally, in the home.

Here at the Laboratory, research is divided into two primary areas based on the distinction between the chemical and the non-chemical control of stored-product insects. However, for operational purposes, all research is conducted within one or more of the following eight fields of endeavor: Biological Research, Biophysical Research, Physical Methods Research, Radiation Research, Chemical Control Research, Mothproofing Research, Insect-Resistant Packaging Research, and Pesticide Residue Analysis Research.

BIOLOGICAL RESEARCH

An understanding of the biology, ecology, physiology, and nutrition of stored-product insects is necessary before truly effective control methods can be developed. We are now conducting research to determine the life cycles of major insect pests and the effect of different environmental factors on their development rate during various stages of growth.

We are also studying the food needs and preferences of insects; the effect of diet on their growth and development; and the influence of environment on their orientation, range, and reproduction. Rearing methods are also being developed for the mass-production of standardized cultures of stored-product insects for research use.

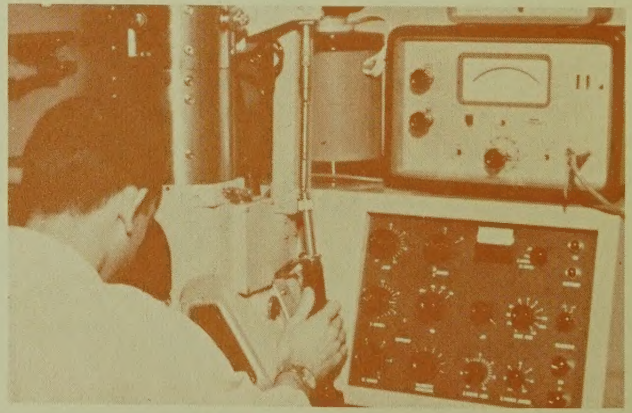


BIOPHYSICAL RESEARCH

If science is to develop efficient new methods for insect control, especially non-chemical ones, we must learn more about the structure and function of insects' sensory systems.

The Biophysical Research team at the Laboratory is currently studying the sensory systems of many insects. Present as well as planned research is designed to determine which insect organs or systems are receptive to specific physical and chemical stimuli, and how these stimuli, in turn, affect the organ or system.

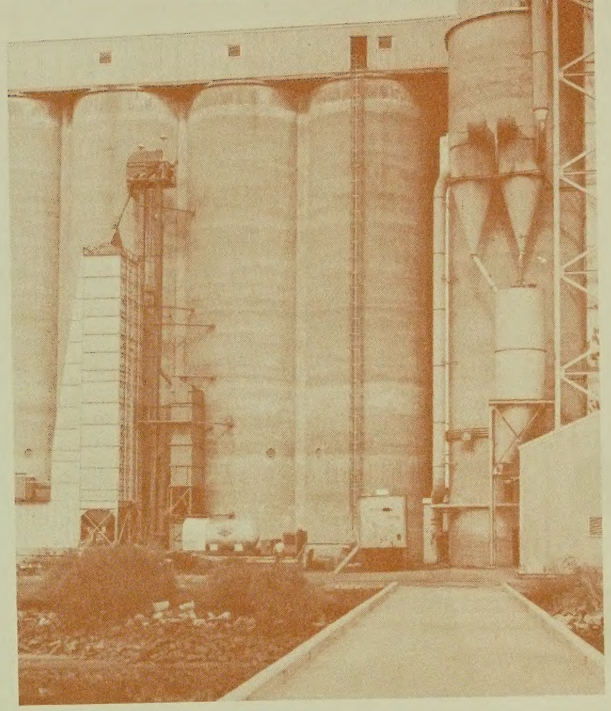
Because most of this research requires the use of microscopes, the research team is also designing specific staining methods for the study of insects under both light and electron microscopes.

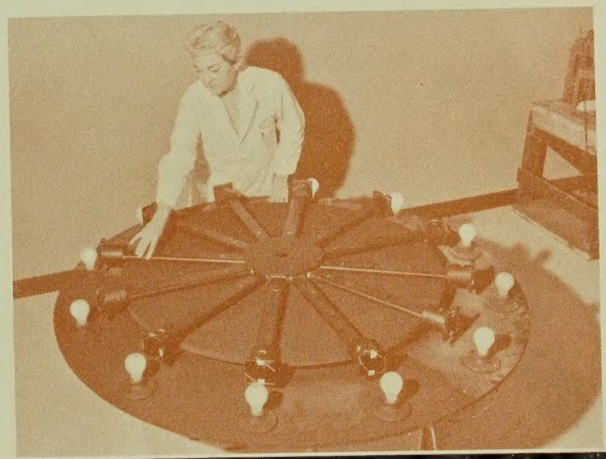


PHYSICAL METHODS OF CONTROL

The Physical Methods Research team is interested not in how an insect sees or hears, but in how it reacts to these stimuli. This group is also investigating non-chemical ways to prevent insect damage to stored commodities.

Current studies are restricted to the use of sound, light, and controlled atmospheric conditions as protectors of stored agricultural products. Present research is concerned with the response of insects to different wave lengths and intensities of light; the reaction of insects to various frequencies and intensities of sound; and the effect of nitrogen, oxygen, carbon dioxide, and mixtures of these gases, temperature, humidity, and other environmental factors on stored-product insects.





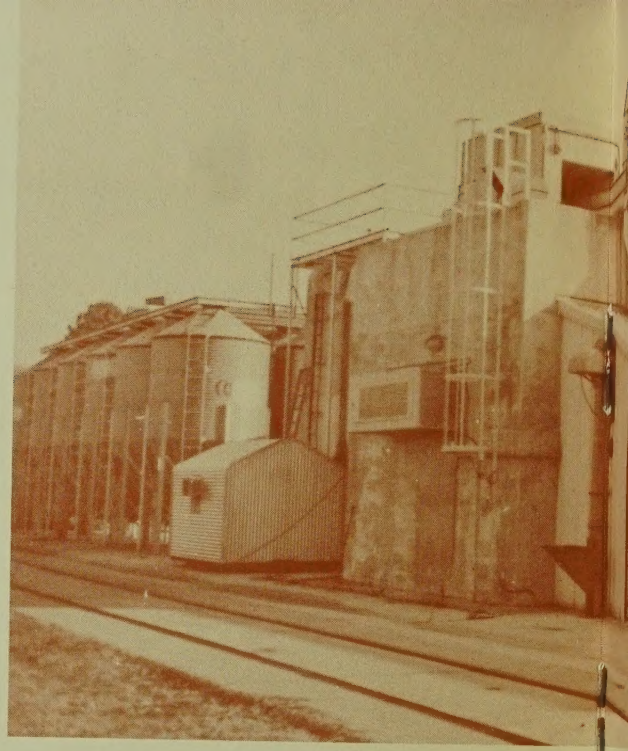
RADIATION RESEARCH

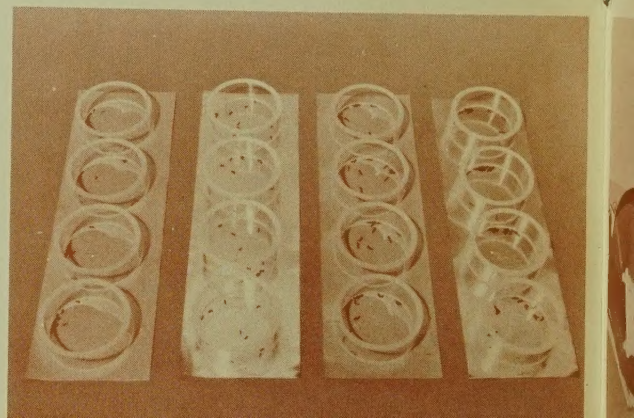
Research on radiation encompasses both basic and applied studies to determine the usefulness of gamma irradiation to control insects in bulk grain and in processed commodities.

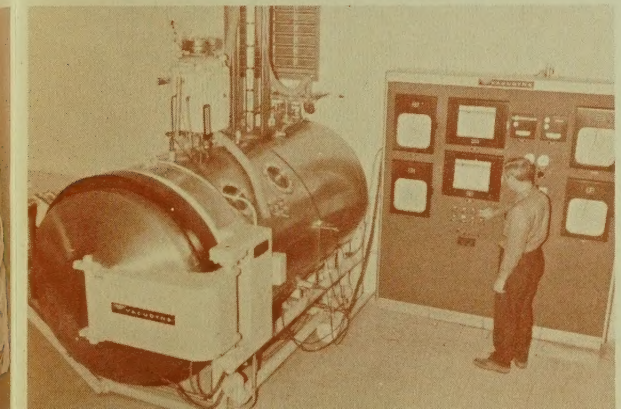
The Nation's first irradiator for free-flowing bulk grain is now in operation at the Laboratory. By using the same Cobalt-60 radiation source, the irradiator can also treat packages and bags of agricultural commodities, such as cereals and grain products, dried fruits and nuts, and legumes.

Studies planned or in progress include the establishment of minimum effective doses for killing representative species of insects, the determination of how sublethal doses of radiation produce various changes in insects' characteristics, and the establishment of minimum effective doses for breaking the reproductive cycle of representative species.

Other projects involve determining the effect of gamma irradiation on numbers and the rate of increase in major pest populations; ascertaining how light, heat, humidity and related factors affect the amount of radiation needed to control a pest infestation; anlyzing the effect of irradiation on the quality of treated commodities; and comparing the cost and effectiveness of irradiation versus the chemical control of insects.







CHEMICAL CONTROL RESEARCH

At the present time, the use of chemicals is the best method available for the control of insects in stored products. Researchers are looking for new, safe materials that will kill the insects, repel them, or otherwise prevent them from damaging or infesting goods, and at the same time be safe for use in and around food or clothing.

We are currently conducting preliminary studies of insecticide toxicity and sponsoring investigations to isolate repellents, attractants, and other non-insecticide control chemicals. One study concerns the extent of insecticide resistance developed, and is exploring alternative ways to deal with resistant insects.

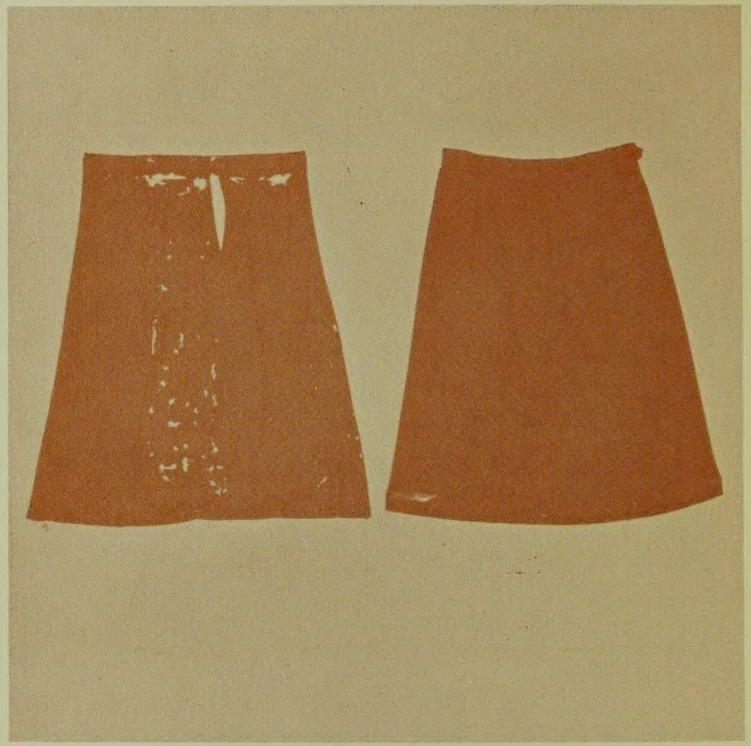
We are also engaged in the improvement of chemical control through new formulas and methods of application. Other research involves the evaluation of new fumigants, and the analysis of changes in temperature, relative humidity, and pressure (or vacuum) on fumigant action. Finally, the search continues for new, safe control chemicals by isolating, separating, and purifying components of natural products.

MOTHPROOFING

Because most current mothproofing treatments contain chlorinated hydrocarbon insecticides, one important research activity at the Laboratory involves the search for compounds toxic to insects but harmless to humans and animals.

Wool and wool products suffer the largest annual loss (estimated) inflicted by stored-product insects on a single commodity. Large losses occur during processing in retail stores, and in home and commercial storage.

Today, research at the Laboratory emphasizes the evaluation of chemicals to protect animal fibers and fabrics from insects. Followup studies are being made to determine the absorption and retention of chemicals by wool. Based on these studies, mothproofing treatments for commercial and home use will be developed.



INSECT-RESISTANT PACKAGING

The best way to keep insects from damaging agricultural products is to keep them out of the products entirely. Researchers at the Laboratory, in cooperation with private industry, have already developed a multiwall paper bag that resists insect penetration and invasion.

Current research emphasizes the evaluation of the natural resistance of flexible packaging materials to insect penetration. It also includes the development of insect-resistant shipping cases, small cartons, and textile bags.

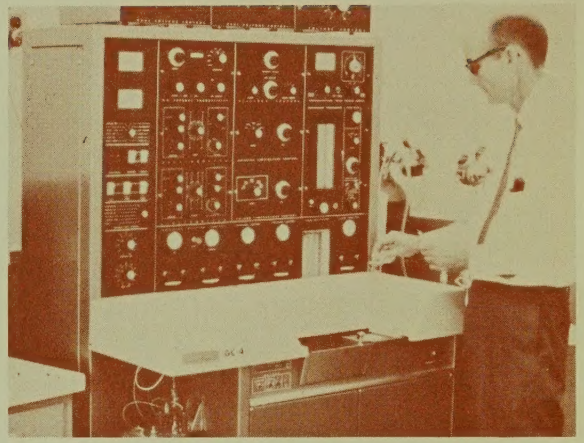
Still other research projects concern the evaluation of new chemicals for use on packages to repel stored-product insects, rating packaging materials on their ability to prevent migration of the insecticide through the material and into the commodity, and studying the behavior of insects around packaged foods.

PESTICIDE RESIDUE ANALYSIS

Finding out what happens to pesticide residues on agricultural commodities is one of the chief objectives of the Pesticide Residue Analysis Research group. Another goal is searching for new and improved ways to detect pesticide residues in harvested agricultural products.

Current research involves determination of the distribution, concentration, and persistence of pesticide residues after experimental treatments have been applied to harvested crops. Additional studies are designed to determine the fate of pesticides commonly used to treat these crops, and their effects on the treated commodity.

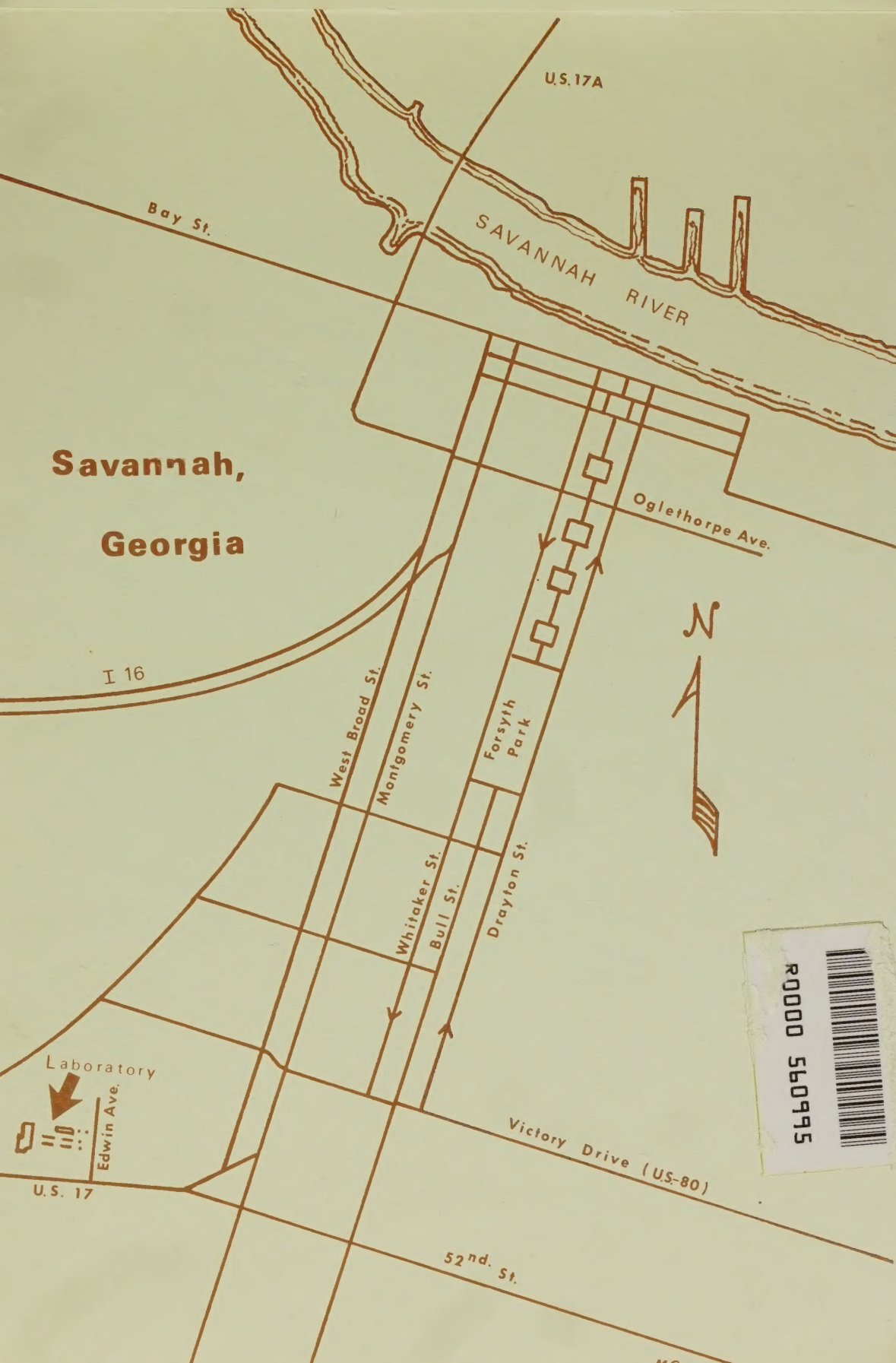
Other projects include collecting residue information needed to establish levels of pesticides permitted to remain on commodities; and developing or improving methods and equipment for the simple, rapid, and accurate detection, analysis, and measurement of residues.



LOCATION

The Laboratory is situated about one-quarter mile south of the city limits of Savannah in the Savannah Industrial Park. The Laboratory's main entrance is on Edwin Avenue. Drive west on U. S. Route 17 (52nd Street Extension), then proceed north (a right turn) onto Edwin Avenue.

Visitors are invited to tour the Laboratory's facilities. Come during working hours, 8:00 a.m. to 4:30 p.m., Monday through Friday.



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