THE MOREHOUSE

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MOREHOUSE COLLEGE

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THE MOREHOUSE JOURNAL OF SCIENCE

Vol. VI. December 1940 — March 1941 Nos. 2 and 3

I. To bring to the teachers of Science in Negro Schools articles on methods of instruction, objectives, and curriculum organizations in both secondary schools and colleges.

II. To publish articles by the profession, giving publicity to individual ideas, methods, et cetera of interest and mutual helpfulness.

III. To act as a clearing house in an attempt to standardize courses in science in the different denominational and public secondary schools, as to aims, content and evaluation, in order to facilitate transfers, and entrance upon the standard college courses.

IV. To point out and emphasize the practical application of the theories of science.

V. To record the achievements of Negroes in the field of Science as historical data for the purpose of inspiration.

VI. To publish unbiased and critical book reviews.

VII. To abstract articles of interest appearing in the periodicals for the benefits of our readers.

VIII. To adhere more or less closely to this general outline but gradually making such improvements and additions as may recommend themselves from time to time.

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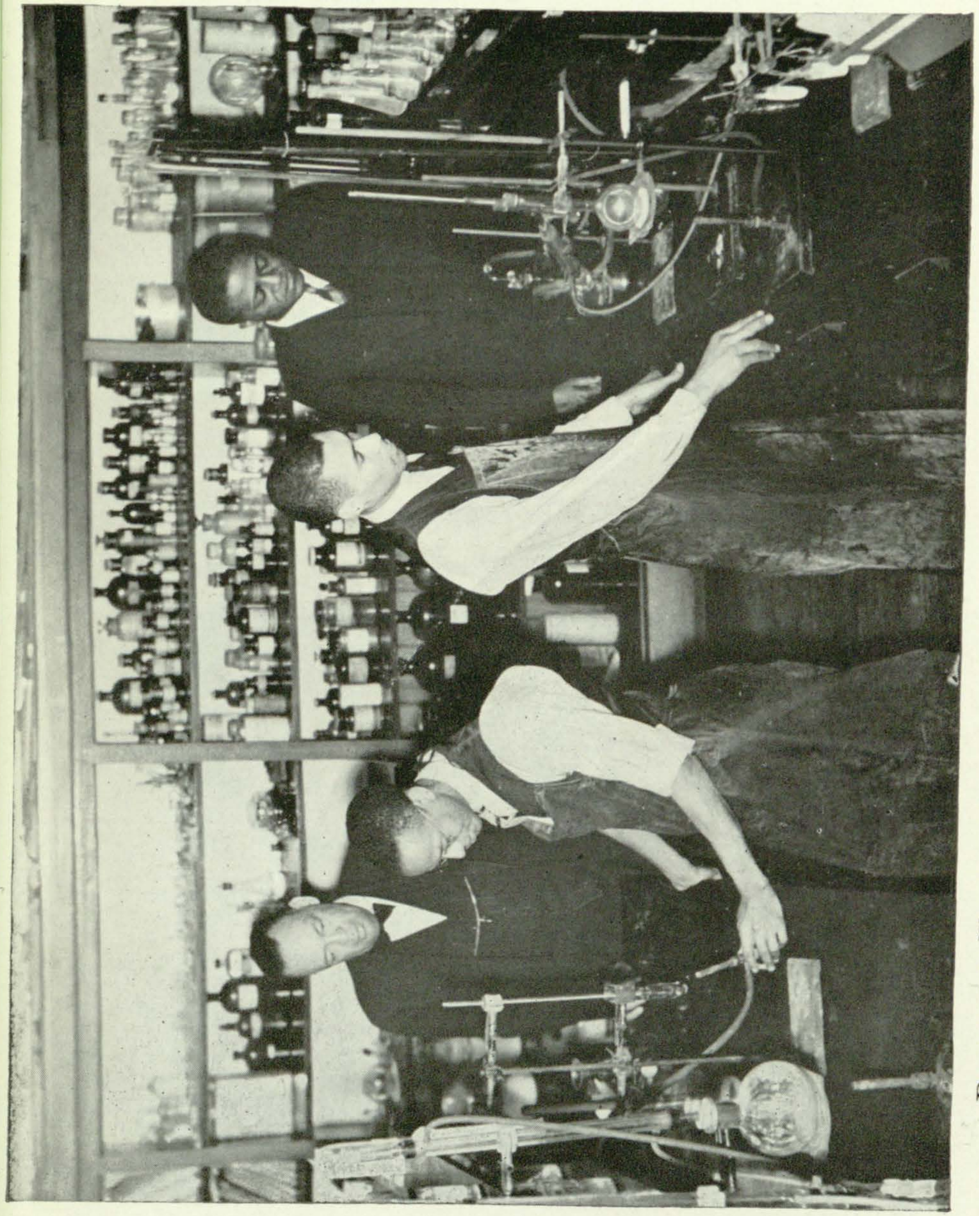
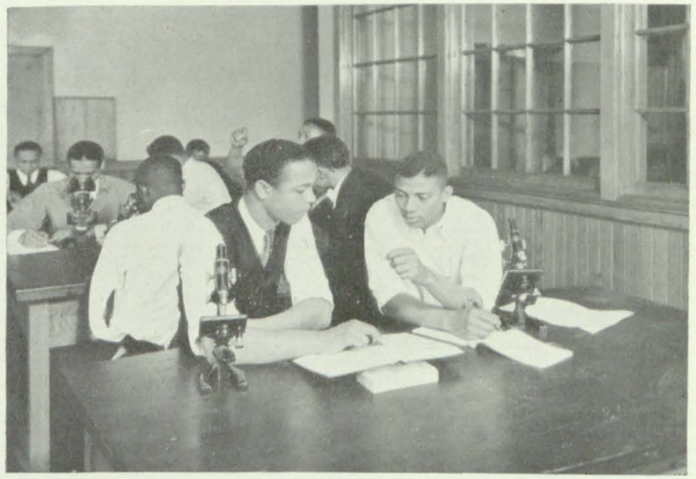
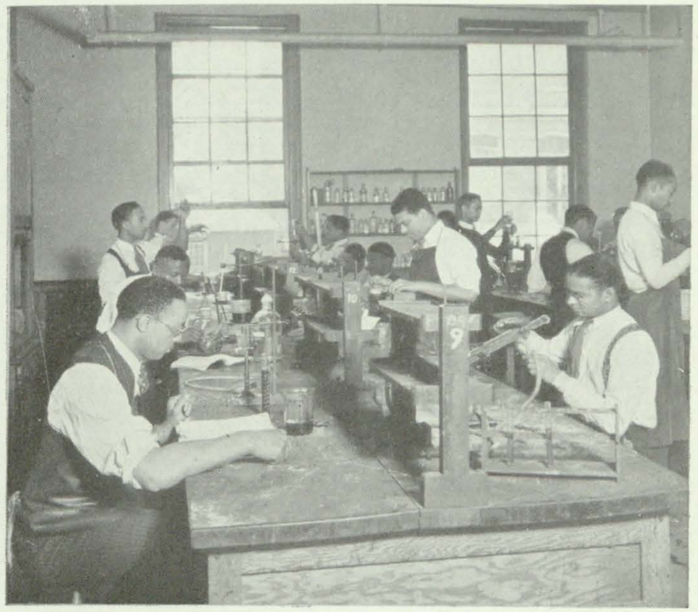


RESEARCH WORK BY ATLANTA UNIVERSITY STUDENTS AND PROFESSORS IN MOREHOUSE COLLEGE SCIENCE LABORATORY



BIOLOGY LABORATORY CLASS MOREHOUSE COLLEGE SCIENCE BUILDING



CHEMISTRY LABORATORY CLASS MOREHOUSE COLLEGE SCIENCE BUILDING

THE MOREHOUSE JOURNAL OF SCIENCE

The Official Organ of the Alabama Association of Science Teachers, the Georgia Association of Teachers of Science in Negro Schools.

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THE MOREHOUSE JOURNAL OF SCIENCE

CONTENTS

OUR VIEWPOINT

We are pleased to send you the Second issue of the attempt to re-establish the publication of the Journal of Science. This issue comes to you largely through the efforts of the members of the Editorial Board, President B. E. Mays of Morehouse College, Atlanta, Ga.; President H. C. Trenholm of State Teachers College, Montgomery, Alabama; and Former Acting President C. D. Hubert, Morehouse College, Atlanta, Ga. These persons through their individual contributions and funds solicited as subscriptions have assured the expense of this issue and the June issue.

We have had some success with reference to the securing of yearly subscriptions. We are hereby announcing that yearly subscriptions received ere this issue was published will expire with the December 1941, issue. We cannot guarantee after this issue to send copies of the Journal to any person who is not a paid subscriber, hence we are asking our friends and those who desire to continue to receive the Journal to make use of the subscription blank on the outside back cover of this issue to assure yourselves of continuing to receive the future issues of the Journal.

ACKNOWLEDGEMENTS We have been gratified at the large number of letters received from readers concerning the last issue of the Journal. As an example we take the liberty of quoting the following letter from Dr. Otis W. Caldwell, General Secretary of the American Association for the Advancement of Science: "I have read the entire issue of the Morehouse Journal of Science, which you were kind enough to send me. It is a good number, and I trust is merely the prophecy of the quality of articles you will regularly publish in the Journal. I am sending herewith my check for regular subscription to the Journal, and while I may have sent a little more than would be required for the subscription, will you please regard this as payment for two years' subscription?"

JUNE ISSUE We would like to call your attention to several articles which will appear in the May issue:

The "Cutoff" Meson Potential for the S State, by H. F. Thaxton and A. M. Monroe, Department of Physics A. & T. College, Greensboro, North Carolina.

The Sums of Powers of Integers, by Joseph A. Pierce, Department of Mathematics, Atlanta University, Atlanta, Georgia.

New Laws of Valence, by T. W. Talley, Department of Chemistry, Fisk University, Nashville, Tennessee.

We are happy to say that arrangements have been completed whereby it will be possible to take care of the printing of any purely scientific article in future issues of the Journal.

We again extend a cordial invitation to groups and individuals to join with us in making the Journal of Science of value and interest to the profession.

NEED OF ORGANIZATION. In this time of emphasis on technically trained individuals for the National Defense it is unfortunate that we have no organization qualified to speak for our group in this connection. Although we have National organizations of practically every kind, there has been a notable lack of organization and co-operation of purposes among the teachers of the Natural and Physical Sciences among our group. In most of our colleges Survey courses and non-technical Science courses have almost swept away the foundation for building super-structures of trained, mentally alert and technical minded students. Too many of our teachers of Science have been self-centered or non-interested in the General Development of Scientific knowledge and attitudes. As a group we are hoping that the seriousness of the present situation and the handicaps that have been nurtured by the curriculum of many of the Private as well as State Institutions will press home the needs of group organization and work by the teachers in the field of Natural and Physical Sciences.

TERMITES GO TO ANT WARS IN SPRING

With the arrival of spring, the civilized nations abroad are not alone in preparing for active warfare. Right here in Virginia, two of the most highly civilized types of beings—the ants and the termites are making ready for a gigantic spring offensive on thousands of fronts.

The ants, perennial aggressors in this war, are planning their strategy for the attack. The termites are flying in swarms from their childhood homes, shedding their wings and establishing fortified cities beneath the underpinnings of dwellings. Calmly but hastily, they are organizing their defensive armies, posting armed soldiers on the cities outskirts to guard against their worst enemy, the ant.

This is not whimsy. These activities, literally, are taking place under our houses. And contrary to popular belief, so efficient are the termites in building their defenses that in Virginia and most of the United States, at least, they seldom are routed by the invaders, according to State Entomologist G. T. French.

TYPES DIFFER

It's different in some other parts of the world, Australia, for instance. There armies of ants break into mound nests of termites; the termites retreat into the interior and wall off the invaders with nest material, but the ants usually are able to take over completely or partially and eat the conquered termites and their food supplies.

Here, says Mr. French, the termites take advantage of natural fortifications—the wooden foundations of buildings—and any householder who believes he is protected by the presence of ants against the boring of the woodeating termites is sadly mistaken.

In addition to the fact that the termites fortify their cities with what might be called Maginot Lines, they have a distinct advantage over their enemies as a result of their development of chemical warfare.

USES GAS IN FIGHTING

The termite soldier, one of three castes of the insect, in some species has a tube projecting from the front of his head through which he squirts a semifluid "gas" sometimes as far as an inch. He aims it at the most vulnerable part of the ant, the waist, where it coagulates and so thoroughly gums the ant together that he is rendered "hors de combat."

In addition, the soldier is armed with deadly mandibles or jaws with which to crush his enemy to bits. The ants, all of whom take part in the warfare, have a slight advantage in mechanical weapons. But in their case the fluid is formic acid, not nearly so deadly as the gas of the termites, the exact nature of which is not yet known. And their rear mandibles are useless if a termite scores a bull's eye with his "gas" before they can be brought into play.

The secret of the termite's success at making war, according to some students of the insect, is due largely to his type of government. His doubtless was the first totalitarian state in the world; the Smithsonian Institution says fossil remains of termites have been discovered in rocks estimated to be 55,000,000 years old.

HAVE CASTE SYSTEM

Besides complete regimentation under the totalitarian state, the termites have a hide-bound social organization. Under their strict caste system, a termite is born either "in" or "out" of "society," and it is impossible for him to change his status no matter what his accomplishments.

The lowest caste, the worker, is usually blind, has no brains to mention and spends his time obtaining food and water for the community. The food he obtains by boring into the wooden foundation of our homes with his saw-tooth jaws. The water, compulsory for a termite's existence, comes from wells sometimes dug as deep as 100 feet.

Like the workers, the soldiers, who comprise the middle caste, are unable to reproduce but they can see and are imbued with more executive ability. Some are common soldiers, or privates, and others might be termed as officers. The officers not only direct the defensive activities of the army but see to it by force if necessary, that the workers perform their duties.

ROYALTY MUST BE FED

The highest caste is aristocracy indeed. It is composed of "Kings" and "Queens" whose sole duty is to reproduce. Neither they nor the soldiers are capable of feeding themselves. They must be fed by the workers, as are their young, on specially predigested or "conditioned" food.

About this time of the year the younger and more fancy-free portion of the aristocracy flies away and establishes new cities. The migrants take no workers or soldiers with them, as the lower castes are wingless, but as soon as they reach their destination they proceed swifty to give birth to young soldiers and workers, as well as more aristocrats.

The queens are not given to much exertion except during the colonization period and consequently grow to 30 times the size of the workers. Some are as much as three-fourths of an inch long, one-forth of an inch wide and 25 years old. The kings aren't so much very like most kings you know of—nothing to write home about.

AKIN TO COMMUNISM

But the aristocracy, however pampered by the workers and soldiers, probably deserve the attention, since the guilding of the nest, its care, its protection, the search for food are all directed to the main object of insect societies, namely, to produce many young for the maintenance of the species.

The termites totalitarian state is closely akin to Communism overship—common ownership of property and state control. The rights of the individual termite, his actions, work, property and food are subordinated to the demands of the commonweal. The survival of the colony and the species, not the individual and the species is the dominant rule of the association. Individuals or even castes may perish so that the community may survive. No sentimentalism occurs in this efficient organization.

When it comes to repelling the invading ant army, this same spirit of co-operation prevails. The workers join the soldiers at the walls—Maginot Lines—of the cities and line up at openings, heads pointing outward, while the soldiers fire with their lethal "gas guns" at the enemies and crush them in the death grip of their tentacles.

SIGNAL WITH JAWS

At these times of disturbance and alarm, according to Thomas E. Snyder of the Federal Bureau of Entomology and Plant Quarantine, great excitement is evidenced by the lower castes, especially if members of the aristocracy are nearby and appear to be endangered. Commands and directions are said to be given through the substratum by more or less synchronous jerky or convulsive movements of the fighters' bodies. Some soldiers with twisted, goat-like jaws, which are not practical for fighting, compose the signal corps; they signal with their jaws.

The superefficiency of the termite army usually proves too much for the ants, however well the latter's attack is organized. Only when a termite city has been disturbed by humans do the ants really clean up. Then, the termites are routed hopelessly, annihilated, devoured.

Spring has come and the wars are on. And in the insect world at least, the aggressors are doomed to failure even before they have crossed the first boundary.

Richmond Times Dispatch.

SOME PHASES OF SCIENCE EDUCATION AND THE NEGRO

THOMAS J. McCORMICK

Ladies, Gentlemen, Visitors, Fellow Members of the Junior and Senior Chapters of the Alabama Association of Science Teachers,

Greetings:

We have come to this historic city to hold our third annual Fall Meeting and to enjoy the hospitality of the citizens of Tuscaloosa and of the faculty and students of Stillman Institute. We are more than happy that this meeting shall go down in the records as one of the greatest that we have held both from the standpoint of numbers and accomplishments. To all who have shared in the various programs and who are to share, to the faculty and students of Stillman, to the faculties and students of the various schools of Tuscaloosa and surrounding territory, we again express our thanks and appreciation for making our stay while here pleasant.

But while we are gathered around these tables enjoying the many blessings we are conscious of the great decline in spiritual values; we are conscious of that beast, race prejudice, let loose; we are conscious of the substitution of might for logical thinking; we are conscious of the plights of the minority groups in the world; we are conscious of the fact that science has to bear the blame for much that has happened lately in the world.

The great social upheavals in the world today have created many complex problems which have or will have a direct bearing on the curriculum. It is during times like this that men are apt to be guided more by emotions than by reason and for that reason science teachers should be alert to the many attempts to further relegate science to the back seat. In this changing world the question arises, "What are the Negro schools doing?" "What contributions are they making in the solution of many of the complex and perplexing problems which are facing and will face Negro graduates? To many, it appears that we as a race are lost in the confusion of objectives; lost in a forest of indecision; lost in the dark recess of fear; and perhaps lost in the art of logical thinking in the interpretation of the many educational theories that are being manufactured of the mass production basis We are not at all certain to adopt the new curriculum and place all of our energies and efforts upon 98 percent of the students who will be consumers of science rather than producers of science; or shall we place our efforts on the 2 percent who may become producers of science. With the confusion that exists, then what part can and what part shall the Alabama Association of Science Teachers play?"

Mr. Herbert Hoover, speaking at the bicentennial of the University of Pennsylvania, called attention to the serious financial difficulties

that threaten the important work of the American scientists. Mr. Hoover stressed the need of increasing our industrial efficiency to cope with the changing social economy. "All types of research need to be encouraged in medicine, in chemistry, and industrial development, increasing the output of the machine and the dozen other fields that require expert knowledge and new information." "In all of our universities and our scientific institutions, I doubt whether we are spending $20,000,000 a year on research in pure science. That's about seven per cent of what we spend on cosmetics. I do not believe there is a profession of medicine or of physics that cannot state a hundred lines of research that are urgent but are lagging for a lack of financial resources."

What implications do the remarks have so far as the South and the Negro are concerned?

In the "Report on the Economic Conditions of the South" prepared for the President of the U. S. by the National Emergency Council we find these pertinent facts that should concern every teacher and especially Negro teachers of science, and give materials for science teaching. "In the South 71 percent of the population is white and native born, 29 percent is colored and native born. The birth rate in the South exceeds that of any other region. The South is a huge crescent embracing 552 million acres in 13 states from Virginia on the east to Texas on the west. The paradox of the South is that while it is blessed by nature with immense wealth, its people as a whole are the poorest in the country. Lacking industries of its own, the South has been forced to trade the richness of its soil, its minerals and forests, and the labor of its people for goods manufactured elsewhere. Sixty-one per cent of all the nation's land badly damaged by erosion is in the Southern states. Training in better agricultural methods such as planting soil, restoring crops, terracing contour plowing, and rotation of crops, has been spreading, but such training is still unavailable to most Southern farmers. The largely rural states of the South must support nearly one-third of their population in school, while the industrial states support less than one-fourth. Rural population has increased most rapidly in those sections where the land is the poorest. In 1930 there were 4,250,000 children of school age in the South, educated on an income of about two per cent of the nation's total. In the South only 16 per cent of the children enrolled in school are in the high school.

After considering the above factual data, perhaps the editor of the Montgomery Advertiser was correct when he stated: "Schools are now becoming more interested in graduating Good Farmers than a Boy with fourteen unit hours." How can one be a good farmer when he is not familiar with the laws and their applications that govern agriculture? How can one be a good farmer unless he is familiar with the science that enters? What shall we do about the laws of and applications of capillarity, plant physiology and morphology, life histories of insects, chemical composition of insecticides, chemical reactions of fertilizers, the problems of buying and selling that have both a sociological and an economic import?

Dr. George D. Palmer of the University of Alabama School of Chemistry recently stated that: "Prosperity of a region is roughly proportional to the number of patents taken out in that region." Statistics show that the South has done very little and the Negro in the South practically nothing in research in pure or applied science. It is significant to note that Dr. Howard W. Odum in his "Southern Regions" has stated: "In higher education the South affords no university of the first rank, while nine of the eleven states comprising the Southeastern region have no universities rated by the American Council on Education as capable of giving the PhD. degree. No southern university is rated competent to give this degree in civil, chemical, mechanical, electrical or mining engineering, or in bacteriology, entomology, geography, plant pathology, plant physiology, or soil science. There is therefore, no institution equipped for advanced training for the development of agrarian culture."

Since the laboratory is recognized as the benevolent friend of man, the Alabama Power Company has offered $25,000 for pure research if the sum were at least matched by some industrial company. Perhaps, if Alabama and the South are to advance, the laboratory may be the deliverer. However, we should remember that the individual scientist working in seclusion making great discoveries contributing to the welfare of man has served his purpose well. Today, with the magnitude of technical, social and economic problems increasing, investigations must be carried on as group undertakings and not an individual one. Dr. George W. Carver of Tuskegee Institute, working by himself, jerred by many, overcoming many obstacles, called by some father of chemistry, has demonstrated not what one Negro can do but what many Negroes must do. Today, at the ebb of his life we find him recognizing the fact that there must be some research laboratory where Negro boys and girls can aid in the solution of the many complex technical, social, and economic problems that affect Negro life.

Dr. P. K. Cameron of the University of North Carolina is conducting experiments having for their aim the using of the entire cotton plant. Some of the products obtained by him are: brightly colored handles of automobile doors, drapery fabrics, washable bookbindings, gowns of velvet, and soda straws.

At the University of Tennessee investigations in the field of plastics are being carried on developing such things as: jars, tops, ash trays, bathroom tile, and many other articles.

The Mellon Institute has made a casein glue for plywood by abstracting protein from cotton.

The Cotton Textile Institute has introduced a house with walls of plywood faced with cotton duck on the exterior, the roof is also faced with cotton duck. The floors are covered with cotton duck which is fireproof and stain proof. Thus we see that chemurgic magic is writing new chapters of progress of the South's number one crop, cotton.

But what has the Negro school been doing and what may the Alabama Association of Science Teachers do concerning what may be the needs of our people and our students? Perhaps, an answer is not obtainable when science courses have been gradually eliminated or fused with other subject matter in such manner that many fundamental concepts have been lost. Perhaps, our educational hash concocted by groups of educational experts far removed from the South and Southern conditions, parading under the name of "Survey" or "Integrated" or some other high sounding misnomer, or "Functional Mathematics" or "Mathematics for Life" may supply the social, economic, and technical problems.

But what has brought about this decadence of science and mathematics courses in our schools? Has it been due to the administrators effort to obtain more funds to train more teachers to train more students to become teachers to train more students who eventually come to our institutions of higher learning priding themselves that they do not know the multiplication table? Or has the decadence been due to the attitudes of the students or the attitudes of the science teachers, or to the educational experts?

Time will not permit a full discussion or an answer to all of these questions but suffice it to say that perhaps our difficulty may be the attempt to carry the traditional curriculum and the new curriculum simultaneously.

Do we admit that students today are intellectually inferior to those of the past? Or have we made school so easy to take care of the shiftless and the dullard that we have become too soft to spend long hours in study?

Perhaps, our science faculties have been too self-centered to keep pace with the changing world and its conditions. Perhaps, we have been too cocksure that traditional courses were here to stay. Too long we have had the statements of heavy teaching loads, lack of equipment and no time or money to join educational associations and attend their meetings, exchange ideas, and aid in working out a definite program of procedures and in the meantime forces have gradually removed science as science from the curriculum.

It is true that in the past science courses have been dead, uninteresting and too much time has been wasted in taking volumes of notes which could be found in many of the better texts. We may have forgotten that steam, electricity, and radiant energy have given men powers never before though possible. Research has given us great speeds, synthetic products that play an important role in our daily lives, great machines that perform as if human. But today new worlds are opened to the student who can use the microscope, the polariscope, the spectroscope and the camera. Biology becomes stimulating when photography is introduced. Has the teacher of science studied how to use simpler equipment designed and made by the students to illustrate fundamental concepts? Has the science teacher attempted such experiments as: heat treatment of metals, tensil strength of fabrics as silk, the conductivity of various insulating materials; airplane models built by students to show the principle of mechanics?

In Biology have we taught the uses and functions of different plants and animals found in the immediate environment? What part has the eradication of insects been incorporated in the course? Or in chemistry has the major portion of the time been occupied with equations problems or with the determination of poisons in cosmetics, foods and drugs or with experiments in everyday use?

In mathematics, what has been our goal? Do we so neglect the mechanics such as the multiplication tables, fractions, the decimal point in order to calculate discount on a million dollars worth of bonds; in order to calculate taxes, profit and loss with the hope that the mechanics may be learned later?

To date the educational experts have failed to agree, therefore we, as science teachers, should bestir ourselves and work with them and NOT against them.

Perhaps, now you are confused and perhaps we may be able to clarify our stand. Some definite method should be worked out to give all the students an opportunity to work to their fullest capacity. The emphasis should not be placed on the 98% or the 2%. Some scheme may be found to give to the 2% fundamental training in procedures and manipulative skills of chemistry, physics, biology, and mathematics. The spirit of investigation may be inculcated in them. The 98% we agree to give them anything to keep them busy but not much that will require logical thinking, mental effort, or scientific manipulative skills.

What part can the Junior Chapters play in this drama? Suffice it to say that such projects as;

1. Photographing biological specimens
2. Identification of minerals and crystals
3. Collecting and cultivating protozoa
4. Liquid wood and paper making
5. The use of the microscope
6. Investigating yeast
7. Collecting and identifying
8. Color
9. Heat treatment
10. Optical instruments

11. Trees
12. Growing plants without soil
13. Insects

Methods of procedure can be found in the Educational Focus published by Bausch and Lomb. Every teacher should be on the mailing list.

Admitting that the majority of students in school today (1) lack interest in school; (2) are poorly prepared; (3) need motivation, is it not possible for the Alabama Association of Science Teachers to decide on a list of objectives that will allow the science teacher to work with the best minds of his class? Is it not possible for the science teacher to teach a select group the fundamentals of arithmetic, algebra, geometry, trigonometry, analytic geometry and calculus? Is it not possible for the science teacher to train a few students in the requisite skills of laboratory procedure? Is it not possible for the science teacher to teach a few how to gather information, design simple apparatus, organize a report? Would such a select group be better prepared to aid in the solution of our great problems? Would this procedure instill in a few a desire to do some research while engaged in teaching? Can the Alabama Association of Science Teachers do anything to aid in bringing to fruition some of these objectives?

Can or shall the A.A.S.T. make a plea for a provision to remove some of the more efficient students to courses that will train for research?

Can or shall the A.A.S.T. seek a place on the various committees dealing with the curriculum?

Can or shall the A.A.S.T. bring to the attention of the public that future teachers will not be prepared to do a good job because of their lack in the fundamentals of science and mathematics?

Can or shall the A.A.S.T. gather statistical evidence to support the contention that teachers should have more and not less science?

Can or shall the A.A.S.T. formulate science courses and gather information as to their efficiency?

Can or shall the A.A.S.T. aid teachers in investigations?

Can or shall the A.A.S.T. stimulate interest that a portion of the budget be set aside for teacher supplies?

Can or shall the A.A.S.T. go forward from here with a new inspiration to eradicate from the minds of students that the school is a place of rest; but to inspire students that the school is a place for the formation of proper attitudes, correct habits of thought, and to develop an inquiring mind?

Knowing you as we do, we are sure that you will give greater support to the A.A.S.T. and whatever program that you may decide and next year our meeting will far surpass this which has surpassed our expectations.

Tuskegee Institute, Alabama.

Keynote Address delivered by President Thomas H. McCormick at the luncheon Fall Meeting of the Alabama Association of Science Teachers at Stillman Institute, Tuscaloosa, Alabama, Nov. 9, 1940.

THE IMPLICATIONS OF SCIENCE FOR DEMOCRACY

F. D. PATTERSON

It seems to me especially fitting at this time that we should consider the implications of science for democracy. Fitting because both democracy as a way of life and science as a method of accomplishment are being challenged to prove their merit. On Sunday evening Dr. Michael A. Heilperin of Poland, told an audience at Tuskegee Institute that the outcome of the present war may spell the end of effective democracy. He defined democracy as government by the will of the majority when the majority are free to have and to exercise their wills.

There are many who recognize in the many problems which confront this nation the hand of science. Overproduction on the one hand and unemployment, at least so far as it is machine made, on the other can be said to be due to following the rapid advances which science has pointed out. The very horror of the war itself, which we have said may destroy democracy, is definitely related to the progress we have made under science.

It is clear, then, if science is to become an aid to the democratic process, it must first be brought under control. The scientific method which is simply the seeking for measurable truth bodes neither good nor ill. The results in terms of the effect of mankind are related entirely to the way in which these truths are used. Too often the truths which are sought are related to man's desires, be they good or ill, wise or unwise. His desire to be powerful has led to the chemical search for truth in the realm of explosives. His desire for the conquest of space has led to the development of aviation and high speed land transportation. The fact that most of his desires have been on the side of material gain has led to an unbalanced expression of science. A distinct lag exists in the use of science to reveal truth about the more sacred of human relations. If religion, for example, is to continue as a potent influence in the life of mankind, then it too must use the

method of science in arriving at its creeds and practices. Ye shall know the truth and the truth shall make you free, is I think a Biblical statement in keeping with this thought.

I offer then as a foreword to any consideration of the use of science in democracy the suggestion that science can be effective only in the hands of reasonable men—men who recognize that a sound will of the majority is possible only when that majority is provided with the basic essentials of comfortable living. It shall then be the duty of science to reveal the truths which shall make that acceptable minimum possible for all. If this is true, then so far as our present serious lacks in terms of food, shelter and clothing are concerned, which exist in spite of a superabundance or our ability to produce these things, the answer must come from the economic truths which will lick the problems of distribution.

The evolution of our methods of production, from that in which every man was sufficient unto himself under his own vine and fig tree to that of highly specialized production, has been too rapid. The direction in which the solution of the problems of distribution lay may be in a resimplification of life and it must certainly lay in the direction greater cooperative effort. The future use of science in a democracy will consist in part in providing certain compensations for the damages already done by the action of science in a democracy. That static condition of over population which we face in this country generally and acutely in certain areas is due to man's conquest over the diseases of youth and epidemic diseases with a consequent lengthening of the life span. We must now provide for a satisfactory adjustment socially and economically of those whom science has permitted to live.

Fortunately science can provide the answer. For with a several fold population increase since 1880 we are able to produce as much as we need on less land than was in production at that time.

If we consider the one item of food alone we find we are not only able to produce more of it on less land; we are able to produce it in better quality and with greater seasonal variety. The wise breeding of plants and animals has not only improved quality but has led in plants to the production drouth resistant and disease resistance varieties. In animals vaccines and sera have been produced to combat disease. Livestock production has been enhanced by the employment of scientific sanitation in methods of growth and handling. Once food is produced it may be preserved indefinitely to tide over periods of scarcity. This may be done by drying, salting, canning and more lately freezing. This latter method bids fair to destroy the seasonal relation of certain foods by making them constantly available in the fresh state. One may not pass on from the topic of plant growth without mention of the coming field of water and sand culture. This as you know relates to direct employment of the chemicals needed for plant growth in solution. Almost every conceivable variety of vegetable or flower may be grown this way. The growth of chickens in confinement on wire approximates this in animal production. Thus the dire prediction of the eminent economist, Malthus, a century and a half ago that the human race would cease to multiply on earth in a hundred years because it would be impossible to feed them seems to have been unfounded.

In the field of transportation mankind has shortened space to a remarkable degree. Good roads and motorized transportation and refrigeration have placed markets within easy reach of the farmer. This is fine for what he has to sell and a curse for what he has to buy. One should not overlook in this particular gain of transportation through science the gain to democracy which comes from increased movement of peoples. The democratic process has been speeded up in remote communities as they have become accessible through improved transportation. The cinema and the radio have also been important factors in this leaving process. There are twenty-five million homes in this country. The home is still regarded as the foundation of society. It is where the first principles are taught. It is fortunate that through science homes have become easier to own, while they have increased in beauty and comfort. Synthetic building materials are more durable as well as quite as attractive as wood. Economical and clean heat has been a potent factor in increased comfort.

We are beginning to see now the extension of modern homes to rural areas. There is no greater need in our Southland than that of low cost, attractive and comfortable homes in the rural South. This brings me to the point I am "hipped" on, namely, how education may through a realistic attack on the problems of living among Negroes bring science to bear in a practical and effective way. Certainly we must concede that with our present imperfect understanding of economics our approach to the acceptable minimum required for wholesome living lies in the direction of the employment of the available resources at hand to create the things we need. The difference between want and plenty is quite often simply a matter of wise expenditure. It will be a fine day for us all if management is ever reduced to a science and included in every curriculum. The approach that I am about to digress from may well begin with the classroom through the creation of teaching materials and extend to the home, the farm and the factory. Thousands, if not millions, of dollars are wasted in the equipment which schools purchase and destroy through neglect. The small amount of money available in most schools may through an ingenius teacher be made to meet entirely the needs of instruction and often of research. I enjoy the Popular Mechanic magazine for the many suggestions it offers for discarded or wasted materials. We have mentioned the rural home. Most are in need of running water, sanitary facilities, adequate heat, closet space, separate rooms for a division of sexes and assemblance of beauty. Most of these provisions are possible at little cost. Tuskegee Institute has developed a durable five room house, space for bath and curbed in well for less than $700.00.

The average small farm would profit by some form of cheap power. Such power could be used for grinding feed, sharpening tools, lifting water, churning milk and mixing cement. The farmer who must do everything the hard way has little chance to compete with his mechanized neighbor.

Small business men today are looking for versatility in their employees. Their income will not permit them to go into the labor market and employ unionized specialists for every small mechanical job required in the maintenance of a small grocery store or hotel. We have distinct service to render then in giving to students the applications of science in the various technical fields. This is an age of keen competition and is possible only as individuals are so prepared in terms of versatility and scientific method that they may make available to themselves or their employers the services needed at small cost.

Perhaps the greatest use of science in the democracy lies in the use of available scientific information in one's own personal self. Our knowledge of the oneness of mind and body should encourage us in the application of principles revealed through the scientific method about mental and bodily hygiene. Keeping well and keeping fit mentally and physically must needs consume more of our thinking as a highly advanced and nerve racking civilization is upon us. As we face conditions of more or less permanent maladjustment for an important share of the nation's people, frustrations and social pressures must be combatted. Those activities which promote mental and physical health must be emphasized all the more. The spirit of the frontier must be instilled. It must exist in the absence of an abundance of the raw materials needed for human happiness at hand. It is waiting to yield to the magic touch of those who know how to use it. Very often the by-products and wastes of industry have yielded under chemical scrutiny that which has proven more valuable than the substance of original manufacture. The possibilities are limitless and our job as educators is that of equipping an otherwise discouraged youth with the goods and outlook necessary to make the effort.

The principles of science in human growth must start at the beginning however. It will in this wise educate for marriage. It will concern itself with child growth and behavior. Dr. Alan Defoe of quintuplet fame told the Herald Tribune Forum that the growth and normal development of the Dionne Quints would not have been possible but for the basic stamina of the Dionne parents. Once that native endowment of prenatal virility is taken care of, then much must result from proper care which takes into account the physical, mental, emotional and social development of the child.

It would appear, therefore, that we have sufficient evidence to believe that science can create for us a more abundant life from the cradle to the grave. If this is to be accomplished, it shall require that man's evolution in terms of a higher and more noble existence shall go on apace with the revelations of science. It shall require a sanity of application of the scientific method which shall seek to enrich human life on all levels and in all conditions. The search for the accptable minimum for all must not lead to lavishness and extravagance. Science may and should offer the 'aison d'etre or right of being for the spiritual, mental and physical aspects of man's nature and so contribute to these as to make possible the sort of normal integrated human personality toward which all education strives.

The possibilities for science are well expressed in the Ballad of Ryerson which is a tribute to the Ryerson Physical Laboratory, noted for Michelson's measurement of the speed of light and Miligan's measurement of the charge of electron.

"Now this is the law of Ryerson and this is the price of peace
That men shall learn to measure or never their strife shall cease.

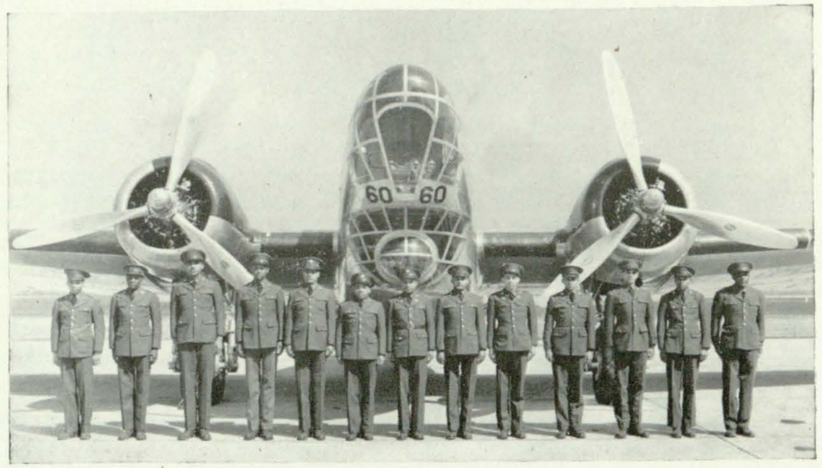
They shall measure the cost of killing, and measure the hearts that
bleed,
And measure the earth for sowing, and measure the sowing of seed.
For if they slay the dreamers and the riches the dreamers give,
They shall get them back to the benches and be as the galley slave.

But if they be wise to measure the star beneath their feet,
Intense with tissue of power and woven with waiting heat,
There are stary uses of stars. Let them love their planet and see
How it longeth to bear the burden and let the slave go free.
They shall loose the lightning gently, the granite shall bloom with
grain,
And under the rainbow glory young Eden shall come again."

Tuskegee Institute.

News From Here And There

MOREHOUSE STUDENTS JOIN 99TH PURSUIT SQUADON



Morehouse College, Atlanta, Georgia, made a significant contribution to national defense when 13 of its students enlisted in the 99th Pursuit Squadron, new all-colored unit of the Air Corps, recently. The recruits shown above will take airplane mechanics' and specialists' courses at Cahnute Field, Rantoul, Ill. They are, left to right: Charles Settles, Atlanta, Georgia; A. Crawford, Dayton, Ohio; James Mason, Monroe, La.; W. Herman, Atlanta, Ga.; W. Warner, Atlanta; L. Young, Dayton; J. Nelson, Atlanta; C. Chisholm, Birmingham, Ala.; James Jackson, Atlanta; Norris Connally, Atlanta; Charles Crenshaw, Little Rock, Ark.; Hiram Little, Atlanta, and John Moore, Atlanta.

SCIENCE IN THE NATIONAL DEFENSE

There is evidence that Germany, as early as 1933, established a research laboratory for military problems, manned by more than one hundred physicists; that some of its famous research institutes were directed to apply all their resources to problems relating to war; and that much of Germany's military success during the past year may be attributed to results of such developments.

Thus, in the huge task of developing our defenses against possible aggression, we are more than seven years tardy as compared with the world's most formidable aggressor. On second thought, certainly not seven years: our army departments—air corps, engineers, ordnance—and our navy have not been idle. Now, to catch up, there has been established the National Defense Research committee, to which responsibility and authority have been given to undertake intensive development of our scientific resources as applied to the defense of our country. That the assignment is in competent hands can be appreciated by noting the eminent men who comprise the committee: Dr. Vannevar Bush, chairman; Dr. R. C. Tolman, vice-chairman; Rear Admiral H. C. Bowen; Mr. Conway P. Coe; Dr. Karl T. Compton; Dr. James B. Conant; Dr. Frank B. Jewett; and Brigadier General G. V. Strong. Dr. Irvin Stewart is secretary of the committee.

We may feel assured that what can be done will be done in making this country strong enough to keep aggressors in all quarters at arms' length, and that every practicable scientific resource is being brought to bear on the problem of the common defense.

Cenco News Chats.

SUGGESTIONS FOR SELECTING AND PREPARING VEGETABLES TO RETAIN THEIR FOOD VALUE

Vegetables are excellent sources of minerals, vitamins, and bulk. For good nutrition we should eat two vegetables besides potatoes daily, one a green leafy vegetable and the other a raw vegetable, if possible.

Vegetables are introduced into the baby's diet about the fourth month of life. Beginning with a teaspoonful and gradually increasing the amount until the baby receives four to five tablespoonfuls per day by the end of the first year.

It is not necessary to have specially prepared canned vegetables for the baby. The mother can remove a serving of the vegetables to be sieved for the baby before the seasonings are added for the remainder of the family.

In selecting vegetables keep the following rules in mind:

1. Buy vegetables in season.
2. Select vegetables that are fresh, firm, and ripe.
3. Do not buy vegetables that are old, withered, moldy, or bruised, underripe, or overripe.
4. Leafly vegetables should not be wilted.
5. Peas and beans should have crisp pods.
6. Buy vegetables of medium size and regular shape.

7. Buy only the amount of summer vegetables you can use immediately, because they deteriorate in quality very quickly and are best when cooked soon after gathering.

In order to preserve the food value in vegetables the following rules should be observed:

1. Don't use soda in cooking green vegetables.
2. Use as little water as possible. Leafy vegetables such as spinach need no other water for cooking than that which clings to the leaves after washing.
3. Don't put them through a sieve while still hot.
4. Prolonged cooking of vegetables destroys certain vitamins, changes the flavor, texture and color.
5. In boiling foods, raise the temperature to the boiling point as rapidly as possible.
7. Don't throw away the water in which vegetables have been cooked. Use it in gravies, sauces, and soups.
8. Don't fry foods valuable for their content of vitamins A., B. or C.
9. Prepare chopped fruits and vegetables just before serving.
10. Start cooking frozen foods while they are still frozen.
11. If vegetables are boiled, cook with the peeling on.

Effect of Cooking and Storage on Vitamin Content of Vegetables:

Very little of the vitamin A in foods is destroyed during ordinary cooking and practically none is dissolved in the cooking water. When stored foods are exposed to light and air under ordinary conditions vitamin A is gradually destroyed.

Cooking causes destruction of thiamin (vitamin B). Soda added to vegetables in cooking increases destruction. Thiamin dissolves easily in water in which vegetables and fruits are soaked and cooked.

Ascorbic acid (vitamin C) is destroyed when exposed to the air. Ascorbic acid is very soluble in water. High temperatures destroy asorbic acid as well as light, aging, and storage.

Riboflavin (vitamin B) is not easily destroyed in cooking except when soda or other alkalies are used. Ribaflavin dissolves easily into water in which foods are cooked. Baking, steaming, using very small amounts of water in boiling vegetables, and using water in which vegetables are cooked, will preserve riboflavin.

Nicotinic acid is soluble in water.

Georgia's Health.

HEAD LICE

It has been said that taxes and death are certainties, with no way to avoid them. Almost the same thing can be said of the spread of the common louse at the opening of schools. Head lice may not be as prevalent as they once were, but, if we mistake not, they have not all passed away. The family still thrives.

We always have an increase and spread of this condition when schools open, because of the intimate contact with children who have been neglected so far as hygiene is concerned. The spread results from direct and indirect methods of contact. Hanging a cap or hat on a peg that has been used by a child who has lice may transfer these little pests to a child who has no lice. Of course, wearing a hat or cap belonging to a child who has lice would also be a method of transmission, and combs, brushes, and such intimate articles can often be charged with the transfer of these insects.

No one should be blamed for having head lice, but the blame lies in one who continues to have head lice after he knows that he is infected with them. Head lice are easily detected on the heads of children in school. If the teacher will give close attention during the regular morning inspection of her school, she will detect, usually just above the ears, some white, shiny particles attached to the hair. These are the eggs or nits of head lice. As soon as they are detected, the matter should be taken up, in a tactful manner so that no offense will be given, with the parents of the child, in order to protect the entire school, perhaps, from infection. Advice should be given that the child see his family physician for diagnosis.

The best way to get rid of lice is to kill the living parasites. A very effective remedy is kerosene oil, or the bichloride of mercury solution or salve can be used. The treatment for head lice should be repeated every 3 or 4 days until it is certain that there is no further infestation.

Cleanliness is perhaps the greatest of all our remedies against head lice. Strict attention should be given to the hygiene of the scalp. Proper soap shampoos are necessary, and in long hair fine-tooth comb should be used to get rid of not only lice but the nits. Short hair makes it much easier to control head lice than does long hair. Combs and brushes that have been used by children with head lice should be thoroughly cleaned and disinfected.

ALABAMA ASSOCIATION OF SCIENCE TEACHERS

At the Fall Meeting of the Alabama Association of Science Teachers which convened at Stillman Institute of Tuscaloosa, the representative present from the Junior Chapters of the High Schools and Colleges organized into a State Group. Mr. Hobort Johnson of Westfield High of Birmingham, was elected president of this group. The group adopted a constitution and agreed to send one to each school in the state. The theme of the discussion was, "How Can a Science Club Serve to the Best Advantage in my School."

The following purposes of the Junior Chapters were adopted;

1. To make Students conscious of the important functions of science and mathematics in the world of today.

2. To promote a type of scientific attitude that will stimulate further study.

3. To organize Junior Chapters in those schools that do not have an active club.

4. To provide a medium for the further study of principles discussed in the classroom.

5. To acquaint the student with the current scientific happenings.

It is the hope that each school will take advantage of the opportunity to organize a club and if one already exists, this material will encourage you in your work. Those clubs can be organized, named and then a charter can be secured at this office by sending a fee of 50c to cover the cost. The Association has designed a pin for the Juniors. This pin can be purchased at cost of 35c from the President, Mr. T. H. McCormick at Tuskegee Institute.

A suggested outline for the direction of the meetings of the Junior Chapters is listed below.

1. Roll Call—Each member responds with a scientific happening or article.

2. Reading and the adoption of the last minutes.

3. Program—Have different groups to sponsor the program for the meeting.

4. The clubs should divide themselves into interest groups and work on the various club projects.

5. The club can supply the school with current scientific magazines.

7. The club can sponsor drives to secure finance to be used to purchase pins for its members.

Each year the Alabama Association awards, prizes to the three Chapters or schools that present the best exhibits at the fall Meeting which is to be held at the same time as the State Teachers' Association, March 13, 14, 15. The following are a suggested list of subjects for the various aspects of the exhibits:

1. Sciences and Civilization.
2. Insect Collections and Displays.
3. Health Posters.
4. Solution of Original problems in Mathematics.
5. Mathematics in the Home.
6. Consumer Education—Composition of Commodities.
7. Communication and Transportation.
8. Chemistry in the Home.
9. Chemistry in Industry.
10. Collections of local Plants, Animals.
11. Building of Simple Apparatus for classroom demonstration.
12. Science as it Relates to National Defense.
13. The Effect of Science on the Present World Crisis.

PRESERVATION AND CURING OF FARM MEATS

BENJAMIN L. GOODE

"A food is a palatable mixture of foodstuffs, which is capable of maintaining the body in an equilibrium of substance, or capable of bringing it to a desired condition of substance. The ideal food is a palatable mixture of foodstuffs arranged together in such proportion as to burden the organism with a minimum labor."

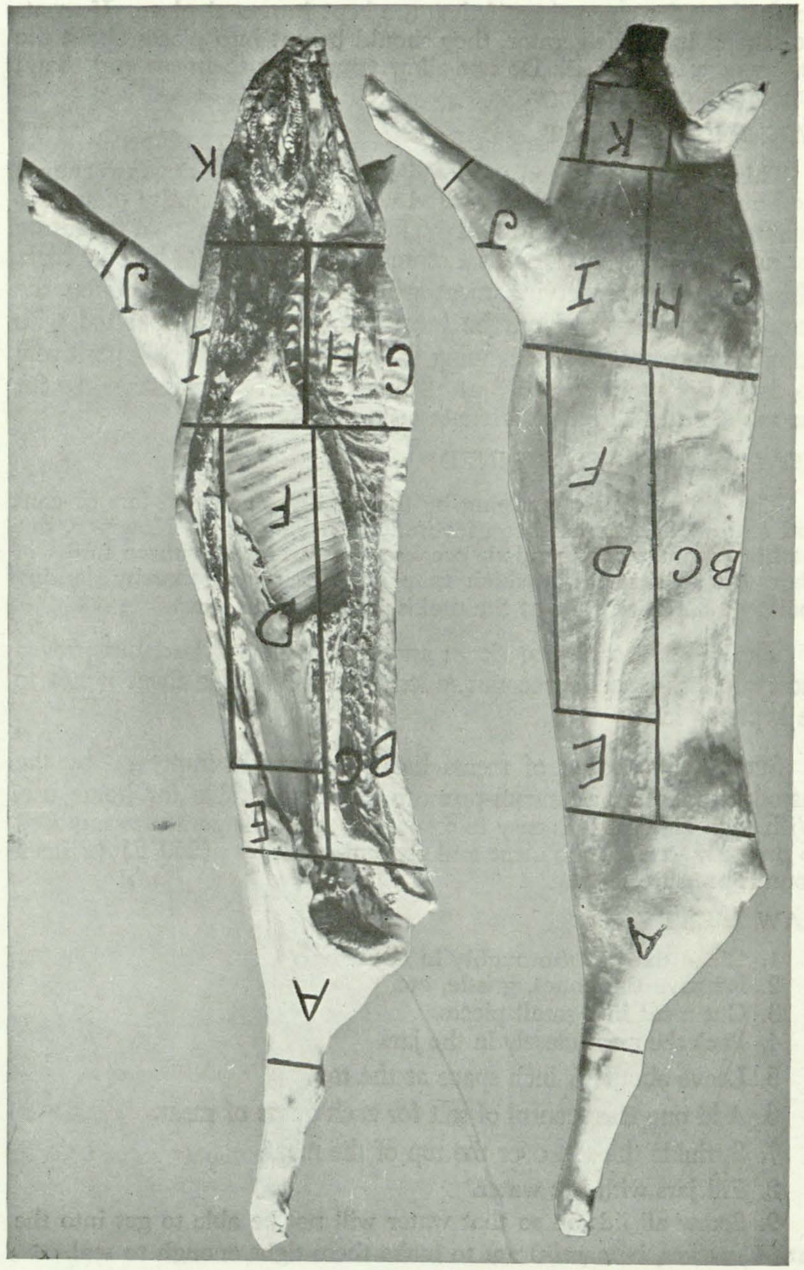
Information about preservation and curing farm meats and its importance is to be found throughout scientific literature. The material available is very extensive but much of it remains buried where the ordinary person is concerned, for it requires more time than he can devote to bring it to light. For this reason the most information from many authoritative sources as well as practical experience, has been gathered and condensed, and is presented here.

It is hoped that this material will be helpful and instructive to the many persons interested in preservation and curing of farm meats.

CURING MEAT

The curing of meat is one of the most common and practical ways of keeping it for future use on the farm or in the kitchen. It is known that some people prefer fresh meat to the cured meat, so it is necessary to devise a means for keeping it.

Meats may be preserved by the cold storage method or by canning. The cause of meat spoilage is in most cases due to bacteria; it is there-



Important Cuts of Pork: (A) Ham; (B) Fat back; (C) Loin; (D) Bacon; (E) Flank piece; (F) Spareribs; (G) Clear plate; (H) Boston butt; (I) Picnic shoulder; (J) Fore shank; (K) Jowl.

fore necessary to prevent bacterial growth as much as possible. Meats can be kept for some time if they are kept in a cool place. If meats are placed in a refrigerator, they should be cut into pieces about the size one expects to use. Do not allow your meat to freeze and thaw; that causes quick spoilage.

CANNING OF MEAT

This method has been used quite extensively by the farmer and the housewife. This method is used when a large quantity of surplus meat may be on hand; and aids the farmer to keep his meat for future use in the home when there is a scarcity, or when prices become high. This process of preserving meat will be practiced more when the people in the city and on the farm become better acquainted with canning processes. If the canning is properly done, there is positively no danger of spoiling, and is at all times ready for immediate use for the table, and will have the exact taste of fresh meat.

HOW ARE MEATS CANNED?

The old method of canning by thoroughly placing in jars or cans and sealing at once has been favored for a long time. However, this method is not recommended, because the farmer has three forms of plant life to deal with which may enter the jars, thereby causing spoilage. He must combat the molds, bacteria and yeast.

The method of frying down and covering with lard has proved most successful and is recommended especially if the meat is not to be kept too long.

Successful canning of meats has been greatly improved by the introduction of small steam-pressure canners suitable for home use. With such canners it is easy to secure the high temperatures required to properly sterilize the meat and prevent spoilage. (250°F) (Fifteen pounds pressure.)

RAW MEAT

1. Clean the jars thoroughly in hot water.
2. Remove the bones, gristle, etc.
3. Cut meat into small pieces.
4. Pack the meat closely in the jars.
5. Leave about ½ inch space at the top.
6. Add one teaspoonful of salt for each quart of meat.
7. Sprinkle the salt over the top of the meat.
8. Fill jars with hot water.
9. Screw all lids on so that water will not be able to get into the jar. However, be careful not to make them tight enough to seal.
10. Place all jars in a hot water bath, double boiler if possible. Be sure not to let the jars touch the bottom; in other words, a rack should be placed on the bottom to prevent the jars from touching.

11. Pack jars in warm water (about one inch) and heat gradually for about four hours.

12. Remove the jars and seal immediately. Store in a dark dry place.

COOKED MEAT

1. The meat should be partially cooked or completely cooked before canning.

2. If thoroughly cooked, it should be sterilized in a boiling hot water bath for three hours, or in a pressure cooker for forty minutes at fifteen pounds pressure. Practically any kind of meat scraps, roasts, steaks, etc., may be canned as stated above.

HOW TO CAN PORK

1. Select a piece of pork for roasting: ham, shoulder or loin. Scrape skin clean, and wipe with a damp cloth.

2. Salt and pepper should be sprinkled over meat.

3. For ham weighing 8 to 10 pounds use 1 to 2 tablespoons of salt and from ½ to 1 teaspoonful of pepper.

4. Heat in a roasting pan from 2 to 3 tablespoons of grease.

5. When hot, put in the roast and sear quickly.

6. Add 2 small turnips to the roasting pan and ½ to the cup of boiling water. Leave skin up and baste.

7. When cooked thoroughly, slice and pack in cans to within ½ inch of top of can.

8. Add the gravy from the roasting pan, with boiling water so that it barely covers the meat. (¼ inch space must be left between gravy and top of can.)

HOW TO CAN PORK CHOPS

1. The chops are quickly seared in hot grease.

2. Salt and pepper added (to taste) cooked until done and nicely browned.

3. The bone may be removed and a short piece of macaroni substituted.

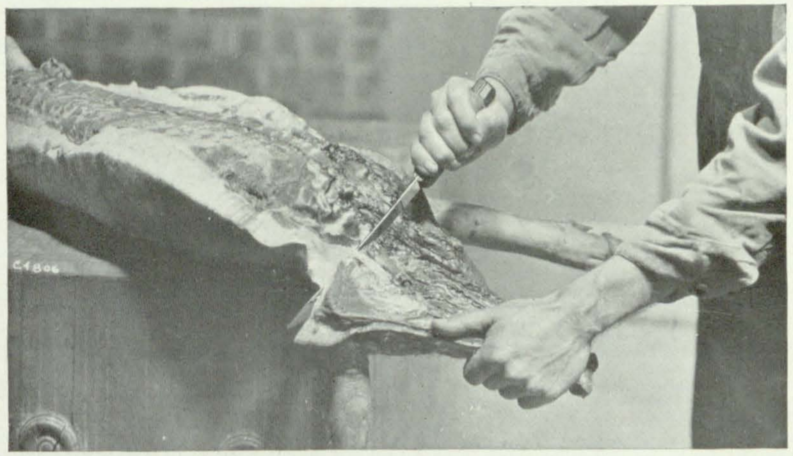
4. Then pack into cans about ½ full and fill with boiled string beans, spinach, sauerkraut, or small evenly browned potatoes.

HOW TO MAKE PORK SAUSAGE

1. An excellent pork sausage is made by using three parts of fresh lean pork to one part of pork fat.

2. Weigh the meat and for 25 pounds add:
   ½ pound of salt
   ½ ounce fine sage
   ¼ ounce ground nutmeg
   ½ to 1 ounce black pepper
   Mix thoroughly and pass again through meat grinder.

One may also can pork sausage by using the following method: Form into little round or flattened cakes and fry in deep fat until nicely browned. After cooking several pans full, pour off the grease and add water to the brown parts in bottom of pan to make gravy stock. Add this while hot to the packed cans. When packed hot (partly seal glass jars) seal cans.



Correct Method of Removing Shoulder

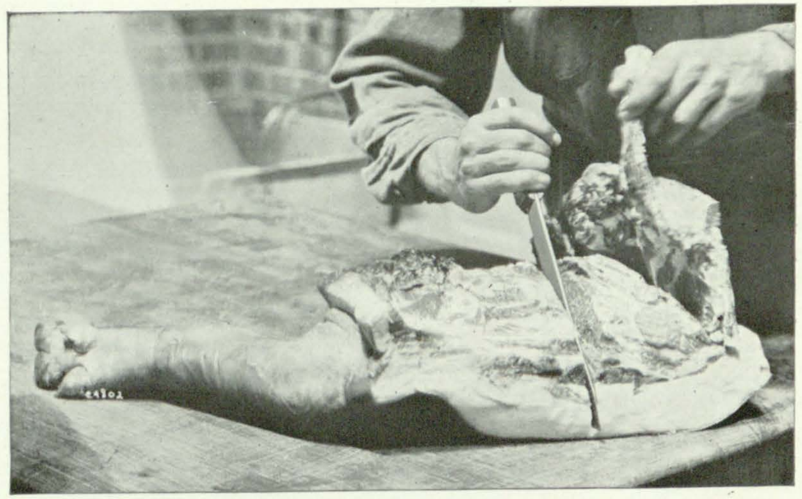
THE MAKING OF SMOKED OR COUNTRY SAUSAGE

There are various methods by which the farmer may make sausage. It is therefore necessary to bring to the persons interested in the making of sausage several different methods.

In all cases the meat should be ground into small pieces with the various seasonings sprinkled over it. It then should be put away in a cool place for from 24 to 36 hours, then add a little water and stuff into hog casings and smoked in a very cool smoke until a dark-mahogany color is obtained. All sausage should be well cooked before eating.

SMOKING CURED MEAT

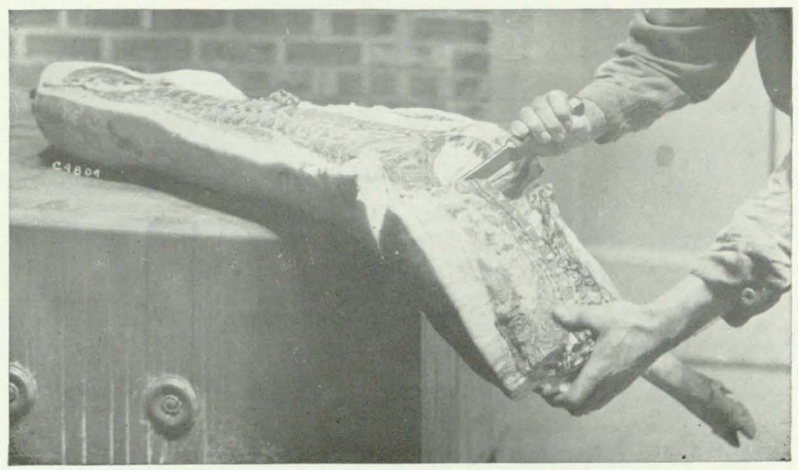
Farmers have many methods by which they cure meat, most of which are simply a variation of two principal methods. It has been



Removing Shoulder Butt from Shoulder

The following is used in making smoked or country sausage:

85 pounds of lean meat
15 pounds of beef
1½ or 2 pounds of salt
4 ounces black pepper
1 ounce red pepper
1 ounce sweet marjoram
1 ounce mace



Showing Proper Method of Removing Head

found that common salt is the basis of all meat-curing material. It has a preserving effect, drying and hardening the tissues.

Smoking aids in preserving the meat. Smoking also gives a desirable flavor to the meat if it is smoked properly and with the right kind of fuel.

The fuel should be green hickory or maple wood. Hard wood is preferable to soft wood. Resinous woods should never be used, as they give an objectionable flavor to the meat. Smoking should be done over a cool fire. The meat should be hung so that none of the pieces touch and are far enough away from the fire to prevent making meat too warm. (6 feet to 8 feet.)

Iowa Agricultural Experiment Station circular No. 6 "Selecting, Dressing and Curing Pork on the Farm," gives a very simple way of smoking meat on the farm. This method is very inexpensive to the farmer, and practical, especially for those who are not able to have a smoke house.

Where there is only a small amount of meat to smoke, the following method will give satisfaction: Dig a hole about three feet deep. Lay a tile from a point about a foot from the bottom of this hole to a point about four to six feet away; then bring the tile to the top of the ground. Knock both ends out of a barrel and set it over the end of the tile. Lay a couple of strong sticks across the top of the barrel to hang the meat on, and then cover as tightly as possible. Build a fire in the hole and cover as tightly as possible. Allow it to smoke about a week. Care should be taken not to raise the temperature of the smoke house above 100° F. The meat will drip and will absorb the hot smoke and a strong flavor results.

RECIPES FOR CURING MEAT

The Brine Cure:

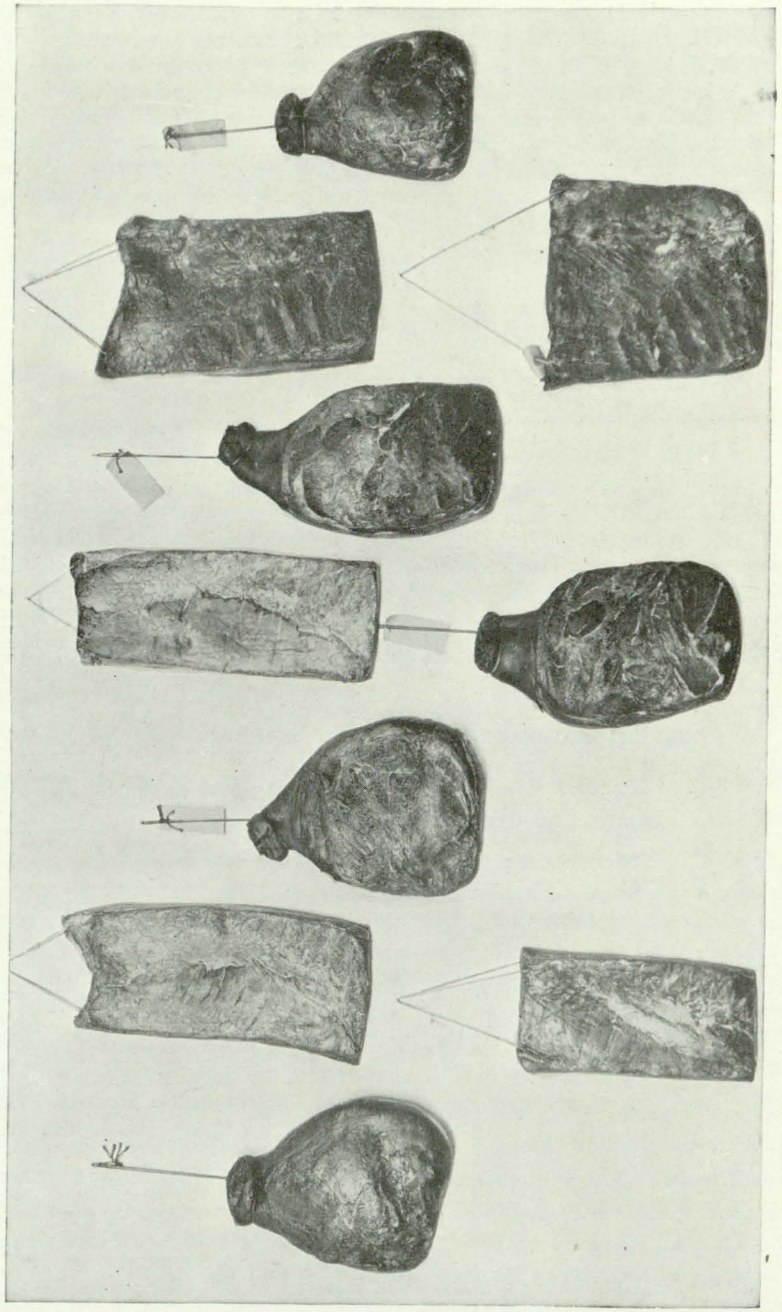
Whenever sugar is added this cure is known as the "sugar cure" or sweet pickle.

For each 100 pounds of meat use:

10 pounds salt
3 pounds sugar
3 ounces saltpeter
5 gallons water

The salt, pulverized saltpeter, and sugar should be thoroughly mixed (brown sugar preferred). The mixture should be thoroughly rubbed into the hams, shoulders, and bacon. All meats may be packed in the same vessel. By using brick, or hard-burned tile, weight this down. This should be done before the brine is poured in.

Six gallons of water should be boiled to make sure that it is absolutely pure. When the water is luke warm, dissolve it in the ingredients left after rubbing the meat. After the brine is cooled, pour it over the



Country Cured Meats

meat. Be sure all meat is covered.

Set aside in a cool well ventilated place to cure about three days per pound per piece. Two days per pound is enough for bacon. The hams should be trimmed down to weigh from 15 to 20 pounds. In order to insure a uniform cure, the meat should be repacked in 7 days, leaving out all small pieces, such as jowl, etc. The meat should be repacked again on the 21st day of the cure and bacon removed. When the meat comes out of the cure, wash thoroughly in hot water to get all grease off rind, then wash in cold water and hang in smoke house to drip about 24 hours before smoking.

THE DRY CURE

Note again salt is the basis. For every 100 pounds of meat use:

8 pounds of salt
3 ounces saltpeter
3 pounds sugar (brown preferred)

Mix all ingredients thoroughly and rub half of the mixture on the meat. In 7 days, rub the other half of the mixture on the meat. The small pieces may be left out this time. Repack again on the 21st day of the cure and remove the bacon. The meat on the top now should be placed at the bottom and vice versa, to get a uniform cure. Three days per pound will be sufficient for the hams and shoulders. Wash the meat with cold water and hang in the smoke house to drip for 24 hours before smoking.

All other methods of curing meat are a variation of one of the above methods.

CURING SMITHFIELD HAMS

The U. S. D. A. Farmers Bulletin 1186 gives the following:

The hams should be placed in a large tray of fine salt, then the flesh surface is sprinkled with finely grounded salt peter until they are as white as though covered by a moderate frost, or use 4 to 6 ounces of the powdered saltpeter to each 100 pounds of green hams.

After applying the saltpeter, salt immediately with fine salt, cover the entire surface well, then pack the hams in bulks, skin side down, put in piles not more than three feet high. In ordinary weather the hams should remain thus for three days. Then break bulk and resalt with fine salt. The hams thus salted and resalted should now remain in bulk one day for each pound; that is a 10 pound ham should remain 10 days and in like proportion of time for larger and smaller sizes. When the cure is complete wash with tepid water until the hams are clean, and after partially drying rub the entire surface with finely ground black pepper. They should then be hung in the smoke house

and the important operation of smoking begun. The smoking should be done gradually and slowly, extending through 30 or 40 days.

After the hams are cured and smoked they should be repeppered to guard against vermin and then bagged. Such hams improve with age and are in perfect condition when one year old.

To prevent the possibility of getting the disease known as trichinosis, be sure to cook pork well.

HOW HAMBURGER IS MADE

In making hamburger, use all the lean trimmings and any parts of the carcass for which you have no other use. Grind and mix:

50 pounds of beef
1 pound of salt
4 ounces of pepper

CORNED BEEF

Practically any part of the beef carcass can be corned, the brisket, navel and rump are often used in this way. Cut in 5 or 6 pound chunks. Pack in a clean vessel. For each 25 pounds of meat use the following sweet pickle:

½ pound salt
1 ounce of saltpeter
¼ pound sugar or syrup
1 gallon of water

Repack in one week, it will take two weeks for the cure and the meat can be used out of the brine.

West Virginia State College.

The authoritative sources of this leaflet are as follows:

U. S. D. A. Farmers Bulletin No. 1186.
North Dakota Agricultural Circular No. 47.
National Livestock and Meat Board.
Lecture Notes and practical experience.
Florida Agricultural Experiment Station Bulletin No. 236.
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Iowa Agricultural Experiment Station Circular No. 61.

The Periscope

McRAE MEMORIAL SANITORIUM

In all the country there is no other institution like McRae Memorial Sanitorium at Alexander, Arkansas. It is not the cost, $450,000, which sets it apart; it is not the type of institution which makes it unusual; it is not because it is a State Sanitorium for the exclusve use of Negroes. The McRae Memorial Sanitorium is noteworthy because it is the only State Sanitorium which has an all-Negro staff of doctors and nurses, and a State Board of Trustees with Negro members.

In the appointment of Dr. H. H. Brown, Superintendent, the Board disproves the frequently made claim that there are no Negro doctors qualified to head a state sanitorium, for as the only Negro Fellow of the University College of Christ Physicians, he is a nationally recognized authority in his field.

The Sanitorium has a Nurses' home which accommodates thirty-six. A training school for nurses will be established with 16 girls from the Arkansas High Schools. Besides the nurses' home there are six other buildings, one of which is a convalescent home.

NATIONAL TECHNICAL ASSOCIATION MEETS

Chicago was host to the 12th annual convention of the National Technical association meeting at the Wabash Avenue Y.M.C.A.

Following registration and the national executive committee meeting, the first business session started, with Paul E. Johnson, national president, presiding. At this time there were reports of credentials committee and national officers and appointments of organization business committees.

In the afternoon there were committee conferences and a business session, followed by a smoker Friday night at the Quincy. New business was taken up and in the afternoon there were tours and inspection of the city and a technical session at the America Negro Exposition in the Chicago coliseum. The ladies auxiliary business meeting took place at the home of Mrs. Paul E. Johnson at which time Mrs. Gertrude E. Henderson presided.

Officers of the Chicago host chapter are William F. Thornton, chairman; S. C. Cheevers, vice-chairman; J. W. Lucas, secretary; Augusta D. Watson, treasurer; Byron Fountleroy and Paul E. Johnson, members of the executive board, and Woodrow B. Dolphin, chairman of the convention committee.

In addition to Mr. Johnson, other national offcers are Richard C. White, Brooklyn, president-elect; James C. Evans, West Virginia State college, secretary; Lewis K. Downing, Howard university, past president, and Julius M. Garner, Washington, treasurer.

Chapters are located in Chicago, Greensboro, N. C., New York, St. Louis, Dayton, Ohio; Los Angeles, Pittsburgh, Tuskegee, Detroit, Nashville, Washington and Prairie View, and has a membership composed of the nation's leading engineers and technicians and architects.

ENGINEERS PRESENT PLAQUE TO DR. GEORGE W. CARVER

The Federation of Architects, Engineers, Chemists and Technicians, at the end of their fifth national convention, honored the achievements of Dr. George W. Carver by awarding him a plaque at a luncheon in the Hotel Pennsylvania Sunday afternoon. Because of illness and orders of his doctor, Dr. Carver was unable to be present and the award was received by his assistant, Dr. A. W. Curtis, Jr.

Dr. Franz Boas, dean emeritus, department of anthropology, Columbia University, made the award as two hundred persons, including delegates to the convention, looked on.

Speakers for the occasion included Dr. Boas, Dr. Curtis, Prof. E. L. Demertri, president of the N. Y. alumni of Tuskegee; Col. B. O. Davis, of the 369th National Guard; and Rev. George F. Miller. Frank L. Hailsstik, Jr., was chairman of arrangements and Lewis Alan Berne, international president of FAECT, acted as master of ceremonies.

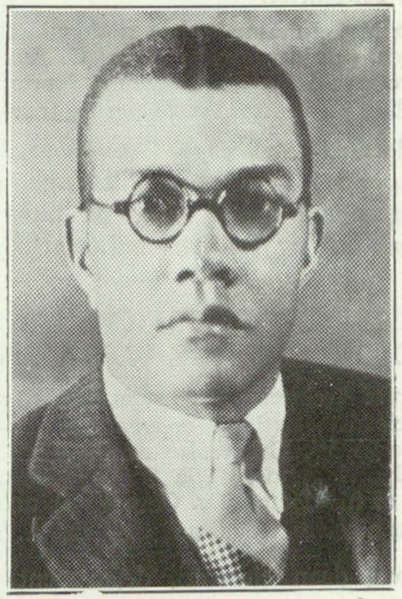
In a letter to the body expressing his appreciation of the award Dr. Carver sent his regrets at not being able to attend but felt sure "my worthy assistant A. W. Curtis, Jr., will tell you how deeply I regretted not being with you in person."

In accepting the award Dr. Curtis told of his appointment as Dr. Carver's assistant five years ago and said that because he was the first person to be honored thus he had the "responsibility of seeing that Dr. Carver's work was perpetuated. If this man born in slavery, had not received the opportunity which he rightfully deserved, his contribution to the progress of the nation would have been lost."

In closing Dr. Curtis said that "this is evidence of the important rôle the Negro has played unselfishly in American life. He has worked, never with the aim of defeating the cause, but always towards the promotion of the ideals and purposes of democracy."

LIVINGSTON PROFESSOR MAKES GREAT ACHIEVEMENT

HAROLD A. L. CLEMENT



CLARENCE W. WRIGHT

Mr. Clarence W. Wright, biology instructor at the North Carolina instiution, attained honor that few Negroes in the field of science ever accomplish. At the 107th annual meeting of the American Association for the Advancement of Science held at Philadelphia, Pa., in the University of Pennsylvania, December 27, 1940 to January 2, 1941, Professor Wright was elected a member of this great and learned organiaztion. Membership into this association is based mainly upon some very significant and original contribution to scence.

Mr. Wright has made original contributions to the field of biological science, of which he is department head at Livingstone, his researches have been in that branch of science that deals with endocrinology and anatomy, which attracted wide attention among scientists. These studies were published in the Journal of Endocrinology. The bulletin of the Association for the Study of the Glands of internal secretion. November 1937 and '38. Since his coming to Livingstone in 1938, Mr. Wright has done much studying on the spleen, one of which is to be published soon and will add to the achievement of science in America. While interviewing the brilliant professor at his office the writer noticed him preparing a manuscript in his field which will be published in the near future as a textbook.

He is to be the speaker and lecturer at a seminar at State Teachers College, Bluefield, W. Va., during Negro History Week, February 14.

Men who become members of the A. A. S. are listed in Cattell's American Men of Science; and according to Professor J. P. Corcoran of Xavier credit only 12 Negroes, prior to Professor Wright's admittance into the organization, as having been listed in the book.

Mr. Wright graduated from Wilberforce University in 1932 and received his M.S. from Ohio U., where he has done much advance work. He gives much credit to Ralph N. Pyrtle of Wilberforce, who is head of the biological department, for his success. He is a member also of the American Biology Teachers' Association and the N. C. Negro Teachers Association.

DR. THEODORE KENNETH LAWLESS

Dr. Theodore Kenneth Lawless, internationally known physician, is instructor in dermatology at Northwestern University school of Medicine.

Dr. Lawless is a specialist in bacteriology. He received his M.D. and M.S. degrees from Northwestern medical school in 1919, and has done further study at Columbia and Harvard universities, the University of Paris, Frieberg in Germany and the clinics at Vienna. Mr. Lawless is from Chicago and is a member of the Chicago Medical Society, a Fellow of the American Association, an associate examiner of the American Board of Examiners, and a member of the Chicago and Mississippi Valley Dermatology Societies.

NEGRO CHEMICAL BUYER SAVES NEW YORK CITY $50,000.00 ON SINGLE DEAL

Mr. A. Maurice Moore, Negro buyer of drugs and chemicals for the City of New York, has added a noteworthy accomplishment to his career by the saving of approximately $50,000 in the purchase of deodorants for the use in landfills. The New York Department of Sanitation desired to use a costly product sold under a brand name. This product was covered by a patent, although it had been introduced as a deodorant in the sewage plants of the City of New York many years before the patent was granted. After an investigation requested by the Department of Purchase, the Corporation Counsel's Office rendered a comprehensive opinion declaring the patent invalid.

Mr. Moore then procured the required ingredients and demonstrated to the Department of Sanitation the proper method of mixing them. The original product sold as a patented article for $2.00 per gallon, while the identical product prepared by Mr. Moore cost approximately $ .60 per gallon.

"FRIDAY" MAGAZINE FEATURES STORY OF NEGRO ARTIST

"Art the Hard Way," by Jerome Klein, one of America's leading art critics, in the January 17th issue of FRIDAY Magazine tells of the courage and hardship of Horace Poppin, Negro artist, and his struggle to become the outstanding painter he is today.

When Horace Pippin was shipped home from France in 1919 with his right arm strapped to his side, it seemed a dead certainty that he was through for life—even though he did have a *Croix de Guerre*. His army doctor admitted he was fit for no man's work.

For ten years he could do nothing but remember and fume—until one day an idea struck him. He had found a way, crippled though he was, to paint again. Patiently and painfully he worked—until the painting he had labored over for three years was "discovered."

Today, with his paintings shown in the great art galleries, he can look upon his achievement as having been well worth the tireless and painstaking effort it cost him, and if ever a man has pulled himself up by his own boot straps to achieve the impossible, Horace Pippin is that man.

FRIDAY'S exclusive feature is supplemented by candid photographs of this fine artist showing his technique and the painting which brought widespread acclaim.

NOTED DOCTOR HONORED FOR SCIENCE CONTRIBUTION

Dr. George Shropshear, junior attending surgeon and chairman of Division of Proctology at Provident hospital was one of the six business and professional people honored by the committee of 100, a Chicago appreciation group, at a Frederick Douglass-Abraham Lincoln-George Washington dinner in Chicago February 28.

Dr. Shropshear was the first physician to report the successful use of the drug, sulfanilamide in the treatment of lympho-granuloma, a venereal disease. His report published in the Illinois Medical Journal and the national leading newspapers, threw new light on the treatment of what medical authorities term a rare and mysterious disease.

Also a Rosenwald Fellow, Dr. Shropshear has studied under the greatest medical authorities in the country, including Dr. Clement L. Martin, professor of surgery at Loyola University School of Medicine.

A lecturer in the control of genito-infectious diseases at the Municipal Social Hygiene Clinic, Dr. Shropshear addressed the Chicago Urological Society at the Palmer House followed by an address to the American Neisserian Medical Society in its annual meeting in New York.

He is a member of the Chicago Medical Society, Fellow of the American Medical Association, American Neisserian Medical Society, American Hygiene Association and the Cook County Physicians Association.

THE PLACE OF SCIENCE SURVEY COURSES IN THE CURRICULUM

H. L. VAN DYKE

It is the intent of this paper that science survey courses refer to these courses in the college, secondary, or elementary curriculum which have for their purpose an integration of the individual courses such as biology, physics, and chemistry.

For years such courses on the elementary and secondary level have been referred to as courses in nature study and general science. In recent years, these courses on the college level have been referred to as orientation courses, or survey courses.

It is difficult to trace the exact beginning of these courses on the elementary and secondary levels, but W. L. Eikenberry[7] in his book, "The Teaching of General Science" sets the introduction of general science into the secondary school at the beginning of the present century.

Morris Winokur[4] of the College of the City of New York made a survey in 1936 to determine the scope of Science Survey courses in institutions of higher learning and the extent that they may be endemic. The first survey course, as we know the survey course today, was offered in 1919. In 1920 there was 1, 1 in 1924, 14 in 1927, 5 in 1929, 5 in 1930, 5 in 1931, 4 in 1932, 8 in 1933, 41 in 1934, 11 in 1935, 4 in 1936 to about 158 in 1938. This list, not including the year 1938, included 44 liberal art colleges and universities, 35 teachers colleges, 11 normal schools, and 14 junior colleges. In the last two years a survey of colleges, science survey tests and syllabi indicated a very rapid increase in the number of courses in the institutions of higher learning, but an exact statement is not possible at this time.

PURPOSE:

The purpose,[7 4] of the general science and nature study courses have been, to give scope to those native and acquired tendencies and interests that can find expression and development through scientific materials and experimentation; to give out-comes essential to efficient citizenship; to lay a basis for increased general intelligence, and for orienting the individual to his environment; familiarity with the general laws of nature; and the developing the scientific attitude of mind.

The purpose of these survey courses in the curricula of the institutions of higher learning may be classified as cultural, and for orientation purposes. Because of the American student's field of narrow specialization early in his college career, and of the classical nature of college curricula, the survey courses intended to give the student a better understanding of his physical and social environment and an acquaintance with worth while leisure activities.

EXTENT AND TRENDS:

Clarence M. Pruitt,[4] business manager of the Journal of Science Education made a survey in 1937 of the integrated science courses in the curricula of the schools of the United States. He found that nearly all elementary and secondary schools used nature study of general science courses, such as chemistry, biology, and physics. For the institution of higher learning the picture is different. From a study of 1,400 representative universities, colleges, teachers colleges, junior colleges, and colleges for Negroes, 150 were found offering survey courses. One third of these were teachers colleges. As far as I can ascertain, two Negro colleges in Alabama are using survey courses in science.

There seems to be some very definite trends in the survey courses in the natural sciences. In the early days, courses in natural philosophy were less specialized and included materials from other fields. They could be called the forerunners of present day survey courses.

At first, survey courses were of two types, comprehensive and selective. Subject matter of the comprehensive course is chosen from the major division of science and arranged so that the student may *"survey"* these divisions.

More recently the selective type is considered. The typical course in a survey of physical sciences is designed to orient freshmen into the fields of specialization such as astronomy, chemistry, geology and physics. It aims to give a concrete conception of the physical world, some knowledge of the scientific method and the part it has had in the intellectual life of the race, and the contribution of the physical sciences to the solution of contemporary problems. Also they may be arranged to teach the fundamental laws of physics, chemistry and biology; to present, by practical demonstrations, laboratory techniques; and to lead students into the fields of scientific thought through library research. Increased emphasis on human activities and curriculum studies recently has favored the selective survey course through the use of topics such as: Human Growth and Development; Maintaining the Personnel and Public Health; Recreational Activities; Economic-Industrial Life; and Thinking About Life and the Universe.

Another trend in the survey course seems to be that the percent of publicly supported institutions interested in survey courses is becoming greater than privately supported institutions.

The larger insittutions are tending to give analytical selective courses in departments, while smaller institutions give a descriptive selective survey for freshmen.

There is the tendency for each institution to write and use a syllabus for these courses with the University of Chicago being one of the first institutions to start this movement.

Recent investigations seem to indicate that the method of teaching the survey by a specialist in the several selected fields in changing to one person teaching the entire course.

A further trend is to make the survey elective for freshmen in liberal arts colleges and compulsory for freshmen in teachers colleges. Further the courses are not offered for majors or minors in science.

APPLICATION IN FUTURE

A. W. Hurd of the University of Minnesota from the analysis of some 500 curriculum studies feels that integrated science courses only should be used from the elementary school through the junior college. He would eliminate the specific course because of th tendency to tach detailed subject matter, because the majority of high school students do not go to college, and a still smaller percentage who do not major in the sciences and therefore do not need subject matter and technique. Those who do not go to college need a general cultural background and correct conception of the universe in which they live as well as some practical every day habits. For those who do continue to college, a correct view of the purpose of science will better enable them to select or not select a major in science during their freshman year in college. It would enable them to organize and teach integrated science courses after college bcause they had pursued their specific science courses with a clear sense of their correlation.

The survey in the Physical and Biological sciences have been used at The State Teachers College in Montgomery, Alabama since 1934. Our aims have been threefold: (1) The effective orientation of the college freshman to his later decision as to a college major of specialization or to further electives in the field; (2) The presentation of the contribution of science to the every day life and intelligence of the student and future citizen not concerned with any major interest in science and probably attending college for just one or two years; and (3) The discovery of promising prospects and the elimination of those intellectually incapable of pursuing advantageously a senior college program.

Our findings in this four year period have shown that 10 percent of those in the survey who did not intend to major in science did start their major or minor in science during their sophomore year.

We also find that the seniors majoring in science show in their methods classes a lack of knowledge of the correlation of the sciences, and hence not the correct prospective for the teaching of general science that most of them do in the State of Alabama. Hence we feel that the survey course should be given so that our aims for those in the freshman closs still hold, but also that the seniors taking methods of teaching science would have the opportunity of electing a survey course for the benefit of the science summary and correlation that it can offer.

SUMMARY

1. We find that general science courses have appeared in this country and have become permanent in the college curriculum in the last six years.

2. The aspects of the survey are mostly cultural in our educational scheme.

3. The trend of the survey in recent years has been for an increase in teachers colleges, and is becoming more selective than comprehensive.

4. The course must be designed for the specific needs of the students in a particular situation.

5. That seniors as well as freshmen may profit from the integrated sciences.

The State Teachers College.

BIBLIOGRAPHY:

[1]Science Education Vol. 21, 1937 page 10.
[2]Science Education Vol. 21, 1937 page 147.
[3]Science Education Vol. 20, 1936 page 133.
[4]Science Education Vol. 21, 1937 page 65.
[5]Science Education Vol. 21, 1937 page 61.
[6]School Science and Mathematics Vol. xxx, 1930 page 653.
[7]Chemical Education Vol. 13, 1936 page 457.
[8]Science in the New Education—Slavson and Speer.
[9]A Second Digest of Investigations in the Teaching of Science—Curtis.
[10]The 31st Yearbook of the National Society for the Study of Education Part 1, A Program for Teaching Science.

EXCHANGES

Organic Finishing, Section of Metal Finishing
Founded January, 1908 as Metal Industry
Publication Office, 116 John St., New York

The Japanese American Review
Established 1900
Nippon Publishing Co., 216 East 45th St., New York

The Du Pont Mazagine
Better Things for Better Living—Through Chemistry
E. I. Du Pont De Nemours & Co., Wilmington, Del.

The Normal Index
State Agricultural and Mechanical College
Normal, Alabama

Science News Letter

Science Service, Inc.
2101 Constitution Ave., Washington, D. C.

College Health Review
Division of Hygiene and Public Health
School of Medicine, Howard University, Washington, D. C.

Georgia's Health
Georgia Department of Public Health
Atlanta, Georgia

The Arcadian Grower, Georgia Edition
The Barnett Company, Atlanta, Georgia

The Southern Frontier
Commission on Interracial Cooperation, Inc.
710 Standard Building, Atlanta, Georgia

THE MOSQUITOES OF GEORGIA, WITH SPECIAL REFERENCE TO DISEASE TRANSMISSION

JAMES H. BIRNIE AND HAROLD B. KELLY

Although investigations conducted during the past half-century have definitely established the fact that certain species of mosquitoes act as vectors for diseases affecting man and domestic animals, there are still some sections of this country for which little information exists regarding the species present and their importance in disease transmission. Further, the available information is frequently widely scattered, hence there is need for studies that bring together the available literature to serve as a guide for workers who wish to plan future studies.

The mosquito fauna of Georgia, so far as the writers have been able to ascertain, has never been the object of a detailed study comparable to that made by Freeborn (1926) for California, Mail (1934) for Montana, Owen (1937) for Minnesota, Carpenter (1939) for Arkansas, or Birnie (1940) for South Carolina. Root (1924) made a very comprehensive study of the mosquitoes of Lee County, Georgia and others have reported the results of local surveys, but these do not present a view of the situation existing throughout the State. The nearest approach we have to a report dealing with the mosquitoes of Georgia is the work of King, Bradley, and McNeel (1939) on "The Mosquitoes of the Southeastern States." This excellent report dealing with the identification, distribution, economic importance, and control of mosquitoes in the Southeastern States brings together a large volume of valuable information but does not furnish much data regarding the role of the disease transmitting species found in various regions.

The information which forms the basis of this report has been compiled from the literature, field observations, and data supplied by physicians throughout the state. It is the hope of the writers that this report will be of service to those interested in the spread of mosquito-borne diseases throughout this section.

I. GENERA AND SPECIES FOUND IN GEORGIA

The data regarding the genera and species of mosquitoes found in

Georgia has been compiled from the work of Howard, Dyar, and Knab (1912-17); Dyar (1922); Dyar (1928); Root (1924); Mayne (1926); Matheson (1929); Boyd (1930); King, Bradley, and McNeel (1939); and other less known workers. Compilation of this data shows that there are thirty-six species of mosquitoes known to occur in Georgia. These are distributed among eight genera. This information along with data regarding the biology of the various species is presented in Table 1.

In addition to the thirty-six species recorded above, the writers have reason to believe that at least two other forms are present within the State. Specimens of *Culex pipiens* Linn. have been found in the western part of South Carolina within seven miles of the Georgia line, and larvae of the salt-water race of *Anopheles crucians* Wied. have been collected along the Carolina coast within seventeen miles of the Georgia line. A consideration of the geographic and climatic conditions leads one to assume that the range of these forms extends far beyond the points where they were collected. Thus, the possibility of these two forms being present within the state should be considered seriously.

II. LARVAL HABITAT

Mosquitoes have a tendency to show preference for waters of a particular character when selecting a site for depositing their eggs. The degree of preference varies in different species, as some larvae are always found in restricted habitats, while others are found in a variety of situations. Collections made in the field lead one to believe that even the most general breeders exercise some preference in selecting a place to oviposit. Investigations regarding the physical and chemical properties of waters have not revealed the reason for the presence or absence of larvae in various habitats.

In this report the larval habitats are divided into five general groups based upon the general character of the water. It will be seen that three species are domesticated, ovipositing in artificial containers such as tubs and catch-basin. Eight species prefer permanent ponds or pools which usually contain acquatic plants around the margin where the larvae are most abundant. Temporary pools, formed by rains or flooding streams, form the larval habitat of twenty-one species. Salt marshes are utilized by twenty-two species. Water collecting in tree-holes forms the larval habitat of five species. It is not to be implied that mosquitoes utilize only one of the sites referred to above, as at least three species are known to be found in more than one of the general habitats listed.

III. ECONOMIC IMPORTANCE

Every blood-sucking insect that feeds on man and domestic animals is regarded as a pest and a potential disease transmitter. Mosquitoes are no exception to this rule. Further, their ability to inflict pain and the diseases they transmit frequently result in definite losses to the residents of mosquito-infested areas.

The effect of mosquito bites on humans varies greatly in different individuals but few enjoy immunity to the swelling and severe itching which follow an attack. As pointed out by Matheson (1929) and Owen (1937), some individuals are sensitive to the bite of one species and are comparatively unaffected by another species. In this connection, the senior author has observed that he does not show a skin reaction following the bite of *Aedes aegypti* or *Anopheles quadrimaculatus*, but the bite of *Psorophora ferox* causes a painful reaction. The annoyance caused by mosquito bites is generally more severe in the case of young children than in adults, as the pustules may remain for weeks and serve as a point of entrance in bacterial infections.

Sportsmen, tourists, and others seeking outdoor recreation in mosquito-infested areas of Georgia are frequently so annoyed that they cut short their stay in that particular area. Further, the unendurable conditions of mosquito-infested areas cause a great reduction in the value of land and real estate. This constitutes a grave problem at the seaside, in the region of lake resorts, and in towns subject to mosquito invasions.

Livestock owners suffer considerable loss due to mosquitoes spreading such diseases as filariasis of dogs, bird malaria, fowl-pox, and equine encephalomyelitis. In addition, considerable loss is suffered due to mosquitoes irritating the animals, a drop in milk production, and the expense of repellents. The drop in milk production is probably the most serious effect felt by livestock owners. Dairymen in the worst affected areas report that milk production may fall off as much as twenty percent during the time that mosquitoes are abundant. The loss of blood due to mosquitoes also constitutes a serious problem to livestock owners. The studies of Stage and Yates (1936) indicate that 500 mosquitoes feeding during their active period would consume 0.05 pint of blood per day. In areas of severe infestation where hundreds of mosquitoes attack an animal daily, this constant blood loss doubtless causes serious physiological upsets. No cases of death due directly to mosquitoes have been recorded in Georgia but a species found in the state (*Psorophora columbiae* Dyar and Knab) is reported by Bishop (1933) to have killed eighty head of cattle, three horses, one mule, sixty-seven hogs, twenty chickens, and two dogs during a severe outbreak in Florida.

In regard to the biting habits of the thirty-six species found in Georgia, seventeen are regarded as vicious biters, fifteen will bite but are not regarded as vicious, and only four are known not to attack humans. With more than 50 percent of the species occurring in the class regarded as "vicious biters," it is easy to understand such problems as the annoyance suffered by humans and livestock, reduction in land values, etc.

The exact financial loss suffered annually by Georgia, due to the presence of mosquitoes, is difficult to estimate. A conservative calculation, based on the work of Hyslop (1939), would indicate an annual loss of approximately $4,000,000 for Georgia. This figure includes direct loss suffered by livestock owners, cost of repellents and screening, cost of medical care in cases of mosquito-borne diseases, and other associated expenditures.

The economic status of the various species, as shown in Table 1, is taken mainly from the work of King, Bradley, and McNeel (1939) with some modifications which the writers felt necessary.

IV. DISEASE TRANSMISSION

Experimental work conducted since the fundamental discoveries of Sir Patrick Manson (1878) has made clear the important role played by blood-sucking insects in the spread of human diseases. Today an imposing array of insects that act as transmitting agents of helminths, protozoa, bacteria, rickettsiae, and viruses are recognized by students of medical entomology.

Considering the variety of forms for which insects serve as vectors and the many factors that of necessity must arise in accomplishing transmission, it becomes clear that several types of transmission must exist. A convenient classification of the types of transmission has been devised by Huff (1931) based upon the occurrence of *multiplication and cyclic morphologic change* in the parasite during its association with the insect vector. This classification does not cover all possible cases but it does present a working basis for general consideration.

The relation mosquitoes bear to such diseases as malaria, blackwater fever, yellow fever, dengue fever, equine encephalomyelitis, and filariasis has established them as possibly the most important disease vectors known to man. It is beyond the scope of this study to treat the etiology of mosquito-borne diseases, but attention will be called to some of the problems that arise due to the presence of certain species within the state.

Of the thirty-six species found in Georgia, five are known to be vectors of diseases affecting humans and two of these serve to transmit more than one disease. Six species are classified as suspected disease vectors for they have been shown to transmit diseases under experimental conditions. The remaining twenty-five species are, at present, regarded as unimportant in disease transmission but no doubt future studies will greatly reduce the number in this group.

1. *MALARIA*

Despite the fact that malaria has been on the decline for several years and is, according to the 1939 report of the Surgeon General, at the lowest rate ever recorded, nevertheless this disease still constitutes a definite menace to the residents of Georgia. This fact is well illustrated by the mortality studies for 1939 by the State Department of Public Health, which indicate that 3.2 persons per 100,000 die annually from malaria and that in certain localized areas of the State, the death rate was above 30 per 100,000.

A consideration of the sickness rate shows the problem to be one of still greater significance. It is well known that there are from 200 to 500 cases of malaria for each death, with 101 deaths occurring from malaria in 1939, calculations would indicate that about 35,000 cases of malaria occur in the state annually. This figure is far above the number of cases reported by the Public Health Department but is probably accurate because of the large number of unreported cases that occur each year. Some interesting data on this problem is to be found in the work of Brown (1940) who studied the records of the 101 fatal malaria cases in Georgia for 1939. It was shown that 75 percent of the Negroes and 50 percent of the whites were sick a week before calling a physician, further 16 percent of the Negroes and 13 per cent of the whites were ill a month before calling a physician. If such is true of the fatal cases, it is obvious that an extremely high percentage of the less severe cases are never seen by a physician and hence have no chance to be reported.

In order for malaria transmission to occur three factors are necessary, namely: (1) a source of gametocytes, (2) a large population of anophelines capable of acting as vectors, (3) contact between humans and the mosquitoes.

In regard to the first requirement for transmission, an examination of the calculations of the sickness rate of the population indicates that approximately 2.0 percent of the population are potential gametocyte carriers. In addition to the gametocyte carriers arising from natural causes, there is a strong possibility of malaria-treated paresis cases (Owen, 1937) and certain types of drug addicts (Moss, 1940) being carriers as the result of induced infection. So far as examinations have disclosed to date, humans serve as the only reservoir for gametocytes, even mosquitoes in hibernation having been shown by Mitzman (1916) to be negative.

Of the 170 species of anophelines found throughout the world, only a few are regarded as efficient malaria vectors as pointed out by Covell (1927, 1931). The work of Boyd (1930) and Hackett (1937) indicates that for any species to serve as an efficient vector it must: (1) be susceptible to infection, (2) come in contact with humans, (3) have a preference for human blood, (4) live long enough for the sexual development of the parasite, and (5) be present in large numbers.

There are four species of anophelines found in Georgia, all of which have proved susceptible to experimental infection as indicated in Table 2. The relative efficiency of the various species as malaria vectors can be obtained by an examination of their characteristics in terms of the requirements stated above. Thus, it will be noted that

Anopheles walkeri is too rare to be considered as an efficient vector. Although *Anopheles crucians* is found infected in nature (Mayne 1919, Metz 1919 and others) its preference for blood other than that of humans, prevents most workers from accepting it as an efficient vector. Further, Mayne (1926) found malaria absent from parts of the Okefenokee Swamp where *Anopheles crucians* was the only anopheline present. *Anopheles punctipennis* is generally regarded as a good vector out of doors but according to Freeborn (1926) and Herms (1939) it seldom enters houses which would prevent it being rated as a transmitter of primary importance. The writers cannot agree with this statement as we have frequently found it attacking humans in houses substantiating the work of Matheson (1932) who describes it as a frequent house invader in New York State. Thus, despite a tendency of some workers to disregard this form, it should be considered as a "good vector" and in some regions is probably the primary malaria transmitter. *Anopheles quadrimaculatus* is, without doubt, the most important malarial vector found in this section for it meets all of the requirements of an efficient transmitter. This conclusion is in keeping with the work of Darling (1925) who made an extensive study of the relative importance of the various malaria found in this section.

The third requirement for malaria transmission, namely, contact between the mosquito and humans, can best be evaluated through an examination of the blood precipitation studies of captured anophelines. King and Bull (1923) found that of 1,455 specimens of *Anopheles quadrimaculatus* captured inside houses, 38.5 percent contained human blood, thus indicating a high degree of contact between humans and this mosquito. The same authors found that of 125 specimens of *Anopheles crucians,* only 4.08 percent contained human blood, and 75 specimens of *Anopheles punctipennis* showed no human blood. No studies on the blood preference of *Anopheles walkeri* are available at the present time but it is known (Matheson 1929) that they will bite humans in nature and are vicious in their attack. It is of interest to note that the figures on the percentage of specimens found to contain human blood occur in the same order as do the figures of natural infection as seen in Table 2. Experimental studies where mosquitoes are given a choice of host upon which to feed yield interesting results but are frequently unreliable due to the abnormal conditions under which they are conducted, therefore they are not considered in this study.

From the work of Hackett (1937) we now recognize that a species does not always show the same efficiency as a vector throughout its entire range. In light of this fact we should not overlook the possibility that certain regions may exist where supposedly unimportant species are in reality the primary transmitting agents. From evidence obtained in other regions the authors suspect that in localized areas the salt-water race of *Anopheles crucians* and *Anopheles punctipennis* may play a more important role than is generally credited to them.

2. *BLACKWATER FEVER*

This disease, characterized by a great destruction of red blood corpuscles and the passage of hemoglobin in the urine, occurs frequently in intensely malarious sections of the State.

Many theories have been advanced as to the causative agent of this disease, yet the exact cause is still unknown. According to Yorke (1922), Matheson (1929, 1932), and Chandler (1940) it is now generally accepted that frequent or prolonged infection with malaria, particularly the malignant tertian type, serves to bring about the conditions associated with this disease. This being true, the vectors that applied to malaria also apply to this disease.

3. *FILARIASIS*

This disease which Manson (1878) first demonstrated to be mosquito-borne is quite common throughout the tropical and subtropical regions of the world but is rare in the temperate regions. According to Francis (1919) the only authentic indigenous cases found in the United States are located in a small area near Charleston, S. C. The occurrence of cases in this area has been confirmed by many workers but there is reason to believe that the disease is more widespread in its distribution than the work of Francis (1919) would indicate. Cases of the "symptomless" type have been studied in sections of South Carolina adjacent to the Savannah River Basin and it is possible that the distribution continues on into Georgia.

The causative agent of filariasis is *Wuchereria bancrofti* Cobbold. one of the parasitic roundworms which lives in the lymph or blood stream of humans. Patients harboring this parasite present a clincial picture of elephantiasis or, as pointed out by O'Connor (1932), may remain "symptomless" throughout life. There are indications that the symptomless form is most common in temperate regions where individuals are not heavily infected. In this area the common house mosquito of tropical and subtropical regions, *Culex quinquefaciatus* Say. (*Culex fatigans* Wied.) is the vector for the causative agent of this disease. The microfilariae are obtained when the mosquito bites an infected human at night, for during this time the worms are abundant in the peripheral blood vessels. Further, Ashburn and Craig (1907) found that the saliva of *Culex quinquefasciatus* contains a substance which attracts the microfilariae to a particular area, thus increasing the efficiency of this mosquito as a vector. The microfilariae undergo a period of development in the digestive tract and thoracic muscles of the mosquito then migrate to the mouth-parts from which they escape to a new host when the mosquito is feeding. About twelve days are required for the mosquito to become infective. The fact that *Culex quinquefasciatus* is one of the domesticated forms, as well as a night feeder, makes it a perfectly adapted vector for this parasite.

4. *YELLOW FEVER*

This disease is not known to occur within the State at the present time and most workers now regard it as only a matter of historical importance. Recent studies, however, have shown such an attitude to be unwise and indicate that there is a strong possibility of yellow fever again developing into a serious public health problem in this section of the world. For this reason we are including a discussion of the disease in the present study.

The work of Reed, Carroll, Lazear and Agramonte (1900) proved that *Aedes aegypti* Linn. (*Stegomyia fasciatus* Fabr.) was the vector of the causative agent of yellow fever. In the years following this discovery, attention was focused on eliminating the disease by controlling the breeding of the vector. This procedure, together with the spontaneous disappearance of the disease, practically eliminated yellow fever from the Western Hemisphere. Thus, the campaign against this disease became one of the most dramatic successes in the history of preventive medicine. Little progress, however, was made in the study of the causative organism or its mode of transmission until Stokes, Bauer, and Hudson (1928) demonstrated that the disease could be transmitted to monkeys, and for the first time proved yellow fever to be a virus infection.

The study of this disease took on an entirely new aspect when Soper (1936) described a rural epidemic of yellow fever in Brazil, existing in an area where apparently *Aedes aegypti* did not exist. This form of the disease became known as "jungle yellow fever" and its existence has been confirmed by Burke (1937); Shannon, Whitman, and Franca (1938), and others.

Burke (1937) identified jungle fever as a strain of yellow fever which differs from the "urban type" only in the conditions under which infection occurs. Shannon, Whitman, and Franca (1938) isolated the causative virus from mosquitoes caught in the jungle, thus establishing the existence of vectors other than *Aedes aegypti*. Further studies revealed at least twenty-one species of mosquitoes that can experimentally transmit the yellow fever virus, and thirty-seven species that serve as incubators of the virus. Table 3 shows the species found in Georgia that are capable of incubating and transmitting the yellow fever virus.

From the above discussion is becomes clear that yellow fever has not been eliminated from the Western Hemisphere for there exists a vast reservoir of this disease in the form of jungle fever now present in South America. Further, as pointed out by Whitfield (1939), there is a grave danger that air transportation may introduce infected mosquitoes into this country and establish cases from which the local vector, *Aedes aegypti,* could obtain the causative virus. The possibility of introducing a mosquito from one faunal region to another is not a mere matter of speculation as illustrated by the introduction of the dreaded *Anopheles gambiae* from Africa to the region of Natal, Brazil where it has become established and has given rise to an epidemic of malaria affecting almost 90 percent of the population.

Finally, Soper, Rickard, and Crawford (1934) introduced a technique by means of which a small piece of liver is obtained from fatal cases of febrile diseases with the idea of examining it for the type of necrosis characteristic of yellow fever. Use of this technique has revealed that many cases are missed by ordinary means of diagnosis and that yellow fever exists in areas where heretofore it was thought to be absent. In light of this observation considerable question is raised regarding the present distribution of yellow fever.

5. *DENGUE FEVER*

Dengue fever, commonly known by such synonyms as break-bone fever,six- day fever, and giraffe fever, is an acute infectious disease of tropical and subtropical regions. In the United States outbreaks of this disease are usually confined to the Gulf states but at times epidemics occur in the northern states. Outbreaks in temperate climates always occur during the summer months and stop with the onset of frost.

Ashburn and Craig (1907a, 1907b) first demonstrated the causative agent of dengue fever to be specific filterable virus which is present in the blood during the first four days of the disease. After the first four days the virus cannot be demonstrated in the peripheral blood, thus limiting the period for the vector to obtain its infective meal.

Graham (1903) claimed to have demonstrated the transmission of dengue by mosquitoes. Ashburn and Craig (1907a, 1907b) proved that *Culex quinquefasciatus* Say. (*Culex fatigans* Wied.) can "mechanically" transmit the causative agent. Biologic transmission was first demonstrated by Bancroft (1906) with *Aedes aegypti* Linn. (*Stegomyia fasciatus* Fabr.) acting as the vector. This work has since been confirmed by Cleland, Bradley, and McDonald (1916); Chandler and Rice (1923); Simmons, St. John, and Reynolds (1931), and many others.

It has been shown by Siler, Hall, and Hitchens (1926) and Schule (1928) that the virus requires an incubation period in the body of the mosquito of from eight to eleven days before transmission can occur, also that once a mosquito becomes infected it remains so throughout life. Attempts to demonstrate hereditary (congenital) transmission through the egg have all been negative.

Aedes aegypti is present throughout practically all sections of Georgia during the summer months, and in areas where conditions are favorable, this species remains well into the winter. The writers have observed it breeding as late as the middle of December. The domesticated habits of this mosquito which keep it in almost constant contact with humans, together with its widespread distribution, make

it an efficient vector for dengue. Thirteen cases of this disease were reported in the state during 1939 and doubtless many others were unreported.

6. *EQUINE ENCEPHALOMYELITIS*

Equine encephalomyelitis has for many years been recognized as a serious disease of horses and mules, but only within the past few years has it become definitely known as an infection of humans.

Shahan, Giltner, and Schoening (1938) have published figures which, although incomplete, show that during the past few years, between 4,000 and 170,000 cases of this disease, together with as many as 50,000 deaths occurred annually in horses and mules throughout the United States. These cases were distributed among thirty-nine states. Such a large number of cases, many of which end fatally, creates a serious economic problem to livestock owners.

The causative virus of this disease was first isolated by Meyer, Haring, and Howitt (1931) during an epidemic in California. Later, Ten Broeck, and Merrill (1933-1934) isolated a second and more severe strain of the virus which was distinct from the former in some of its reactions. More recent work has definitely established that there is a "western" and "eastern" strain of the virus existing in the United States.

Although a few cases of the disease in humans had been reported as early as 1932, the first proved cases were recorded by Fothergill, Dingle, Farber, and Connerly (1938) when the eastern strain of the virus was isolated from the brain of fatal cases occurring in the Massachusetts epidemic of 1938. Since that time the virus has been isolated from many human cases in widely scattered areas. A study of these cases reveals three interesting facts: (1) the occurrence of the cases is always in summer, (2) the cases are always in areas where horses are affected, and (3) many of the patients have had no contact with horses. These findings strongly suggest an insect as the vector of the disease among humans.

The first demonstration of an insect vector of equine encephalomyelitis was the work of Kelser (1933), who showed that *Aedes aegypti* could transmit the causative virus from one guinea pig to another and that disease could also be transmitted to horses by infected mosquitoes. Since the original work of Kelser, eight species of mosquitoes have been shown to be capable of transmitting the causative virus of this disease. Table 4 shows the species found in Georgia that are capable of acting as vectors together with data on the strain of the virus each species transmits. Multiplication of the virus within the body of the mosquito was demonstrated by Merrill and Ten Broeck (1934) through their experiments with *Aedes aegypti*.

In 1933 it was suggested by Giltner and Shahan that birds were possible reservoirs of the causative virus. This suggestion came as the result of the demonstration that pigeons could be infected with the virus. This idea was confirmed by the finding of many different types of birds infected in nature. Those found infected were: the ring-necked pheasant, Tyzzer, Sellards, and Bennett (1938); pigeons, Fothergill and Dingle (1938); mallard ducks, Shahan, Giltner, and Shoening (1938). From the above list of birds found infected in nature, it seems quite possible that migratory birds play a part in the distribution of the causative virus of this disease.

From the above discussion, it is clear that equine encepalomyelitis is now a definite public health problem, hence, it is advisable that cases of paralysis-producing infections should be observed with greater care to determine the occurrence and spread of this disease.

7. *TULAREMIA*

The history of this plague-like infection is one of the most confused chapters in modern medical literature. It has been described as a *"new disease"* and also as an *"American disease,"* neither of which is correct, for apparently the same disease was described in 1837 by a physician in Japan (Ohara, 1926). The symptoms take several forms depending upon the time of year and means by which infection occurs, thus causing serious errors in diagnosis. Finally, the ability of the causative organism to penetrate the unbroken skin has so complicated the study of experimental vectors that it is difficult to distinguish between "mechanical" and "biologic" transmission.

The modern period in the study of this disease had its beginning when McCoy (1911) discovered a plague-like disease among ground squirrels in Tulare County, California. The following year McCoy and Chapin (1912) isolated the causative organism of this disease, which they named *Bacterium tularense.* The first case of a human suffering from infection with *Bacterium tularense* was reported by Wherry and Lamb (1914) who also called attention to the importance of the wild rabbit as the reservoir of the disease. In 1922, Francis described seven cases of rabbit fever infection in humans, from which he isolated the causative organism and identified it as *Bacterium tularense,* McCoy and Chapin (now known as *Pasteurella tularensis* Frances). To this disease Francis gave the name "Tularemia." In the same report Francis described the discovery of the disease in jack rabbits and experimental transmission by means of the deer fly (*Chrysops discalis*) and the rabbit louse (*Hemodipsus ventricosus*). Since the classical report of Francis many vectors have been reported, a list of which includes bed bug, house fly, stable fly, and several species of ticks. Another important discovery regarding transmission was made by Parker and Spencer (1926), who demonstrated hereditary (congenital) transmission of the causative organism n the wood tick (*Dermacentor andersoni* Stiles), thus showing how the infective agent may remain active from year to year without the intervention of a vertebrate host.

It now appears that transmission in the summer is by means of arthropod vectors, while winter transmission occurs mainly by humans coming in contact with infected vertebrates. Thus, epidemics such as the one described by Hillman and Morgan (1937) of thirty-seven cases in a Civilians Conservation Corps Camp, occur during the summer, while winter cases are scattered and developed mainly among butchers and hunters.

Although transmission in nature by mosquitoes is still a matter of speculation, Philip, Davis, and Parker (1932) have presented evidence to the effect that, under experimental conditions, mosquitoes fed on animals infected with tularemia can mechanically serve as vectors of this disease. Their investigations indicate that due to the power of the causative organism to penetrate the unbroken skin, transmission may occur through bites, by crushing infected mosquitoes on the skin, or by deposition of excrement on the skin. At the present time we know nothing of the relationship between the causative organism and the mosquito with regards to the period of survival of the causative organism or the mode of transmission.

Owen (1937) points out that mosquitoes may play an important roles in the transmission of this disease to humans. In Georgia, where infected animals occur together with mosquitoes that feed on them and on man, there is a strong possibility that transmission is effected in this manner. With 127 cases of tularemia occuring in the state during 1939, a consideration of all possible modes of transmission should be checked to prevent the further spread of the disease.

8. *LYMPHOCYTIC CHORIOMENINGITIS*

Physicians have for many years reported a form of meningitis distinguished by the production of a lymphocytosis in a bacteria-free cerebrospinal fluid. Various workers have applied to this disease such names as serous meningitis, idiopathic meningitis, and acute aseptic meningitis.

During the St. Louis epidemic of encephalitis in 1933, Armstrong and Lillie (1934) isolated a specific virus which they described as the causative agent of "lymphocytic choriomeningitis." This work was soon confirmed by Rivers and Scott (1935-1936), who recovered the same virus from patients diagnosed as suffering with acute aseptic meningitis. Further confirmation, based upon immunological reactions, have appeared from all sections of the United States, England, and France.

It appears from the work of Armstrong and Wooley (1937) that there exists a non-meningeal form of this infection, for humans who have never shown the neurologic symptoms frequently give the specific serum-neutralizing test for the virus. Approximately eleven percent of all the individuals tested were found to give the specific reaction for the virus. Still more interesting is the fact that twenty-eight percent of the individuals presenting a history of minor respiratory infections (influenza, grippe, and colds), but without neurologic symptoms gave the specific reaction for the virus.

The mode of transmission was, until recently, assumed to be by droplet infection with the virus entering the respiratory tract. However, Coggeshall (1939) has demonstrated biologic transmission of the causative virus by the mosquito (*Aedes aegypti Linn*) thus for the first time presenting evidence of an insect vector. Too little information is available at the present time to evaluate this work, but it is nevertheless highly suggestive.

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V. SUMMARY

(1) This paper was designed to bring together records of the species of mosquitoes found in Georgia together with notes on their biology and role in disease transmission. No attempt has been made to discuss mosquito control, flight range, identification, or methods of collecting. The writers are aware of the fact that all of the literature on the mosquitoes of Georgia has not been cited, but hope that the major records have been covered.

(2) There are thirty-six species of mosquitoes, distributed among eight genera, known to be present in the state. In addition, attention is called to the possibility of at least two other forms being present.

(3) Due to their biting habits, mosquitoes constitute an annoyance to the residents of the state who work or seek recreation out-of-doors. Further, they cause considerable financial loss by reducing land values, irritating livestock, spreading disease, etc.

(4) With the exception of the members of four species, all female mosquitoes found in the state are known to bite humans. More than fifty percent of the species are regarded as vicious biters.

(5) There are five species of mosquitoes in the state that are known to be disease vectors, and at least six species are suspected vectors. These species are known to transmit five diseases, are suspected of transmitting two diseases, and are potential vectors for one disease which does not occur within the state at the present time.

(6) Of the disease transmitting species, *Anopheles quadrimaculatus* and *Aedes aegypti* stand out as the most dangerous forms being responsible for the spread of more than half of the mosquito-borne diseases that occur in this section.

VI. REFERENCES

Armstrong, C., and Lillie, R. D. (1934) *Pub. Health Repts. (U. S.)* 49: 1019.

Armstrong, C., and Wooley, J. G. (1937) *Jour. Amer. Med. Asso.*, 109: 410.

Ashburn, P. M., and Craig, C. F. (1907) *Philippine Jour. Sci.*, 2: 1.

Ashburn, P. M., and Craig, C. F. (1907a) *Jour. Inf. Dis.*, 4: 440.

Ashburn, P. M., and Craig, C. F. (1907b) *Philippine Jour. Sci.*, 2: 93.

Bennett, B. L. Baker, F. C., and Sellards, A. W. (1939) *Ann. Trop. Med. Parasit.*, 33: 101.

Birnie, J. H., (1940) *S. C. State A. and M. Coll. Bull.*, 29: 7.

Bishop, F. C. (1933) *Science*, 77: 115.

Boyd, M. F. (1930) *An Introduction to Malariology*. Cambridge, Mass.

Brown, H. W. (1940) *Amer. Jour. Pub. Health*, 30: 1199.

Burke, A. W. (1937) *Amer. Jour. Trop. Med.*, 17: 313.

Carpenter, S. J. (1939) *The Mosquitoes of Arkansas*. Little Rock, Ark.

Chandler, A. C. (1940) *Introduction to Parasitology*. New York, N. Y.

Chandler, A. C., and Rice, L. (1923) *Amer. Jour. Trop. Med.*, 3: 233.

Cleland, J. B., Bradley, B., and McDonald, W. (1916) *Med. Jour. Australia*, 3: 179.

Coggeshall, L. T. (1939) *Science*, 89: 516.

Covell, G. (1927) *Ind. Med. Res. Mem.*, No. 7: 117 pp.

Covell, G. (1931) *Rec. Malar. Surv. India*, 2: 1.

Craig, C. F., and Faust, E. C. (1940) *Clinical Parasitology*, Philadelphia, Pennsylvania.

Darling, S. T. (1925) *South. Med. Jour.*, 18: 452.

Davis, N. C. (1933) *Ann. Ent. Soc. Amer.*, 26: 491.

Davis, N. C., and Shannon, R. C. (1931) *Amer. Jour. Trop. Med.*, 11: 21.

Davis, N. C., and Shannon, R. C. (1931a) *Amer. Jour. Hyg.*, 14: 715.

Dyar, H. G. (1922) *Proc. U. S. Nat. Mus.*, 62: 1.

Dyar, H. G. (128) *Carnegie Inst. of Wash., Pub. No.* 387.

Fothergill, L. D., and Dingle, J. H. (1938) *Science*, 88: 549.

Fothergill, L. D., Dindle, J. H., and Connerley, M. L. (1938) *New Eng. Jour. Med.*, 219: 411.

Francis, E. (1919) *U. S. Pub. Health Ser., Hyg. Lab. Bull., No.* 117: 34 pp.

Francis, E. (1922) *Jour. Amer. Med. Assoc.*, 78: 1015.

Freeborn, S. B. (1926) *Univ. Cal. Pub., Tech. Bull. Ent.*, 3: 330.

Giltner, L. T., and Shahan, M. S. (1933) *Science*, 78: 63.

Graham, H. (1903) *Jour. Trop. Med.*, 6: 209.

Hackett, L. W. (1937) *Malaria in Europe*. London.

Herms, W. B. (1939) *Medical Entomology*. New York, N. Y.

Hillman, C. C., and Morgan, M. T. (1937) *Jour. Amer. Med. Assoc.*, 108: 538.

Howard, L. O., Dyar, H. G., and Knab, F. (1912-17) *Carnegie Inst. Wash., Pub. No.* 159.

Huff, C. G. (1931) *Science*, 74: 456.

Hyslop, J. H. (1939) *Insect Pest Sur. Div. U. S. Bur. Ent.*, Washington, D. C.

Kelser, R. A. (1933) *Jour. Amer. Vet. Med. Assoc.*, 82: (n. s. 35), 767.

Kelser, R. A. (1937) *Science*, 85: 178.

Kelser, R. A. (1938) *Jour. Amer. Vet. Med. Assoc.*, 92: 195.

King, M. V., Bradley, G. H., and McNeel, T. E. (1939) *U. S. Dept. Agr. Misc. Pub., No.* 336.

King, M. V., and Bull, C. G. (1923) *Amer. Jour. Hyg.*, 3: 497.

Mail, G. A. (1934) *Montana Agr. Exp. Stat. Bull.*, No. 288.

Manson, Sir P. (1878) *Jour. Linn. Soc. Zool. London*, 14: 304.

Matheson, R. (1929) *Handbook of Mosquitoes of North America*. Baltimore, Md.

Matheson, R. (1932) *Medical Entomology*. Baltimore, Md.

Mayne, B. (1919) *Pub. Health Repts. (U. S.)*, 34: 1355.

Mayne, B. (1926) *Pub. Health Repts. (U. S.)*, 41: 1652.

McCoy, G. W. (1911) *U. S. Pub. Health Service, Pub. Health Bull.*, 43: 53.

McCoy, G. W., and Chapin, C. W. (1912) *Jour. Inf. Dis.*, 10: 61.

Merrill, M. H., Lacaillade, W. C., and Ten Broeck, C. (1934) *Science*, 80: 251.

Merrill, M. H., and Ten Broeck, C. (1934) *Proc. Soc. Exp. Biol. Med.*, 32: 421.

Merrill, M. H., and Ten Broeck, C. (1935) *Jour. Exp. Med.*, 62: 687.

Metz, C. W. (1919) *Pub. Health Repts. (U. S.)*, 34: 1357.
Meyer, K. F., Haring, C. M., and Howitt, B. (1931) *Science*, 74. 227.
Mitzmain, M. B. (1916) *U. S. Public Health Service, Pub. Health Bull.*, No. 84.
Most, H. (1940) *Amer. Jour. Pub. Health*, 30: 403.
O'Conner, F. W. (1932) *Trans. Roy. Soc. Trop. Med. Hyg.*, 31: 413.
Ohara, H. (1926) *Japan Med. World*, 6: 263.
Owen, W. B. (1937) *Univ. Minn. Agr. Exp. Stat., Tech. Bull.*, No. 126.
Parker, R. R., and Spencer, R. R. (1926) *Pub. Health Repts. (U. S.)*, 41: 1403.
Philip, C. B., Davis, G. E., and Parker, R. R. (1932) *Pub. Health Repts. (U. S.)*, 47: 2077.
Reed, W., Carroll J., Agramonte, A., and Lazear, J. W. (1900) *Phila. Med. Jour.*, 6: 790.
Rivers, T. M., and Scott, T. F. McN. (1935) *Science*, 81: 439.
Rivers, T. M., and Scott, T. F. McN. (1936) *Jour. Exp. Med.*, 63: 415.
Root, F. M. (1924) *Amer. Jour. Hyg.*, 4: 449.
Schule, P. A. (1928) *Amer. Jour. Trop. Med.*, 8: 203.
Shahan, M. S., Giltner, L. T., and Schoening, H. W. (1938) *Proc. 42nd Annual Meeting U. S. Live Stock Sanitary Assoc.* December, 1938.
Shannon, R. C., Whitman, L., and Franca, M. (1938) *Science*, 88: 110.
Siler, J. F., Hall, M. W., and Hitchens, A. P. (1926) *Philippine Bur. Sci., Mono. No.* 20.
Simmons, J. S., St. John, J. H., and Reynolds, F. H. (1931) *Philippine Jour. Sci.*, 44: 1.
Soper, F. L. (1936) *Revista di Hygiene e Saude Publica, Rio de Janeiro*, 10: 107.
Soper, F. L., Rickard, E. R., and Crawford, P. J. (1934) *Amer. Jour. Hyg.*, 19: 549.
Stage, H. H., and Yates, W. W. (1936) *Jour. Parasit.*, 22: 298.
Stokes, A., Bauer, J. H., and Hudson, N. P. (1928) *Jour. Amer. Med. Assoc.*, 90: 253.
Ten Broeck, C., and Merrill, M. H. (1933-1934) *Proc. Soc. Exp. Biol. Med.*, 31: 217.
Tyzzer, E. E., Sellards, A. W., and Bennett, B. L. (1938) *Science*, 88: 505.
Wherry, W. B., and Lamb, B. H. (1914) *Jour. Inf. Dis.*. 15: 331.
Whitfield, F. G. S. (1939) *Bull. Ent. Res.*, 30: 365.
Yorke, W. (1922) *Trop. Dis. Bull.*, 19: 613.

TABLE 1

Genera and Species of Mosquitoes Occuring in Georgia

With Notes on their Biologies.

Genus and Species	Disease vector	Biting record	Economic status	Larval habitat	Wintering stage
Aedes eagypti Linn.	+ +	+ +	Important	Domesticated	Egg
Aedes atlanticus D. and K.	— —	+ +	Annoying	Temporary pool	Egg
Aedes bimaculatus Coq.	— —	+ +	Rare	Temporary pool	Egg
Aedes infirmatus D. and K.	— —	+ +	Annoying	Temporary pool	Egg
Aedes mitchellae Dyar	— —	+ +	Rare	Temporary pool	Egg
Aedes sollicitans Walk.	+ —	+ +	Important	Salt marsh	Egg
Aedes sticticus Meig.	— —	+	Rare	Temporary pool	Egg
Aedes taeniorhynchus Wied.	+ —	+	Important	Salt marsh	Egg
Aedes thibaulti D. and K.	— —	+	Rare	Tree hole	Egg
Aedes tormentor D. and K.	— —	+ +	Rare	Temporary pool	Egg
Aedes triseriatus Say	+ —	+ +	Annoying	Tree hole	Egg
Aedes trivittatus Coq.	— —	+ +	Rare	Temporary pool	Egg
Aedes vexans Meig.	+ —	+ +	Annoying	Temporary pool	Egg
Anopheles crucians Wied.	+ +	+	Annoying	Temporary pool	Adult
Anopheles punctipennis Say	+ +	+	Common	Temp. Perm. pool	Adult
Anopheles quadrimaculatus Say	+ +	+	Important	Permanent pool	Adult
Anopheles walkeri Theob.	+ —	+ +	Rare	Temporary pool	Adult
Culex apicalis Adams	— —	—	Rare	Permanent pool	Adult
Culex erraticus D. and K.	— —	+ +	Common	Permanent pool	Adult
Culex nigripalpus Theob.	— —	+	Common	Temp. pool Dom.	Adult
Culex peccator D. and K.	— —	+	Rare	Permanent pool	Adult
Culex pilosus D. and K.	— —	—	Rare	Temporary pool	Adult
Culex quinquefasciatus Say	+ +	+	Important	Temp. pool Dom.	Adult
Culex restuans Theob.	— —	+	Annoying	Temporary pool	Adult
Culex salinarius Coq.	— —	+	Annoying	Permanent pool	Adult
Mansonia perturbans Walk.	— —	+ +	Important	Permanent pool	Adult
Megarhinus rutilus Coq.	— —	—	Rare	Tree hole	?
Megarhinus-septentrionalis D.+K.	— —	—	Rare	Tree hole	?
Orthopodomyia signifera Coq.	— —	+	Rare	Tree hole	Adult
Psorophora ciliata Fabr.	— —	+ +	Annoying	Temporary pool	Egg
Psorophora columbiae D. and K.	— —	+	Important	Temporary pool	Egg
Psorophora discolor Coq.	— —	+	Rare	Temporary pool	Egg
Psorophora ferox Humb.	+ —	+ +	Annoying	Temporary pool	Egg
Psorophora...howardii Coq.	— —	+ +	Rare	Temporary pool	Egg
Psorophora varipes Coq.	— —	+ +	Rare	Temporary pool	Egg
Theobaldia melanura Coq.	— —	+	Rare	Permanent pool	Larvae

TABLE 2
Anophelines of Georgia*

Species	Occurrence	Place of attack		Blood preference		Infection rate	Evidence		
		In house	Other places	Man	Animal		Nat.	Exp.	Epid.
A. quadrimaculatus	Common	+	+	+	+	1.47	+	+	+
A. punctipennis	Common	—	+	—	+	.18	+	+	+
A. crucians	Common	—	+	—	+	.25	+	+	—
A. walkeri	Rare	?	?	?	?	?	—	+	—

*Compiled from Boyd (1930), Matheson (1929), Craig and Faust (1940), and other investigators.
Nat. = Natural infection, Exp. = Experimental infection, Epid. = Epidemiological evidence.

TABLE 3

Mosquitoes of Georgia Experimentally Incriminated as Carriers of Yellow Fever Virus

SPECIES	Status as Carrier	References
Aedes aegypti	Virus transmitted by bite	Stokes, Bauer, and Hudson, 1928
Aedes taeniorhynchus	Virus transmitted by bite	Davis and Shannon, 1931a
Aedes triseriatus	Virus transmitted by bite	Bennett, Baker, and Sellards, 1939
Culex fatigans	Virus transmitted by bite	Davis, 1933
Psorophora ferox	Virus survives in mosquito	Davis and Shannon, 1931

TABLE 4

Mosquitoes of Georgia Experimentally Incriminated as Vectors of Equine Encephalomyelitis Virus.

SPECIES	Type of Virus	References
Aedes aegypti	Western	Kelser, 1933
Aedes aegypti	Eastern	Merrill and Ten Broeck, 1935
Aedes sollicitans	Eastern and Western	Merrill, Lacaillade, and Ten Broeck, 1934
Aedes taeniorhynchus	Western	Kelser, 1938
Aedes vexans	Western	Kelser, 1937

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