

FISHERIES  
RESEARCH UNIT  
AGRICULTURAL EXPERIMENT  
STATION SYSTEM  
AUBURN UNIVERSITY



# The Department of Fisheries and Allied Aquacultures and The International Center for Aquaculture



**Swingle Hall, the three-story building that houses the Department of Fisheries and Allied Aquacultures and International Center for Aquaculture at Auburn University, was completed and occupied in 1972.**

**COVER PHOTO.** Small ponds (front cover) and large ponds (back cover) are used in fisheries teaching and research programs of Auburn University School of Agriculture and Agricultural Experiment Station. Typical international teaching and research programs are illustrated by the activity photos on the front cover.

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# *The Department of Fisheries and Allied Aquacultures and The International Center for Aquaculture*

AUBURN UNIVERSITY has gained a worldwide reputation for its warmwater fisheries and aquaculture research and teaching programs. This brochure describes briefly the programs supported by Auburn University through its Department of Fisheries and Allied Aquacultures and the International Center for Aquaculture. Also described are services available through the International Center to fisheries agencies of foreign countries and USAID Missions, and to other organizations supporting international aquacultural activities.

## **HISTORY OF PROGRAM**

The formal program in fisheries research and management at Auburn University was started in 1933 by Dr. H. S. Swingle. Since then pond and laboratory research facilities have been expanded and modernized, creating what is now one of the largest pond research stations in the world.

Courses in fisheries and aquacultures were established in 1946. The first graduate degree was awarded in 1948. Fisheries students have come to Auburn from throughout the United States and from many foreign countries.

On July 1, 1970, the fisheries and aquaculture program, which had been a part of the Department of Zoology-Entomology, was accorded full departmental status as the Department of Fisheries and Allied Aquacultures. At the same time, the International Center for Aquaculture was established as an associated entity. Both the Department and the Center are part of the University's School of Agriculture and Agricultural Experiment Station System.

As one of the nation's land-grant universities, Auburn University is dedicated to the service of the people of Alabama, the nation, and the world through instruction, research, and extension.

The University is located in Auburn, Alabama, in the east central section of the State. Although in pleasant rural surroundings, it is within easy reach of several major cities.

## **THE STAFF**

The staff is a highly qualified assemblage of specialists. Of the present 29 staff members, 22 hold doctorates and 25 have the academic rank of assistant professor or higher. Many of these have achieved international as well as national recognition. Well over three-fourths of the staff have experience in fisheries and aquaculture work overseas. The following is a list of the faculty and their fields of specialization.

- E. W. SHELL (Ph.D.). Head, Department of Fisheries and Allied Aquacultures, and Director, International Center for Aquaculture.
- R. ALLISON (Ph.D.). Fish parasitology and parasite-induced immunity in fishes and intensive fish culture.
- D. R. BAYNE (Ph.D.). Ecological aspects of reservoir management and algology.
- C. E. BOYD (Ph.D.). Water quality and aquatic ecology.
- W. D. DAVIES (Ph.D.). Population dynamics of reservoir fishes; analysis of fishery statistics; sport fish management.
- J. S. DENDY (Ph.D.). Limnology of impounded waters; ecology of fish food organisms.

B. L. DUNCAN (Ph.D.). Tropical aquaculture; international training and aquaculture development.

R. K. GOODMAN (M.S.). Hatchery management and aquaculture.

J. H. GROVER (Ph.D.). Tropical aquaculture.

J. P. HAWKE (M.S.). Anadromous fisheries.

D. G. HUGHES (M.S.). Tropical aquaculture.

M. C. JOHNSON (M.S.). Tropical aquaculture; commercial fish farming; pond construction.

J. M. LAWRENCE (Ph.D.). Nutrient inputs and outputs of reservoirs and aquatic weed control.

D. F. LEARY (Ph.D.). Tropical brackish water aquaculture.

R. T. LOVELL (Ph.D.). Fish nutrition-technology; biochemistry of food fish utilization.

L. L. LOVSHIN (Ph.D.). Tropical aquaculture.

E. W. MCCOY (Ph.D.). Aquacultural economics.

D. D. MOSS (Ph.D.). Assistant Director, International Center for Aquaculture; international fisheries development.

M. M. PAMATMAT (Ph.D.). Ecology and metabolism of benthic communities.

R. P. PHELPS (Ph.D.). Fisheries extension; international aquaculture development.

J. A. PLUMB (Ph.D.). Bacterial and viral diseases of fishes.

E. E. PRATHER (M.S.). Intensive management of catfish ponds for sport fishing and commercial production.

J. S. RAMSEY (Ph.D.). Systematic ichthyology; zoogeography of fishes.

W. A. ROGERS (Ph.D.). Taxonomy, ecology, and control of fish parasites.

E. W. SCARSBROOK (M.S.). Algal taxonomy and ecology.

H. R. SCHMITTOU (Ph.D.). Tropical brackish water aquaculture.

W. L. SHELTON (Ph.D.). Biology of fish in streams and reservoirs; biology of fish reproduction.

R. O. SMITHERMAN (Ph.D.). Tropical aquaculture and fish breeding.

J. R. SNOW (M.S.). Reproduction and production aspects of aquaculture and hatchery management.

## **PHYSICAL FACILITIES**

Field facilities of the Fisheries Research Unit of the Agricultural Experiment Station are located on a 567-hectare tract approximately 8 kilometers north of the campus. A field research facility constructed over the past 36 years consists of 228 earthen ponds with a surface area of 80 hectares, 96 concrete ponds, and approximately 200 plastic pools. Surveys are presently being made for construction of additional earthen ponds. In addition to ponds, there are buildings housing laboratories, offices, and service facilities. Included in the facilities are mechanical hatching units capable of handling 100,000 channel catfish eggs per week, concrete and fiberglass tanks for holding and overwintering fish, and aquaria for conducting experiments under controlled conditions.



Feeds and nutrition laboratory in Swingle Hall.

A new fisheries building on campus, Swingle Hall, was occupied in 1972 by the Department of Fisheries and Allied Aquacultures. This three-floor building has approximately 2,322 square meters of floor space. It houses offices for staff and graduate students, a lecture hall, two teaching laboratories, various modern research laboratories, a publications library, and administrative offices.

### RESEARCH PROGRAM

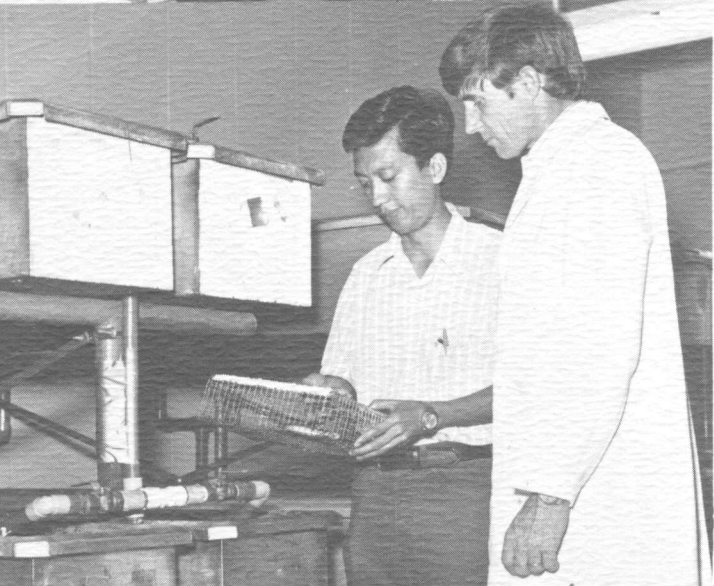
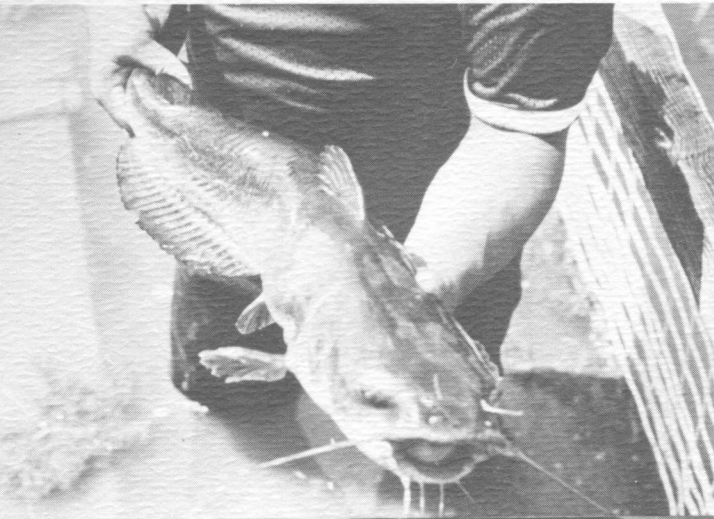
Research activities at Auburn have been generally focused in the areas of aquaculture, management of farm ponds for sport fishing, and management of streams and large impoundments. Aquaculture research has been greatly facilitated by a method developed at Auburn in which ponds are used in much the same way that field plots are used in agronomic research.

This unique approach to experimentation, supported by excellent field facilities, has resulted in the development of techniques and procedures of warmwater fisheries management and aquaculture that are today in general use throughout much of the United States and many foreign countries.

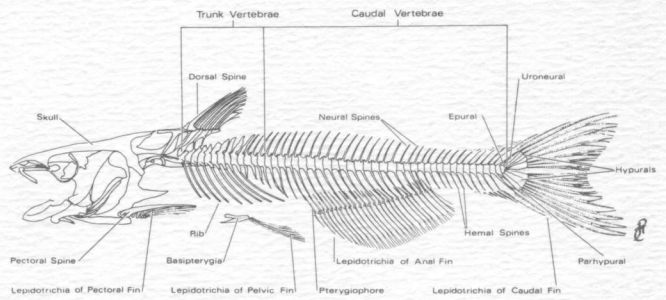
Research efforts at Auburn University have provided information for over 300 scientific publications on aquaculture, warmwater fisheries management, and related subjects. Major areas of research conducted within the department are described in the following section.



Graduate students sample a polyculture experiment.



**TOP**—male channel catfish used in genetic studies; **CENTER**—Dr. John Plumb determines the causative agent of a fish kill; **BOTTOM**—Dr. Tom Lovell and a graduate student from the Philippines evaluate various artificial feeds for fish.



**The anatomy and physiology of channel catfish are studied in detail.**

### Aquaculture Research

**FISH SPAWNING AND REPRODUCTION** in an attempt to gain direct control by artificial means over reproduction of important cultured fishes.

**POLY CULTURE**, or growing two or more species of fishes together, to increase utilization of the different types of food produced in the pond.

**FISH BREEDING** to improve by genetic manipulation the quality and culture characteristics of pond raised fishes.

**FISH PARASITES AND DISEASES** to develop prophylactic and therapeutic procedures for debilitating diseases of cultured fishes. Basic research is also conducted on all aspects of fish diseases.

**FISH NUTRITION** to establish dietary requirements of cultured fish and test practical feed formulations.

**FISH PROCESSING TECHNOLOGY** to improve the quality and increase the utilization of fish products as food.

**INTENSIVE FISH CULTURE** as a means of economically culturing fish at high densities by methods such as aeration and recirculation-filtration of water.

**COMMERCIAL FISH PRODUCTION** to develop management practices for profitably culturing fish on a commercial basis.

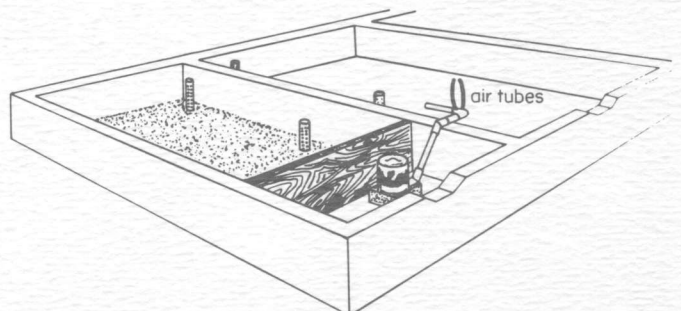
**WATER CHEMISTRY-AQUATIC PLANT RELATIONSHIPS** to provide information necessary for the control and management of the pond environment.

### Related Research

**AQUATIC ECOLOGY** in an attempt to define characteristics of, and relationships within, aquatic environments.

**RIVERS AND RESERVOIRS** to identify problems arising from multiple uses of public waters and to relate physical, chemical, and biological changes in these waters to sport and commercial fisheries.

**FISH SYSTEMATICS AND ECOLOGY** to study the distribution, morphology, and taxonomy of fish. The Auburn University Ichthyological Museum is maintained jointly by the



**Filter systems used in intensive culture.**



**TOP**—Plankton samples taken by students as part of a limnology study; **CENTER**—graduate student monitors dissolved oxygen; **BOTTOM**—Dr. Bill Shelton records results of stream sample.

Department and the Alabama Cooperative Fisheries Research Unit. Most of its half-million specimens are from waters of the Eastern United States, but other regions of the world are well represented.

**SPORT FISH MANAGEMENT** in which farm pond and reservoir fish populations are studied to understand their dynamics, interactions, and management.

### TRAINING PROGRAM

Since the first degree was granted in 1947, more than 300 students have graduated from regular courses and special training programs, of which approximately 100 were from foreign countries. Over 50 Ph.D. degrees and 150 M.S. degrees have been awarded to students studying fisheries and aquaculture. These graduates are employed in the United States and in many countries throughout the world. Many of them hold high administrative and research positions in the fisheries organization of their respective states or countries.

Auburn University offers one of the strongest curricula in fisheries and aquaculture to be found anywhere in the United States. Some 23 regularly scheduled courses are offered in various aspects of fisheries. These are in addition to the courses in biology, botany, and zoology offered by other departments in the University. The formal fisheries courses available to undergraduate and graduate students are listed with a brief description of each.

**LIMNOLOGY.** Biological, chemical, and physical factors affecting aquatic life.

**BIOLOGY PRODUCTIVITY AND WATER QUALITY.** Biological and chemical measures of water quality in streams and impoundments as related to fisheries. Effects of pollution, fertilization, and feeding of fish on water quality.

**FISHERIES BIOLOGY.** An introduction to the study of vital statistics of fish populations.

**ADVANCED FISHERIES BIOLOGY.** The concepts of population dynamics and of the interaction of reproduction, growth, and mortality in fish populations, and the use of these concepts in fish population management.

**AQUACULTURE.** Principles underlying aquatic productivity and levels of management as demonstrated by domestic and foreign lotic and lentic cultures of fish and other aquatic crops.

**MANAGEMENT OF STREAMS AND LARGE IMPOUNDMENTS.** Fish populations of streams and large impoundments and a consideration of methods for managing those populations.

**MANAGEMENT OF SMALL IMPOUNDMENTS.** Consideration of species of fish used in management of small impoundments, species balance, population balance analysis, methods of correcting unbalanced populations, renovation of old impoundments, and related problems of water management.

**FISH SEED PRODUCTION.** Methodology and systems of management for mass production, harvest, and distribution of food, bait, and game fish species. Controlled spawning, incubation, rearing, and harvesting are emphasized for the included fish species.

**GENERAL ICHTHYOLOGY.** Morphological, functional, geographical, and behavioral survey of fishes. Classification of fishes using monographs and keys. Field trips and laboratory work emphasize local species.



Students sort results of a reservoir study.

**FISH PARASITES.** The external and internal parasites of fishes, their identification and control; laboratory studies on life histories and epidemiology of parasite populations in ponds and impoundments.

**ADVANCED FISH PARASITOLOGY.** The morphology, taxonomy, life history, ecology, and pathological effects of parasites of fish.

**FISH DISEASES.** Bacterial and viral diseases of fishes, their isolation, culture, identification, and control.

**ADVANCED MICROBIAL FISH DISEASES.** Immunology of fish to viral and bacterial infection, serological identification of fish pathogens, and intensive fish cell culture.

**AQUATIC COMMUNITIES.** Environmental relationships of the biota of freshwater habitats.



The ichthyological museum has fish from throughout the world.

**FISH PROCESSING TECHNOLOGY.** Chemical and biological aspects of fishery products as related to their use as human food, principles of preservation, unit operations in processing fishery products, product evaluation, and packaging.

**FISH NUTRITION.** Basic and applied aspects of warmwater fish nutrition, including nutrient requirements and metabolism, nutrient sources, diet formulation, and feeding practices.

**MANAGEMENT OF AQUATIC FLORA IN FISHERIES AND AQUACULTURE.** A study of the role of aquatic vegetation in fish production, its utilization and control.

**NUTRIENT CYCLES IN AQUACULTURE.** A study of physico-chemical and biological dynamics of inorganic nutrients in freshwater habitats. Emphasis is given to biological problems caused by nutrient imbalance, and to biological indicators of water quality.

**FUNCTIONAL MORPHOLOGY.** Gross and micro-anatomical studies of representatives of principal fish groups from the Southeastern United States.

**SAMPLING FISH POPULATIONS.** Theory, equipment, and procedures for sampling fish populations.

**WATER QUALITY MANAGEMENT IN AQUACULTURE.** Chemical, mechanical, and biological methods of maintaining and improving water quality in aquaculture.

**SPECIAL PROBLEMS IN FISHERIES AND ALLIED AQUACULTURES.** A. Aquaculture; B. Aquatic Ecology; C. Biology and Management; D. Ichthyology; E. Nutrition; F. Pathology; G. Processing and Technology.

**ECONOMICS OF AQUACULTURE.** Theory and application of economic principles of production, marketing, and consumption applied to aquaculture with emphasis on fish pro-



duced in ponds. Marginal and locational analyses, and commercial significance of fish production as a farm enterprise.

**POND CONSTRUCTION.** Principles and practice in the selection of pond sites, surveying and mapping pond areas, and construction of dams; practice in the design and planning of aquaculture stations.

In cooperation with the Department of Fisheries and Allied Aquacultures, the Department of Zoology-Entomology offers the following aquatic courses.

**GENERAL OCEANOGRAPHY.** Introduction to the physical, chemical, geological, and biological characteristics of the marine environment.

**BIOLOGICAL OCEANOGRAPHY.** Oceanic ecosystems, energy transfer in oceanic food chains, and biological productivity of the oceans.

**MARINE BIOLOGY.** Physiological ecology (nutrition, respiration, osmoregulation, bioluminescence) of marine organisms.

**MARINE INVERTEBRATE ZOOLOGY.** A general study of the anatomy, life histories, distributions, and phylogenetic relationships of all marine phyla below the chordates, in the laboratory and field. Offered only at the Gulf Coast Laboratory, Ocean Springs, Mississippi.

**MARINE VERTEBRATE ZOOLOGY AND ICHTHYOLOGY.** A general study of the marine chordata, including lower groups and the mammals and birds, with emphasis on the fishes. Offered only at the Gulf Coast Research Laboratory, Ocean Springs, Mississippi.

## UNDERGRADUATE PROGRAM

Bachelor of science degrees are offered in fisheries management and marine biology. During the first 2 years, courses in the basic sciences and background courses are completed. Courses more directly applicable to the student's major are then taken during the third and fourth years.

Favorable consideration for admission is given to accredited secondary school graduates whose college ability test scores and high school grades give promise of success in college courses. Applicants of mature age who are not high school graduates may be considered for admission if their educational attainments — through testing — are shown to be equivalent to those of a high school graduate.

## GRADUATE PROGRAM

Master of science and doctor of philosophy degrees are offered through the Department of Fisheries and Allied Aquacultures. The master of science degree is a thesis program where the student conducts research and prepares a thesis on a selected topic under the direction of his major professor. In addition, the student is expected to successfully complete a minimum of 45 quarter hours of courses approved by his major professor and committee. The master's degree program typically takes 18 to 24 months to complete in the Department of Fisheries and Allied Aquacultures.

The degree of doctor of philosophy (Ph.D.) is conferred in recognition of the mastery of a special field of learning as evidenced by: (1) the satisfactory completion of a prescribed course of study and investigation; (2) the successful passing of general examinations covering the major and minor fields;



**TOP**—sportfishing provides fun for people of all ages; **BOTTOM**—graduate student from the Philippines studies development of fish eggs.





Dr. John Plumb conducts a fish disease class.

(3) the preparation of an acceptable dissertation reflecting high achievement in scholarship and independent investigation; and (4) the passing of a final examination on the dissertation and related subjects.

Students are generally required to demonstrate a reading knowledge of two foreign languages, but other options are available. Course work ranges from 80 to 120 quarter hours beyond the bachelor's degree. A Ph.D. program generally takes 30 to 36 months beyond the master's degree to complete.

Further details concerning admission requirements and applications are available from:

Graduate School  
Auburn University  
Auburn, AL 36830

Special training programs are offered to groups such as U.S. Soil Conservation Service and U.S. Peace Corps, and to foreign nationals.

Additional information concerning degree programs and special training programs in fisheries and aquaculture is available from:

Department Head  
Department of Fisheries  
and Allied Aquacultures  
Auburn University  
Auburn, AL 36830

Financial aid may be available to selected graduate students, primarily in the form of graduate research assistantships and work-study programs.

## INTERNATIONAL CENTER FOR AQUACULTURE

Advisory assistance from Auburn University to foreign countries began in 1958 in Thailand and Israel. It was extended to India in 1961. In 1967, a worldwide project for technical assistance in fisheries and aquaculture to developing countries was initiated between Auburn University and the U.S. Agency for International Development. Principal function of this international project was assistance to developing countries in increasing their capabilities to produce adequate amounts of high quality protein through cultures of fish, shrimp, and other aquatic organisms.

Through the support of USAID, the International Center has been able to expand its facilities and develop a diverse staff capable of dealing with any aspect of inland fisheries and aquaculture in the world. Among the services available through the International Center for Aquaculture are:

1. In-country surveys to evaluate the potential for aquaculture and the development of plans for increasing fish production in developing countries. Surveys of this type have been conducted in Africa (Cameroon, Central African Republic, Ghana, Ivory Coast, Kenya, Morocco, Nigeria, Tanzania, Togo, and Zaire), Asia (Bangladesh, India, Indonesia, Malaysia, Pakistan, Philippines, Thailand, Taiwan, and Vietnam), and Central and South America (Brazil, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Nicaragua, Panama, Paraguay, and Peru).

2. Planning of pondculture research stations, including soil examination, details of pond construction, accessory re



**Dr. Bill Shelton samples a lake in Peru.**



search facilities, and cost estimates. Auburn has helped to plan research stations in Bangladesh, Brazil, Colombia, El Salvador, India, Nigeria, Panama, and the Philippines.

3. Providing assistance to the cooperating fisheries departments of host countries in developing research programs and experimental procedures for various phases of aquaculture. Such a cooperative program was conducted with the Department of Fisheries of Thailand where assistance was given in developing a 5-year program of research and extension.

4. Conducting short courses both at the Center and in host countries to inform fisheries and aquaculture research and extension personnel of advances in aquaculture and to help develop their competence in areas of particular need. Programs of this type have been conducted in Brazil, Philippines, Thailand, and Auburn.

5. Training of personnel at B.S., M.S., and Ph.D. levels and special non-degree students in academic subjects and research methods at Auburn under USAID, FAO, and foundation scholarships.



**TOP—monosex culture of tilapia in Brazil; BOTTOM—Dr. Len Lovshin and assistant are involved in aquaculture development in Brazil.**

Auburn on campus has trained students in fisheries and aquaculture from:

Bangladesh	Indonesia	Nigeria
Brazil	Iran	Panama
Colombia	Iraq	Peru
El Salvador	Israel	Philippines
Ghana	Italy	Portugal
Guatemala	Ivory Coast	Swaziland
Guyana	Kenya	Taiwan
Honduras	Korea	Thailand
Hong Kong	Mexico	Turkey
India	Nepal	

6. Providing assistance to personnel in the cooperating fisheries departments of host countries in preparation of research results for publication and in producing more effective extension leaflets on improved methods of aquaculture.

7. Providing experts in various phases of aquaculture and inland fisheries from Auburn University's International Center for Aquaculture for short-term visits to developing countries to help solve special problems as they arise. These may

include one or more of the following subjects:

- Aquacultural economics
- Water chemistry problems in aquaculture
- Inventory of species - fish taxonomy
- Fish feeds and feeding
- Fish parasites and diseases
- Shrimp culture
- Fish culture
- Chemical and biological aquatic weed control
- Fish technology, processing, and preservation
- Limnological surveys
- Reservoir fisheries management
- Riverine fish populations
- Pond construction

8. Provide staff and technical support for long-term, in country projects. In the past such projects have been for 2 years or longer. Auburn has continued to provide personnel in aquaculture programs in Brazil, El Salvador, Nigeria, Panama, and the Philippines.

For information concerning international programs contact:

Director  
International Center for Aquaculture  
Auburn University  
Auburn, AL 36830

