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The Morehouse Journal *of* Science

BURWELL T. HARVEY, JR., *Editor*

The Objectives of Science Teaching.

Report to Southern Association of Colleges and Secondary Schools.

Fisk Dedicates New Library.

Nobel Prizes.

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OUR VIEWPOINT

INVENTORY

In trying to balance the account of the JOURNAL OF SCIENCE, we beg leave to make the following report in our inventory:

Assets

1. Four volumes filled with information for the use of teachers and pupils, alike, especially concerning Negroes in the field of Science and Education.
2. Letters of approval of the JOURNAL OF SCIENCE, from teachers, administrators and educators.
3. Articles of merit, written by authorities, contributed gratuitous to the columns of this periodical.
4. A number of limited advertisements, because of the type of periodical published.
5. 1000 Negro school libraries, on whose shelves a space is reserved for the JOURNAL OF SCIENCE.

Liabilities

1. The printing of four issues of Volume V, 1500 copies each. The cost of printing.
2. Keeping trust with Negro youth of high school and college, to continue to record the achievements of Negroes in the field of Science, as historical data for the purpose of inspiration.
3. To publish articles by the profession, giving publicity to individual ideas, methods, etc., of interest and mutual helpfulness.
4. To bring to the teachers of Science in Negro schools, articles on methods of instruction, objectives and curricula organization in both secondary schools and colleges.

Deficit

In order to make these sheets balance, we need 1000 paid up subscribers. Will you not be one?

HONOR SUBSCRIBER

Mr. S. William Proctor, 709 W. Vanhorn Street, Independence, Mo., has the honor of being the first subscriber to pay for the year 1931. His renewal subscription was received December 26, 1930. We are grateful for the many expressions of approval and good will towards our periodical, but to insure its continued publication, we must have the financial aid of a larger number of subscribers. If you consider the work of value to high school and college students, help us by sending your subscription today.

THE SOUTHERN ASSOCIATION REPORT

We are publishing in full, the report of Professor Arthur D. Wright, to the Southern Association of Colleges and Secondary Schools. This Association is the recognized accrediting agency for the following states:

Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia, namely those

states in which the majority of the institutions of higher learning for our group are located. This report marks the first recognition by this Association, of the existence of these schools and their responsibility for and willingness to, investigate them for accreditment.

It is hoped that this investigation will be extended to the secondary schools. For although all the states mentioned as members of the Association, either through their State Department of Education or the State University Department of Education, publish an accredited list of high schools for Negroes, it is common knowledge that this work of accreditment is not on the same basis as that for white schools. It is interesting to note the following additional institutions accredited by other associations.

Association of Colleges and Secondary Schools of the Middle States and Maryland

Howard University, Washington, D. C.
Lincoln University, Lincoln, Pennsylvania.
Morgan College, Baltimore, Maryland.

North Central Association of Colleges and Secondary Schools

West Virginia State College, Institute, West Virginia.

American Medical Association, Grade A

Howard University Medical College, Washington, D. C.
Meharry Medical College, Nashville, Tennessee.

American Association of Colleges of Pharmacy

Howard University Department of Pharmacy, Washington, D. C.
Meharry Medical College, Department of Pharmacy, Nashville, Tenn.

Dental Educational Council of America, Class B[1]

Howard University Dental College, Washington, D. C.
Meharry Medical College, Nashville, Tennessee.

American Library Association. Junior Undergraduate Library School

Hampton Institute, Hampton, Virgia.

[1] A school which in certain particulars, does not meet with all the requirements—and which in the judgment of the Council will be able to meet them within a reasonable time and which meanwhile in the judgment of the Council is making full utilization of teaching facilities and is devoting all of the income toward the promotion of the teaching and advancement of Dental Education, shall be considered worthy of assistance and designated as Class B.

A REQUEST

In order to record the achievement of Negroes in the field of Science as historical data, for the purpose of inspiration, we are asking our readers to send to the office, the following information:

1. Name and address of any Negro business concerns producing or manufacturing crude or finished products.
2. Name and address of Negroes employed in business concerns, manufacturing crude or finished products.
3. Names and address of other Negroes, such as inventors, eminent surgeons, physicians, technical employes, etc.

THE OBJECTIVES OF SCIENCE TEACHING

THOMAS P. FRAZER, *Professor of Natural Science*
Wilberforce University, Ohio

The essential aims of science must be formulated before the principles for the selection of subject matter to attain these aims can be decided upon, after the aims as defined have been generally accepted goals of instruction, a more specific definition of subject matter and materials of instruction which may contribute to the accomplishment of these aims is required; then class room activities for the realization of these aims must be determined and finally objective tests for measuring the attainments of these aims must be constructed.

The plan followed in the study on the general objectives of science is an analysis of the books, articles and state syllabi given in the bibliography. Upon the investigation of the data it was apparent that the objectives although differently stated by the various authors, had certain essential meanings which could be listed in four main categories.

(1) The meaning and value of scientific knowledge.
(2) Scientific Method.
(3) Interpretation of environment.
(4) Development of desirable habits, ideals, tastes, appreciations, interests, skills, and emotionalized standards.

Under the four general categories the following general objectives of science and science teaching are listed.

Science teaching should impart an insight into:

(1) The meaning and value of scientific knowledge. (A) Scientific knowledge has modified thinking in many fields. (B) Scientific knowledge has greatly influenced thought reactions. (C) Scientific knowledge is essential to the intelligent living of laymen.

Science teaching should give training in the:

(2) Scientific Method. (A) Scientific spirit. (B) Problem solving ability. (C) Scientific attitude. (D) Scientific thinking.

Science teaching should develop:

(3) Interpretation of environment.
- (A) Appreciation of environment.
- (B) Significance of environment.
- (D) Control of Environment.
  - (a) Skill in producing better plants and animals to serve man's needs.
  - (b) Explanation and control of physical and chemical phenomena.

Science teaching should contribute to:

(4) Development of desirable habits, ideals, tastes, appreciations, interests, skills, and emotionalized standards.
- (a) Habits which make for healthful living.
- (b) Attitudes which make for good citizenship and worthy home membership.
- (c) Habits of carrying conclusions over into actions.
- (d) Interest drawn from science experience developed into permanent interests.

- (e) Desirable personal habits.
- (f) Economy, health and safety in community and private life.
- (g) Skills based on scientific laws such as healthful living.
- (h) Emotionalized standard as shown by self sacrificing devotion of scientists.

A summary and evaluation of 67 authorities and successful teachers, 35 investigations reported by Dyer[1] and report of a summary of published studies made by Curtis shows the following on teachers objectives:

1. To develop a comprehensive view of subject matter	154
2. To give training in scientific method and attitude	124
3. To develop cultural attitude and training for leisure	46
4. To prepare for vocational pursuits	35
5. To develop the social attitudes	21
6. To develop ethical character	16
7. To train for health	14

According to this report it is evident that the science teachers must stress subject matter and impart an insight into the scientific method of thinking. Dr. Powers[2] makes the following indictment "The task set for high school students of chemistry is beyond their accomplishment. Evidence is convincing that students obtain no mastery of a large amount of materials of instruction. A large proportion of the text-book material means little or nothing to 50% or more of the pupils who have studied one of these texts for one year in high school." According to Downing we must concentrate on a few fundamental principles and curtail details so that materials of instruction might be retained by the students.

Why do students take science? 1500 physics students were asked why they took the study of physics? 729 replied—as an aid to make a living. In Hollywood High School those taking physics gave as their reason:

Practical value	63.3%	44%
College entrance	23.3%	20%

From these studies, the aims of the pupils are evident. Foremost in importance to pupils is the practical value, with college entrance coming in for serious attention. Concerning the two kinds of values Powers[3] makes the following indictment: "For practical purposes it seems likely that no line of division can be drawn between these kinds of values; for learning which enables one to care for his radio set intelligently is both practical and liberalizing and learning which enables one to make a more satisfactory mental adjustment is both liberalizing and practical."

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[1] *An analysis of certain outcomes in Teaching of Physics, University of Pennsylvania Monograph.*

[2] *A Diagnostic study of the subject matter of High School Chemistry.*

[3] *Research in Science Teaching, T. C. Record. Volume 30.*

For criteria recommended in selecting objectives for Natural science, see Craig.[1] Concerning the general objectives of science Downing[2] concludes: "Finally and most important science teaching should give the child the habit of scientific thinking—by reasoning to correct conclusion on the basis of observed facts."

The evaluation of the objectives should furnish a key to the selection of subject matter. The ranking of objectives as indicated by educated laymen's judgment is suggestive..[3]

Running through most of the literature examined is the idea of making the general objectives more specific. The writer feels that the general objectives, which are guide posts along the way, ought to be firmly in the mind of the teacher, if she is to fully appreciate the significance of the larger objectives.

The larger objectives of science taken from Craig's study are given. These objectives must be broken up into learning elements and arrayed throughout the grades in sequential order.

Larger objectives of science that may be used in developing the elementary and secondary curricula in science, based on revisions of list given in the Horace Mann Course of Study in Elementary Science (Grades I to V.)

1. Man's conception of truth changes.
2. It is desirable to have confidence in the scientific method.
3. Nature's principles are invariable.
4. There is a cause for every effect.
5. Much knowledge remains to be revealed.
6. Conditions favorable to life are apt to persist on the earth for a very long time; no catastrophe for the entire earth is probable for immense periods of time.
7. Man has become an important determining factor of the environment of all life. His continued existence and advancement are dependent upon his wise modification and control of the environment.
8. The earth is very old as measured in terms of our units of time.
9. The surface of the earth has not always had its present appearance and is constantly changing.
10. There have been profound changes in the climates, not only of various regions, but of the earth as a whole.
11. Space is vast.
12. The earth has been developed as a result of the action of natural forces.
13. The sun is the original source of energy for the earth.
14. The earth's position and relation to the sun and moon is of great importance to the life of the earth.
15. Matter and energy cannot be created or destroyed.
16. All life has evolved from very simple forms.

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[1]*Technique used for Developing Course of Study in Science—pp. 56-57 and 13.*

[2]*Teaching Science in Schools.*

[3]*Craig ad. cit. pp. 21-24.*

17. Species have survived because by adaptations and adjustments they have become fitted to the conditions under which they live.
18. The physical environment has great influence, not only upon the structural forms of life, but also upon society.
19. Man has modified plant and animal forms through a knowledge of nature's methods.
20. There is a very great variety and range in the size, structure and habits of life.
21. Through interdependence of species and struggle for existence, there is maintained a balance among the many forms of life.
22. Chemical and physical changes are manifestations of energy.
23. There are less than one hundred elements.
24. Every substance is one of the following: (a) an element, (b) a chemical compound, (c) a mechanical mixture.
25. Life is dependent upon certain materials and conditions.
26. All life comes from life and produces its own kind of living organism.
27. Efficient living is dependent upon knowledge of the principles of health and satisfaction.
28. Light is indispensible to life. The phenomena and the applications that man has made of light are important to his continued progress.
29. Sound is caused by waves which are produced by a vibrating body which can affect the auditory nerves of the ear.
30. Gravitation is the attraction between bodies. It has profound influence upon the movements of astronomical bodies.
31. The earth and its life are greatly affected by the ocean of air which completely surrounds it.
32. In industry and in the home, man can accomplish more in less time by the use of machines.

Any machine, no matter how complicated, may be analyzed into a few simple types.

34. The properties of the different elements depend on the number and arrangement of the electrons and protons contained in their atoms.
35. All matter is probably electrical in structure.
36. The applications of electricity and magnetism in the home and industry has revolutionized the methods of living of many people.
37. Heredity is responsible for the difference between parents and off-springs as well as resemblances.

The revision of the objectives in science is drawn from a number of sources. Lists of principles of science that have been drafted from time to time by the Syllabus Committee, revising the New York State Course of Study in Science. Lists of principles drafted in connection with reorganizing the Science Instruction of the Parker School District, Greenville, S. C. Lists of principles drafted in Seminar Classes conducted by Professor Powers of Teachers College, Columbia University. Lists of objectives and their evaluation as stated in the "Techniques Used in Developing the Horace Mann Course of Study in Elementary Science."

The "big ideas" of science must be broken up for different grade levels. According to Dr. Powers it is the task of the curriculum worker to array throughout the grades of learning, experience for building up these large concepts set as goals. There should be no abrupt break but a gradual correlation of subject matter from the lower grades throughout the high school. Subject matter means data for the solution of a problem. The teacher of science is concerned in providing learning experiences which will contribute to a functional understanding of these objectives. The teaching situations must take the learner through learning experiences which will give a comprehensive knowledge and understanding of these objectives.

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School Science and Mathematics, 28: 496-505.

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University of the State of New York Press, pp. 1-2.

SUBJECT MATTER TO ACHIEVE THESE OBJECTIVES

Powers gives the following criteria for the selection of subject matter: 1. Must contribute to the objective. 2. Must challenge interest of children. 3. Must have functional value, *i. e.* value recognizable after accomplishment in its affect upon the behavior of the learner 4. Must have social value.

Frank gives the following for General Science:

1. The subject matter must be selected wholly from the pupils' environment.

2. Materials must be selected which relates directly to the pupils' activities.

4. All of the subject matter selected must be socially worth while

5. Only such material should be selected as are capable of contributinging to the accomplishment of the specific aims of General Science or of the general aims of secondary education.

The N. E. A.[1] gives the following criteria for elementary science:

1. Should belong to the activities and experiences of childhood and to the child's environment.

2. Should arouse the interest and curiosity of the child.

3. Must have social value.

4. Material should be seasonal.

5. Should be unified and progressive.

A procedure recommended in the selection of subject matter would be: (1) The listing of the things of the environment of a student of a given school age in a community. (2) The organization of this material into topics in proper sequence. (3) The selection of laboratory experiments to be used and of class room methods. As a final check on this material list all the subject matter relating to pupil's

[1] *Department of Superintendence, N. E. A. Fourth Yearbook, pp. 99-100.*

interest and activities. If this gives additional instructional material, include in the course. For studies on children's interest see Downing,[1] Trafton,[2] Mau.[3]

To determine the amount of scientific knowledge found in the public press which is a reflection of public needs and interests see Finley and Caldwell.[4] Although this is a study of biological material the same procedure if carried out will give an index of astronomical, geological, chemical and physical materials. This sort of procedure will furnish the supervision with part of the foundation upon which to proceed in selecting subject matter. The community needs and interest should be determined in a scientific manner and the procedure carried out by Finley and Caldwell seems desirable. To determine the principles of science most frequently used in the daily lives of men, a survey of social groups can be made of doctors, housewives, lawyers, preachers, plumbers, etc.

A syllabus is desirable and along with the syllabus an adopted text-book should be used. Vocabulary difficulties of text-books can be determined with the aid of The Teachers Word Book[5] and Powers[6] studies. No text-book or manual is complete in itself. Supplementary materials are recommended, for suggestions.

On such material the teacher is referred to Woodring, Oakes Brown,[7] Roller,[8] and the back numbers of Science Education,[9] The Science Class room,[10] and School Science and Mathematics.[11]

For helpful supplementary materials for elementary science see Department of Superintendence, N. E. A. Fourth yearbook, pp. 102-112.

The teacher should use every available reference. The following courses of study in science are helpful. The courses of Denver, Cleveland, Toledo, St. Louis, Sacramento, The Baltimore County Course of Study (Warrick and York, Baltimore). Illinois State Courses (Public School Publishing Co.

[1] *Downing: Children's Interest in Nature Materials.*
Curtiss: Investigations in the Teaching of Science, pp.129-131.

[2] *Trafton: Children's Interest in Nature Materials. Same book, pp. 119-123.*

[3] *Mau: Some Experiments With Regard to the Relative Interests of Children in Physical and Biological Material, pp. 123-128.*

[4] *Finley and Caldwell: Biology in the Public Press. Digest of Investigations, pp.259-364.*

[5] *Thorndike.*

[6] *S. R. Powers: The Vocabulary High School Science Text Books. T. C. Record 26, 368-382 and 9 Vocabulary of Scientific Terms for High School Students, 28: 220-245.*

[7] *Enriched Teaching of Science—Bureau of Publications, Columbia University.*

[8] *Sources of Free Material for Teaching Natural Science—University of Oklahoma.*

[9] *W. W. Whitman Publishing Co., Salem, Mass.*

[10] *381 Fourth Avenue, New York, N. Y.*

[11] *404 N. Wesley Avenue, Mount Morris, Ill.*

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THE ORGANIZATION OF SUBJECT MATTER

The unit plan of organization is recommended in this sort of organization, the pupil has a constant sense of mastery which gives him confidence. The unit of learning as defined in this study is the comprehensive and significant study of some aspect of the environment. The major units of instruction should be selected by teacher and supervisor. The Morrison plan is suggestive:

1. Exploration
   (a) Serves as a basis of recall.
   (b) Locates difficult points.
   (c) Motivates the work.
2. Preview
   (a) Gives broad over view of unit in related form.
   (b) Raises question in minds of pupils.
   (c) Gives demonstrations of key studies.
3. Assimilation
   (a) Confronts pupil with problem.
   (b) Teaching initiative and self reliance in collecting, organizing material and drawing conclusion.
   (c) Provides practice in the scientific method.
4. Organization
   (a) Organize around "great wholes."
   (b) Pupils summarize work and correlate it.
   (c) Clear up difficulties.
   (d) Make oral report of projects.
5. Testing
   (a) Clear up points for special students.
   (b) Teacher evaluates own work and value of unit.

Downing gives the following principles for the organization of subject matter.

1. Any course of study in science must have dependent continuity.
2. The course must increase in difficulty commensurately with the student's increasing capacity—most worth while specific objectives, the minimum essentials and proper grade placements.
3. Materials should be organized into small interdependent units within the grasps of pupils so the pupils will have a sense of mastery.
   (a) Units should result in the comprehension of a principle of science of importance in the life of the pupil.
   (b) Drill must be given in carrying the principle over into problematic life situations.
   (c) Organize some of the units into project and problem form.
   (d) Oranization of units should treat the history of lives of great scientists so as to obtain an appreciation of the value of science and the devotion of scientists.
   (e) The subject matter should be so organized that it takes into account the need of supervision.

Frank gives the following:

1. The subject matter must be organized as a whole, must have continuity.
2. Must be broken up into smaller units.
3. The units must be organized on the same general plan—uniformity of organization makes for economy in learning.
4. The units must be in good sequence.
5. Units should be treated as a whole.
6. Units should be divided into sub-units.
7. Time and attention to be given to each topic.

For illustrative units of instruction in elementary science Craig's[1] work is recommended, in the Junior high school, The Fifth Yearbook.[2]

The following principles of psychology are valuable in the organization of science units and are taken from Laton's monograph.[3]

1. We learn best the responses we actually make and others only in proportion to their resemblance to these.
2. Select specific objectives for their value to the students both in the present and in the future and teach the responses which these objectives indicate as desirable for the student to learn to make.
3. Make situations and responses to be connected identifiable in the mind of the learner.
4. Teaching situations should be as nearly as possible those in which the student is expected to use the information or attitude which he learns. While transfer to other situations may take place, the amount and kind of transfer is uncertain, and the safer plan is to teach the facts and principles to be learned in the relationships in which they are to be functionally associated. (This is the Law of Analogy regarded by Dr. Laton as the most important in selection of material for teaching.)
5. Attach responses to the situations in which they are to be used. The greatest amount of transfer is to be expected when situations have as many elements in common as possible and when these elements are brought into consciousness.
6. A generalization is best formed when several situations containing a common element and other situations containing a contrasting element are presented.

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[1]*Course of Study in Science in Horace Mann School Grades 1 to 6. Bureau of Publication.*

[2] *Department of Superintendence, N. E. A. Fifthyearbook, pp.166-118.*

[3]*Laton, A. D., Psychology of Learning applied to Health Education through Biology.*

The formation of the generalization is facilitated when the learner becomes conscious of the common elements and the contrasting elements.

7 Learning is more efficiently done when interest becomes inherent in the material to be learned.

8. Having a problem in mind will focus attention on the elements in the situation which appear to be revelant to the solution of the problem.

9. Becoming conscious of unanswered questions brings a state of dissatisfaction which is removed by finding the answers to the questions. This satisfaction strengthens the bonds formed.

10. Do not form bonds which must be broken. Form bonds of the desired strength with the desired responses.

11. We learn the connections we actually make. The connections may appear in the form of attitudes and mental habits as well as in the form of knowledge and physical habits.

12. Other things being equal repetition of recently made connections strengthens bonds.

These principles of psychology can be applied to the whole range of possible materials in selecting objectives, subject matter or methods of instruction. The following table gives the steps in the learning process, pupil activities, and the psychological principles applied in arranging class procedure and is taken from Laton's work, page 49. For more detailed analysis of pupil's learning see Chapter 4.

Steps in Learning Process	Pupil Activity	Psychological principles Applied To Arranging Class Procedure.
1. Planning	Choosing diseases and material concerning these disease for study.	Principles of mind set, interest and identifiable elements.
2. Assimilation	Learning details concerning the specific diseases.	Principles of satisfaction, use, recency analogy and identifiable elements.
3.Generalization	Forming generalizations, concerning immunity, transfer of organisms and others.	Principles of Analogy
4. Application	Applying knowledge gained to critical reading of current articles.	Principle of use

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Technique of Instruction

There is a technique of instruction to be improved and with respect to classroom procedure "improvement of instruction is the primary aim of the supervisor." The science supervisor should evaluate teaching skill largely in terms of teachers' success in supervising the thought process.

The thought process may be outlined:

1. Accurate observation.
2. Recall of past experiences, especially those that are related to present problem.
3. Pick out essentials.
4. Encouragement of pupils hypothesis.
5. Pupil's test of hypothesis. Accumulation of facts or development of experiments to test validity of hypothesis.
6. Arrangement of material should be such that it will point to conclusion.
7. Pupils should develop skill in stating clear and accurate conclusions.
8. The reasoning process must be supervised.

Dr. Laton gives four steps in the learning process: (1) Planning by class, (2) Assimilation, (3) Generalization, and (4) Application, which have been outlined on Page 12 of this study. The teacher must get the students to see the problem which we shall call motivation or stimulation. This seems to be the first step in the learning process. Planning by the class so as to encourage activity seems desirable, the teacher should aid pupils in the selection of materials. Students will be glad to bring in newspaper articles, books and suggest plans for field trips. The third step, Assimilation—Generalization really means directed study and reflection on the unit as a whole and the scientific principles involved. The last step, Application—is very important—this the reaction to the stimulation set up in the first step. The teacher is concerned here with testing the utility of knowledge. If a lot of information has been imparted rather than scientific knowledge, this step will seem hard to pupils, on the other hand, if the teacher has imparted scientific knowledge and has been drilled in the scientific method, this knowledge will be carried into problematic life situations which is a major objective of science teaching. The table is an attempt to give an idea of teacher and student activities in the four steps of the learning process.

Steps In Learning Process	*Teacher Activity*	*Student Activity*	*Testing*
Get student to see problem Stimulation or Motivation S	Teacher sketch or unit. Use the lecture demonstration. Review of previous work, recalling experiences related to unit. Pre test to determine student's background.	Observing, note-taking, reading discussion, written work. Recall of past experiences.	This first step is largely one of exploration and motivation. Check up by questions or exercises. Have students give oral or written outline of unit.
Planning by class and teacher	Selection of materials for study of unit. Encourage students to help in plans.	Help in selection of activities, reading matter and equipment.	
Assimilation	Supervision of study, group or individual. Encourage hypothesis — See that student's reason from observed phenomena to general principle involved.	Reading, Field Trips, Observation, Demonstrations before class. Drawing Experimentation. Learning details concerning specific unit.	Various forms of tests. Summaries. Discussion before classes. Interpretation of some problematic situation.
Generalization			
Application R	Organization material should be so organized as to lead to conclusions. Recitation. Outline projects.	Outline the unit. Oral and written recitation. Making plans for projects which should be completed.	Have the student devise experiments for testing hypothesis.

Certain activities are recommended to fulfill the objectives of science. The Department of Superintendence N. E. A. Fourth Yearbook, pp. 73-98 gives a list of activities for elementary schools. A criterion for the selection of an activity is the determination of whether or not the student has attained the objectives by participation in the activity.

For developing skill in the scientific method, the problem project method seems best. The project is a problem the answer to which is expressed in the concrete as setting up a force pump to demonstrate the principles involved.

Pieper and Beauchamp[1] divide the instruction in each Unit into five phases: (1) exploration, (2) preview, (3) assimilation, (4) organization, and (5) recitation.

For the development of emotionalized standards, the teacher will assign readings or tell the stories of the sacrifices made by devoted scientists. The story of the life of Pasteur and the story of the Age of Stone are suggestive.

Field trips must be carefully planned and conducted, the teacher should visit the place and prepare a set of questions to be given the class before the visitation. Thomas Briggs[2] in his article "The Excursion as a Means of Education" makes the following statement. "Experience leads the teachers to conclude that the excursions are valuable as a means of enriching and extending the ordinary work of the school and as a stimulus to interested, intelligent and varied co-operative effort. They acquaint pupils with their community, they initiate them with resulting "satisfactions" into desirable activities that they should perform again and again, and they furnish the best of opportunities for initiative, self direction and co-operation. A little ingenuity will enable a teacher in any community to arrange excursions or field trips to accessible objectives that will contribute greatly to the real education of pupils."

There has been much controversy on the efficiency of demonstration as contrasted with individual laboratory work. Horton[3] concludes: "Demonstration, it appears can present almost if not quite as effectively those experiences which serve as information and for making verbal answers to verbal questions in written tests. If this information is all we set up as a goal; if a passing acquaintance with the phenomena of chemistry sufficient to understand written articles of a popular nature; or ability to interpret elementary chemical discussion is all that is desired it would seem that the demonstration method adequately and much more economically as regards both time and materials meets the requirement . . . .

However, if further work in the field of chemistry or other science is to be done in college or technical school laboratories, pupils will doubtless find themselves handicapped unless they have had some prac-

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[1] *Reprint from—Teachers Guidebook for Everyday—Problems in Science.*

[2] *T. C. Record Volume 22:419.*

[3] *Horton: Does Laboratory Work Belong? Journal Chem. Ed. 5: 1442-3*

tice in the individual laboratory work . . . . we should seek to make the laboratory and the demonstration complementary and mutually helpful, and let both contribute to making chemistry not only a preparation for more chemistry but a means of achieving our larger task, namely, the training of thoughtful men and women who not only know but are able to do?"

Cooprider and Cunningham found demonstration method about as efficient as individual method. One can teach laboratory manipulations in early stages by the demonstration method. A skillful demonstrator can give good manipulary skills in the early stages. If the student is going on into an allied profession needing science he should have his science, by the laboratory method. The demonstration method is much more economical of time and material. The mere working our of experiments in the laboratory by following directions seems to have little educational value except that the student has a chance to manipulate the material. If the directions are removed from the experiment, a laboratory problem is left which has more educational value than the traditional laboratory experiments. The demonstration method together with the laboratory problem method would give the manipulatory skills, scientific knowledge and the scientific method of thinking all of which are specific goals of instruction. Relative to the controversy between the advocates of the two methods Powers[1] states: "There can be no acceptable general statement of which method of laboratory instruction is best." In the same article, Dr. Powers brings out the idea that laboratory is a means to an end, and the end is the accomplishment of definite objectives. The same can be said of notebooks; they too should provide learning experience which should contribute to the accomplishment of desirable objectives.

Proper study habits and attitudes are means by which students may come to an understanding of science phenomena. Pieper[2] gives the following student activities for developing proper habits of study in science, "(1) listening to the spoken word, (2) reading, (3) interpreting diagrams and pictures, (4) interpreting observed phenomena in the laboratory or outside of the class room, (5) organized knowledge, and (6) oral and written expression." These activities demand directed supervision. The teacher must be able to diagnose and correct poor study habits and study attitudes. The following types of questions are valuable in diagnosing the student's study habits and are taken from Pieper's study.

1. Does the student read with serious sustained application?
2. Can the student give orally, or in written form a coherent statement of the gist of the subject matter read?
3. Can the student write in his own words and in a single statement the major idea contained in a paragraph?

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[1] *T. C. Record, Volume 30: 341.*

[2] *Pieper, C. J. Supervised Study in Natural Science. School Review, Volume 32, Page 122.*

4. Does the student understand the meaning of the new scientific terms used?
5. Does the student see clearly the cause and effect relationships?
6. Does the student make cross references as indicated in science text books?
7. Does the student associate the factual subject matter with the unit concept?

The teacher must plan to meet the individual differences in ability and interest which develop during the required work. Some students will complete the required work in the unit ahead of the class, they may be given additional exercises or supplementary projects. Some students will lag behind the class, they may be given special aids by the teacher such as conferences.

The supervisor should take into account the value or extra-curricula activities in science, Meister states, "The Science Club is an organization which may serve as a medium through which after school activities in science may be stimulated, guided; controlled and developed."

The extensive reading of science material can be utilized to increase scientific knowledge. Concerning General Science, Curtis concludes "The conclusion seems justified that extensive reading functions in adding to the pupil's achievement in general science whether this reading be done entirely appart from any course in general science, or as an integral or a supplementary part of the regular course in general science".

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1. Reprint from Teachers Guidebook for Everyday Problems in Science, Pieper and Beauchamp.
2. Powers: Research in Science Teaching.
3. Uhl et al: The Supervision of Secondary Subject, Chapter 2, by Pieper.
4. Burton et al: The Supervision of Elementary Subjects: Chapter 10 by Downing.

The Measurement or Results

Students should be working and learning at their maximum capacity. The results of teaching must be measured if the teacher is to get an accurate knowledge of the efficiency of his teaching. Classes tested with proper frequency and accuracy are likely to work near their maximum capacity. The examination must be constructed so as to measure as far as possible the extent to which the objectives have been realized. The examination should be objective, here the factor of personal opinion is ruled out. The examination should be comprehensive, the sampling should adequately cover the subject matter of the course. The examination must have high reliability that is it must measure whatever it sets out to measure. The objective examination is more economical of time and effort. The teacher should keep in mind the aims of science in measuring the results of teaching. The new type examinations have their advantages and disadvantages, some of which are (1) Takes pains to construct, (2) Must be worded so that statements will not be ambiguous, (3) Have to be explained and justified since pupils and parents are accustomed to the traditional essay examinations. On the other hand (1) There is opportunity for adequate sampling. (2) Capable of only a single interpretation.

The treatment below is an attempt to give a number of test suggestions:

1. The True-False Test. Here you have a number of true and false statements arranged in chance order as—mark the following with a + if you think they are true and with a — if false. Place your mark in the left-hand margin of your paper opposite the numbers.

+ 1. Water is a chemical compound.

— 2. Plants take in nitrogen through the stomates.

2. The Modified True-False Test built on the plan devised by Curtis and McClusky, as:

Correct the statements you consider to be false by changing not more than two words in the original statements so as to make it true. All changes are to be made in the form of substitutions. Do not change the subjects of any of the statements.

(oxygen)
1. Water is a compound of (nitrogen) and hydrogen.
(water) (air)
2. Light travels more rapidly in (air) than (water).

3. The multiple—Choice Test. The pupil is presented here with a set of statements each of which is to be matched with one word or set of words in a list of several offered.

SAMPLES

Write the number preceding the word or words on the dotted line at the right which correctly answers the question or completes the statement.

1. Air has a gas in it called (1) Chlorine (2) Bromine (3) Oxygen (4) Iodine..........3.........
2. The man who discovered circulation of blood is (1) Agassiz (2) Huxley (3) Audobon (4) deVries..........2.........
4. The Matching Test. The pupil is presented here with two lists of statemeents and instructed to follow directions. Before each item in List No. 1, place the number of the item in List No. 2 which best answers question raised in List No. 1.

I	II
2.......1 Protoplasm	1. The transfer of pollen from another to stigma.
3.......2 Pollination	2. The living substance of plants and animals.
1.......3 Fertilization	3. The union of sperm and egg.
5.......4 Protozoa	4. Greensubstance founded in the leaves of plants.
4.......5 Chlorophyll.	5. One-celled animals

There are other types of objective examinations which can be constructed by the teacher but the four mentioned seem best for class room purposes. Paterson's Preparation and use of New Type Examinations (World Book Co.) is recommended.

The teacher should be familiar with the new type examination which are standardized, especially those in natural science. An article by Rich[1], refers to most of the new type tests in Natural science. Powers[2] makes the following statements "Teachers and supervisors of general science will find the test valuable for each of the following purposes.

1. It furnishes the pupil an objective measure of his accomplishment and of his standing in the group to which he belongs.
2. It furnishes a basis for comparison of accomplishment in different schools.
3. It furnishes objectives criteria for assigning marks, making promotions, reporting to parents, determining honors, etc.
4. A pupil's score on the test is in some measure a prediction of his ability to do successful work in specialized courses in science such as the later courses in biology, physics and chemistry.
5. The test will be useful in school surveys for studying the efficiency of a school."

The same statements might be made of other standardized tests especially those with established norms. The teacher is able to interpret the score of her classes by comparison with norms. The study seems to indicate the following steps in the teaching process, the supervisor should carefully evaluate the skill of the teacher in following them out.

1. The objectives to be accomplished.
2. Pupil activities through which they may accomplish objectives.
3. Teacher activities in guiding and aiding those of the pupils.
4. Instructional material for carrying out activities.
5. Measurement to see if objectives have been accomplished.

In supervising a unit of instruction the supervisor might apply the following questions to evaluation of the teaching process.

1. Does the teacher have a knowledge of the general and larger objectives of science teaching?
2. Does she know the specific objectives and the "essential meanings to be developed" in a given unit of instruction?
3. Has she a knowledge of desirable pupil activities through which they may accomplish objectives?
4. Is she able to guide and aid students in carrying out their activities?
5. Is the instructional material arranged around the activities?
6. What criteria does she employ in the selection and organization of the materials and activities of instruction?
7. Does she know the true nature of the learning process?
8. Is she making science socially worth while *i. e.* is she influencing the behavior of the learner through his knowledge of scientific generalizations?
9. Is she able to objectively check to see if the results have been attained?

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[1] *School Science and Mathematics Vol. 26, pp. 845-852.*

[2] *Power's General Science Test. Direction for Giving.*

The study seems to warrant the following recommendations:

1. The supervisor should formulate valid objectives and see to it that these objectives are comprehended by the teaching staff.
2. The major objectives should be agreed upon early in the year.
3. Specific objectives should be formulated as the units are taken up in class.
4. Supervisor should select and organize with teachers the activities for accomplishing the objectives.
5. Major units of instruction should be selected by teachers and supervisors.
6. The plan for the organization of units should be outlined by supervisor.
7. Teacher and supervisor should select text-books and other materials for instruction.
8. Supervisor should not impose any one technique of instruction on teachers, rather they should decide on the combination of methods to be employed in a unit of instruction.
9. Supervisor should outline the general plan of testing.

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REPORT TO SOUTHERN ASSOCIATION OF COLLEGES AND SECONDARY SCHOOLS

Early in June, 1930, a circular was sent to each institution of higher education for Negroes in the Southern States, explaining the work of this Committee and inviting them to request inspection, with a view to eventual rating by the Association. It was found that there were 85 institutions of this type in the Southern States, and up to the present time 60 of them have asked for the necessary forms on which to submit reports to the Southern Association. Of this number 35 have filed complete reports.

On the first of September the field work for this Committee was undertaken by the Committee's Executive Agent, Professor Arthur D. Wright, of the Department of Education of Dartmouth College.

Obviously it was impossible to visit each of the 35 institutions mentioned above in the time between the opening of the college year and the first of December, when the Southern Association was to meet. Therefore it was necessary to select some of the institutions most likely to meet the Association standards, as evidenced by the reports submitted, and confine attention to them for the first few months. Fifteen institutions were selected for inspection, but it was only possible to visit nine of them, along with informal visits to a number of other institutions.

Early correspondence and conferences indicated very clearly that the institutions of higher education for Negroes wished to be rated by the Southern Association on exactly the same basis as to standards as were the institutions for white youth, thus avoiding the setting up of what might be termed "Negro standards." This policy has been followed without exception, even though the resultant ratings seem very limited in number and conservative in degree.

At the annual meeting of the Southern Association in Atlanta, Ga., on December 2nd, the Executive Agent of the Committee reported to the Committee on Approval of Negro Schools, which Committee in turn reported to the Executive Committee of the Association. The latter Committee approved the following action, constituting as it does the first formal rating of any colleges for Negro youth by the Southern Association.

APPROVED LIST OF COLLEGES AND UNIVERSITIES FOR NEGRO YOUTH

These institutions, not members of the Southern Association, have been approved by the Executive Committee of the Association, having been inspected by their request after a full and complete report from each institution.

CLASS "A"

Institutions in this class meet in full the standards set up by the Association for institutions of higher education:

Fisk University, Nashville, Tennessee.

CLASS "B"

Institutions in this class do not yet meet in full one or more of the standards set up by this Association for institutions of higher education, but the general quality of their work is such as to warrant the admission of their graduates to any institution requiring the bachelor's degree for entrance:

Johnson C. Smith University, Charlotte, N. C.
Morehouse College, Atlanta, Georgia.
Spelman College, Atlanta, Georgia.
Talladega College, Talladega, Alabama.
Virginia State College, Petersburg, Virginia.
Virginia Union University, Richmond, Virginia.

A rating in Class "A" indicates the attainment of standards equivalent to those attained by full members of the Association, while a rating in Class "B" indicates the attainment of standards equivalent to those attained by institutions on the list known as "Approved Four-Year Non-Member Colleges."

It is greatly to be regretted that time did not permit of the inspection of all colleges that might be likely to qualify for Class "A" or Class "B" but the limitations of time and travel prevented, for instance, any visits before December 1st to Mississippi, Louisiana, Texas, and some other states.

From now on to the end of the year every effort will be made to visit each institution that has filed a report, not alone with a view to inspection but in many cases more especially to assist in devising ways and means to help the institution attain an eventual standard rating.

As more institutions are visited it may be found desirable to set up a list of Class "C" institutions, if such action may seem wise. Furthermore, there will be set up lists of junior colleges and teachers' colleges, each divided into Class "A" and Class "B" groups, as has already been done for the four-year institutions.

One of the problems that is quite apparent is that some plan must be worked out for rating the secondary schools for Negroes in the Southern States. This committee has power to make such ratings and will welcome any suggestions as to policies and plans of procedure from any interested parties.

The Secretary-Treasurer of the Southern Association is the president of Birmingham-Southern College, Dr. Guy E. Snavely, hence it was believed best for the Executive Agent of this Committee to have an office at Dr. Snavely's institutions. All inquiries concerning the work of the Committee and all requests for report forms, all completed reports and all other correspondence should be addressed to Professor Arthur D. Wright, Birmingham-Southern College, Birmingham, Ala.

COMMITTEE ON APPROVAL OF NEGRO SCHOOLS

H. Ivy, Supt. Schools, Meridian, Miss., Chairman;
J. Henry Highsmith, State Supervisor of High Schools, Raleigh, N. C.;
Dr. T. H. Jack, Dean, Emory University, Atlanta, Ga.

BELIEVE IT OR NOT

You can't live fast and live long.

You can't drink intoxicants and drive safely.

You can't run a car in a closed garage and always escape alive.

You can't get smallpox if recently successfully vaccinated.

You can't always judge the safety of a cook by the neatness of her dress.

You can't control an outbreak of contagious disease by closing the schools.

You can't judge the safety of a glass of water by its clear, sparkling appearance.

You can't starve down and grow thin without weakening your resistance to disease.

You can't judge the desirability of a restaurant by the appearance of the room.

You can't eat largely and get fat without developing fatty degeneration of the organs.

You can't determine how many people have coughed disease germs upon foods which are exposed.

You can't be careless in nursing a typhoid patient without danger to him, to yourself and to others.

You can't do the most effective work when handicapped by an uncorrected physical defect or suffering from preventable disease.

You can't have unreported and unquarentined cases of contagious disease in your home without endangering your neighbors and arousing their enmity. —*H. B. W. Pennsylvania's Health.*

THE PERISCOPE

FEWER TRIALS FOR NEGRO CHILDREN BUT WHITES EXCEL IN SPEED

Negro children, when given a test of learning to associate certain numbers with letters as in a code, were able to learn in fewer trials than those required by White children, but the White children excelled in speed.

The trial was made by Prof. Lyle H. Lanier, of Vanderbilt University at Nashville, Tenn., who gave individual tests to nearly 500 12-year-old White and Negro children in three typical cities: Nashville, Tenn.; Chicago, Ill.; and New York City. Full details of the study are reported in the current issue of *Comparative Psychology*.

—*Science News Letter.*

NEGRO EDUCATION RISE TRACED BY SECRETARY WILBUR

There is no more amazing picture in the history of education than that presented by the American citizen of the Negro race. His advance forward with our civilization has been phenomenal.

It is natural that he should reflect the social conditions of his environment. These are shifting for him every day.

While in 1860 most Negroes were living in a civilization which was primarily agricultural, and for the most part upon land owned by others, we now have tens of thousands of homes and farms own by Negroes, and about one-third of them are living in our cities instead of in the rural districts. In fact, the migration of the Negro to the industrial centers has been one of the striking migrations of peoples on this continent. During the last 50 years there has been constant adjustment of the Negro to the new industrial age with its demands that men shall be sorted in accordance with their abilities to do different things.

CAN CHOOSE PROCEDURES BY FACTS

Education gives elasticity to the individual in meeting changes. The Negro has shown not only capacity but elasticity to a degree that indicates that he will continue to make adjustments to new conditions. The Negro is now making good in all walks of life. Some have attained distinction in law, medicine, dentistry, and education. Others have shown good capacity in administration. The leaders in these fields have not only great opportunities but great responsibilities, for it is important that others should follow them.

Along with the development of these outstanding leaders there has been the general rise in the condition of the masses of the race. Out of these masses must come more leaders. A steady improvement will depend upon the increase of educational opportunity and an increase in the share that the Negro will have in the economic life of our country.

Our educational aims are no longer based upon authority, or caste, or tradition, but rather upon the needs of the individual and society and the innate capacities of those to be trained. Scientific investigation has given us many new methods, and instead of following the blind path of the past we can now choose our procedures by facts derived from research. More and more men and women are devoting themselves to the scientific investigation of the Negro boy and the Negro girl. This will permit an improvement of the educational work in all of the different grades and in the higher levels of education.

Specialist in Office Education

The United States Office of Education of the Department of the Interior is interested in the study of all that is going on in Negro education throughout the Nation. It is endeavoring to assist in the guidance of the workers in this important field. The right methods, if thoroughly established and given the widest possible use, will give us the greatest results in the shortest space of time.

At present in the Office of Education the section on the education of Negroes consists of one specialist, a man, one assistant specialist, a woman, and one stenographer-clerk, a woman. They are being assisted and guided by a committee of some 20 men and women educators of both races who have had successful experience in educating Negro students, both children and adults. We hope that their work will stimulate interest in bringing an educational opportunity to every Negro, young and old. Our government and our economic system both depend upon an informed and contributing citizenship. Education will permit the Negro not only to obtain a secure economic position, but also to do his full share as an American citizen.

—From an address by Secretary Wilbur over Station WKC, Washington, D. C.

SCIENTIFIC MEN HONOR WORK OF MOREHOUSE PROFESSOR

The possibility of improving the acoustics of unsatisfactory auditoriums by regulating their humidity was the interesting suggestion embodied in a paper read before the Indiana Academy of Science at its annual meeting last week, by Prof. Halson V. Eagleson, of Morehouse College, entitled "The Effect of Humidity on the Reverberation Period of a Room," Prof. Eagleson's paper aroused great interest at the meeting of the Academy, which was attended by more than four hundred scientists from over the State. It will be published in the proceedings of the body.

The study comprehended several hundred delicate experiments with the reverberation periods of rooms under varying conditions of humidity. These revealed the fact that the degree of moisture in a room so affects its period of reverberation as to make decided changes in its acoustic properties.

The work was done under the advice of Dr. Arthur L. Foley, head of the physics department of Indiana University, from which Prof. Eagleson graduated in 1926 with the A. B. degree, and in which he is continuing post-graduate work looking to the master's degree. Dr. Foley expressed great interest in the experiments, it is understood and has offered his co-operation in carrying them to more exact and unmistakable conclusions. Since 1927, Prof. Eagleson has been a teacher of physics and mathematics in Morehouse College.

COLLEGE PLANS COURSE FOR NEGRO PHYSICIANS

Dr. W. T. Sanger, president of the Medical College of Virginia, announced that a post-graduate clinic for Negro physicians will be established by the college in connection with St. Phillip's Hospital, to begin June 18. President Sanger said it would be the first medical venture of its kind in the South.

The clinic is designed to supply post-graduate courses for the state's Negro physicians and will be backed by the full facilities of the college and aided by one or more of the big scientific foundations, Dr. Sanger added.

Plans for the educational venture, viewed here as a pioneer effort that may pave the way for further advances in the professional education of the Negro in the South, are being worked out in co-operation with the Negro physicians and a five-year program is being prepared to consist of from one to four weeks' intensive clinical training annually under the best modern guidance. The general plan has been under consideration at the college for several years and the clinic is designed to enable Negro physicians to keep up to the minute with the developments ni their profession.

—Associated Press.

GEORGIA SUPERVISOR NEGRO EDUCATION

Prof. J. C. Dixon, Supervisor Negro Education, is a most worthy successor to Mr. Walter B. Hill. We do not believe a better man could have been found to follow this good man, Mr. Hill. Prof. Dixon is manifesting deep interest in the educational advancement for our people. Our cause is safe in his hands.

HON. WALTER B. HILL

Mr. W. B. Hill, the Negroes' Friend will never be forgotten in Georgia by our people. We shall always honor him through profound gratitude. For many years he was a hard worker and a strong advocate for our Educational Advancement. He has been promoted and is now a member of the General Education Board and an assistant to Mr. Jackson Davis, Richmond, Virginia.

Thousands of colored teachers of Georgia heartily join us in an expression of best wishes for him.

—The Georgia School Picture.

FISK UNIVERSITY DEDICATES NEW LIBRARY

"A library connotes knowledge made accessible", said Dean Herbert Hawkes of Columbia University in his address of dedication at Fisk University. "The development of language, the whole long story of the attempt to pass knowledge and the things that knowledge has taught us to produce from person to person and from place to place and time to time is all a part of this attempt to transmit ideas, to make knowledge and its results accessible. Contrasted with the idea of knowledge is belief, opinion, ignorance, indifference. In these modern times one must know. It is the function of a library to serve as one of the foci in the attempt to replace indifference by intellectual life. This process need never stop for the items of knowledge possessed by any individual or by the race is finite, while the number of things we do not know is infinite. In recent years we have weighed much and touched many things that to our elders were counted among the imponderables or intangibles. We have weighed the stars; we have learned to control epidemic diseases; we measure with reasonable accuracy the native intellectual ability of individuals. But there are plenty of imponderables left. Integrity, loyalty, religion, love, life itself are at present not susceptible of measurement. The recognition of the existence of the imponderables and a consciousness of their importance, imposes an obligation to understand them better. We are moving toward what seems to be an interpretation of the world in terms of personality—the personality of the Author of it all. In dedicating this beautiful building Fisk must needs rededicate herself to the cause of truth made accessible. This involves nothing less than thinking the thought of God after Him."

Dean Hawkes' discussion of "The Modern College and the Imponderables" was a splendid climax of the dedication exercises. Greetings were brought to Fisk by Mayor Hilary Howse of Nashville, Adam Strohm, president of the American Library Association, Jackson E. Towne, president of the Tennessee Library Association, G. Lake Imes, representing Dr. R. R. Moton, Louis R. Wilson, librarian of the University of North Carolina, Herbert Hirschberg, dean of the school of library science of Western Reserve, and Louis Shores, librarian at Fisk. The building was presented by the achitect, Henry Hibbs, and accepted by Paul D. Cravath, chairman of the Fisk Board of Trustees.

The dedication exercises occurred in the middle of the week of conferences, the first two days of conference of presidents and deans of Negro Colleges; the last two a conference of librarians. Some of the speakers of national prominence in their fields who addressed these conferences were: Arthur L. Wright of Dartmouth College; John M. Gandy, president of Virginia State College; William E. Stark, Dean of Hampton Institute; Shelton Phelps, dean of Peabody College; Robert M. Lester of the Carnegie Corporation, and Clark Foreman of the Julius Rosenwald Fund; Monroe N. Work, of Tuskegee; Arthur A. Schomburg; Thomas F. Blue, head of the colored division of the Louisville Public Library.

The Board of Trustees of Fisk University in a meeting in Nashville on November 21, accepted formally a gift of $300,000 from the General Education Board for the building and equipping of a Chemistry Building, and let the contract for the building. The chairman of the Board, Paul D. Cravath of New York City, presided. In inviting bids the trustees had taken pains to make it plain that bids would be asked of contractors who were so well regarded that the lowest bidder could be safely awarded the contract. Eight contracting concerns were invited to bid of whom three were officered by Negroes. Only one Negro contractor submitted a bid.

The Board unanimously decided in accordance with its announced policy to award the contract to the lowest bidder, the Rock City Construction Company of Nashville, bidding $160,584, agreeing to break ground for the building December 1, 1930. and complete it July 1, 1931. The Negro firm bid $192,000. J. W. N. Lee, president of the construction company, attended the meeting of the board who expressed to him their desire that inasmuch as Fisk is a college for the education of Negroes, Negro labor should be employed on the Chemistry Building so far as possible. Mr. Lee promised the board that he would give Negro labor preference.

Henry C. Hibbs, who planned the Fisk Library, is architect for the Chemistry Building working closely with St. Elmo Brady, head of the chemistry department. The building will be three stories high, 162 feet long, will contain six students' laboratories, two private research laboratories and will be one of the best equipped chemistry buildings in the country.

NOBEL PRIZES

THE NOBEL PRIZE IN CHEMISTRY

The award of the 1930 Nobel Prize in chemistry to Professor Hans Fischer, of Munich. for his research on human blood is a recognition of the value of what is sometimes called pure science, meaning discoveries or developments which are of great theoretical importance but which may or many not have practical value.

Professor Fischer's recent noteworthy contribution was the synthesis or laboratory production, of hemin, which is one of the components of hemoglobin, the red coloring matter of the blood.

Hemin has also been called respiration ferment. said to rule the organic world. In the higher animals, hemoglobin is a transport agency for oxygen, carrying it from one place to another in the body, but the respiration ferment, hemin. takes up the atmospheric oxygen, which was transported by the hemoglobin, and transfers it to certain organic substances which in turn become oxidized. The respiration ferment or enzyme rules the organic world because in everything that happens in living matter respiration furnishes the driving force. It is found in all living cells.

Professor Fischer's synthesis of hemin made possible the artificial production of hemoglobin itself, which is indispensable for the life of animals, especially mammals.

When Professor Fischer announced this synthesis last year, scientists hailed it as an important contribution to the chemistry of living matter. Some claims were made for it on practical grounds, but Professor Fischer himself did not agree with these views.

"Contrary to many fantastical statements of the daily press no changes will take places in the field of therapeutics (treatment)," he said, "since hemin has been easily obtainable from blood for a long time. It is improbable that the intermediate products of the synthesis and the numerous isomeric hemins, on which work is being done, will gain a practical importance but their investigation is of interest from a theoretical viewpoint. In addition, the influencing of the metabolism of the blood pigment in this way is not likely since this probably depends upon sterins or substances closely related to them."

Professor Fischer was born at Hœchst-am-Main in 1881. He studied at the University of Lausanne, at Marburg, where he received the degree of doctor of philosophy, and at Munich, where he was made a doctor of medicine. He has been on the faculties of various German universities and is now head of the Organic Chemical Institute of the Munich Technical High School. He has devoted himself to studying the pigments of blood and bile, and pyrrol chemistry.

THE NOBEL PRIZE IN PHYSICS

The discovery that light of a single color, or wave-length, shining on certain transparent substances, is partly changed to other colors is regarded as the greatest accomplishment so far of Chandrasekhar Venkataram Raman, of the University of Calcutta, who has been awarded the Nobel Prize in Physics. Named after its discoverer, this phenomenon is now known as the Raman effect, and it was first announced in the spring of 1928. Research laboratories in all parts of the world are now engaged in studying it, because it has opened up an entirely new field in the study of molecular structure.

One of the first investigators, outside of Sir Chandrasekhar's own laboratory, to vertify the discovery, was Dr. R. W. Wood, of the Johns Hopkins University. Working at the private laboratory of Alfred L. Loomis, Tuxedo Park, New York, Professor Wood considerably improved the original apparatus and detected the effect in the summer of 1928.

The Raman effect occurs when monochromatic light (which is light of a single color, or wave-length) shines on transparent substances, such as quartz, chloroform or water. Generally a mercury arc is used as the light source. The light that is scattered by the transparent material is mostly of the same color as that of the light illuminating it. The spectroscope, the instrument that analyzes light, however, shows that part of this light is changed to wave-lengths a little longer or shorter than that of the source. This is, part of the light is either more reddish or more bluish.

On the spectrum photographs the result is a heavy line, representing the main color, attended on either side by narrower and fainter lines. The fainter lines on the one side are arranged the same way as those

on the other, except that they are reversed, as if reflected in a mirror, the center heavy line being the mirror. Sir Chandrasekhar, in his first experiments, found only a single and very faint line on the high frequency, or blue side of the main one, but with improved apparatus Prof. Wood found groups of nearly equal strength on each side.

The great importance of the discovery came from the fact that the differences between the frequency of the additional, or Raman, lines, is precisely the same as the frequencies of the infra-red absorption bands of the same substance with infra-red light, or light vibrating too slowly to be seen, are very difficult to determine directly, so the Raman effect was a convient means of studying them, thus giving a new means of studying the properties of the molecules of these substances, and of the structure of light.

Incidentally, the Raman effect was a rather convincing proof of the validity of the quantum theory of light, which supposes that light and other radiation consist of separate pulses, or quanta, rather than waves. Five years before the effect was discovered, it had been predicted, on the basis of this theory, so when it was detected it immediately provided good evidence in favor of the existence of light quanta.

Sir Chandrasekhar was born in India on November 7, 1888, and graduated from the Presidency College in Madras in 1904. In 1907 he joined the Indian Finance Department, and after that held various scientific positions, finally becoming Sir Taraknath Palit professor of physics at the University of Calcutta and honorary professor at Benares University. In 1924 he visited the United States, following the meeting of the British Association for the Advancement of Science at Toronto, to attend the centenary celebration of the Franklin Institute in Philadelphia. After that he served for a time as research associate at the California Institute of Technology at Pasadena. In the same year he was made a fellow of the Royal Society, the highest British scientific body. He was knighted in 1929.

DR. LANDSTEINER'S DISCOVERY OF BLOOD GROUPS

Discovery that human blood is of four different types, and that blood of one type does not always mix with blood of another type, has won the 1930 Nobel prize in medicine for Dr. Karl Landsteiner, of the Rockefeller Institute for Medical Research.

The enormous importance of Dr. Landsteiner's discovery has been evident to patients who have had the life-saving operation of blood transfusion performed. For this operation the blood of the donor and that of the patient must mix well, or serious and even fatal results may occur. Consequently before each transfusion, samples of the two bloods are tested or "matched" to see if they are compatible and belong in compatible blood groups.

When the blood liquid of one normal, healthy person and the red blood cells of another are put in the same test-tube, instead of mixing freely the red cells often clump together as if they were glued, Dr. Landsteiner observed during the course of some investigations made in Vienna in 1900. Scientists called this gluing together or clumping, agglutination. When it happens in a man's vein, following blood transfusion, death may result.

Agglutination does not take place at random, but depends on certain definite properties of the blood. It is on the basis of these properties that blood was divided into different groups or types. Three of the types were discovered by Dr. Landsteiner and the fourth by two of his students.

Every human being belongs to one or the other of the blood groups. To a certain extent blood groups are inherited, and this fact is often used to determine paternity. If the blood groups of each parent are known, one can state to which groups their child might belong.

NEWS FROM HERE AND THERE

SEVEN TYPES

The "thoroughbred" is the title Joseph T. Griffin, principal of a New York City public school, gives to his ideal teacher. In a series of articles Mr. Griffin has written in the New York *Sun* he considers:

1. The inspirational teacher, who performance varies from low to high but whose memory lives pleasantly with her pupils.
2. The "scatterbrain" teacher, who is popular enough but who is aggravating to her supervisors and her fellow teachers.
3. The over-conscientious teacher, who has no measuring stick for the important and unimportant.
4. The rebel teacher who is "agin" everything in the system.
5. The old-style teacher, obsessed by discipline, but withal earnest and sincere.
6. The "flapper" teacher, who is much on the job in her classroom and who handles things efficiently and successfully.
7. The "thoroughbred" teacher, who has all the good points of the other types and none of their inefficiencies.

"The thoroughbred may forget all about her school and its troubles when she hangs up her keys at the close of the day and blithely enters her own circle of activities, but while she is in school she plays her part like a soldier and a gentleman."

—*School Topics.*

EXPERTS STATE 19-POINTS OF MINIMUM STANDARD FOR CHILDHOOD

A 19-point standard of the minimum requirements for a healthy, happy childhood, formulated by the White House Conference on Child Health and Protection, is intended for the guidance of every parent and teacher and every other person having to do with the life of an American child.

The epitome of final opinion of the body of experts summoned by President Herbert Hoover is as follows:

"Every American child has the right to the following services in its development and protection.

"1. Every prospective mother should have suitable information, medical supervision during the prenatal period, competent care at confinement. Every mother should have post-natal medical supervision for herself and child.

"2. Every child should receive periodical health examinations before and during the school period including adolescence, by the family physician, or the school or other public physician, and such examination by specialists and such hospital care as its special needs may require.

"3. Every child should have regular dental examination and care.

"4. Every child should have instruction in the schools in health and in safety from accidents, and every teacher should be trained in health programs.

"5. Every child should be protected from communicable disease to which he might be exposed at home, in school or at play, and protected from impure milk and food.

"6. Every child should have proper sleeping rooms, diet, hours of sleep and play, and parents should receive expert information as to the needs of children of various ages as to these questions.

"7. Every child should attend a school which has proper seating, lighting, ventilation and sanitation. For younger children, kindergartens and nursery schools should be provided to supplement home care.

"8. The school should be so organized as to discover and develop the special abilities of each child, and should assist in vocational guidance, for children, like men, succeed by the use of their strongest qualities and special interests.

"9. Every child should have some form of religious, moral and character training.

"10. Every child has the right to a place to play with adequate facilities therefor.

"11. With the expanding domain of the community's responsibilities for children, there should be proper provision for and supervision of recreation and entertainment.

"12. Every child should be protected against labor that stunts growth, either physical or mental, that limits education, that deprives children of the right of comradeship, of joy and play.

"13. Every child who is blind, deaf, crippled or otherwise physically handicapped should be given expert study and corrective treatment where there is the possibility of relief, and appropriate development or training. Children with subnormal or abnormal conditions should receive adequate study, protection, training and care.

"14. Every waif and orphan in need must be supported.

"15. Every child is entitled to the feeling that he has a home. The extension of the services in the community should supplement and not supplant parents.

"16. Children who habitually fail to meet normal standards of human behavior should be provided special care under the guidance of the school, the community health or welfare center or other agency for continued supervision or, if necessary, control.

"17. Where the child does not have these services, due to inadequate income of the family, then such services must be provided to him by the state.

"18. The rural child should have as satisfactory schooling, health protection and welfare facilities as the city child.

"19. In order that these minimum protections of the health and welfare of children may be everywhere available, there should be a district, county or community organization for health education and welfare, with full-time officials, co-ordinating with a state-wide program which will be responsible to a nation-wide service of general information, statistics and scientific research. This should include:

(a) Trained full-time public health officials with public health nurses, sanitary inspection and laboratory workers.
(b) Available hospital beds.
(c) Full-time public welfare services for the relief and aid of children in special need from poverty or misfortune, for the protection of children from abuse, neglect, exploitation or moral hazard.
(d) The development of voluntary organization of children for purposes of instruction, health and recreation through private effort and benefaction. When possible, existing agencies should be co-ordinated."

CAUSE OF "GINGER JAKE" PARALYSIS DISCOVERED

The United States Public Health Service has proof that technical triorthocresyl phosphate was the cause of thousands of cases of paralysis attributed to drinking Jamaica ginger. Ginger itself is completely exonerated. The Jamaica ginger drink responsible for the paralysis was adulterated with the tricresyl phosphate. Ginger snaps, ginger bread, and other ginger delicacies need not be shunned for fear of the disease. The United States Public Health Service has no record of a single case of paralysis caused by ginger put out by a reputable pharmaceutical manufacturer.

The adulterant that caused the paralysis is a relative of carbolic acid. It is widely used in the manufacture of varnishes, shellacs, etc. It is cheap and easily obtainable and was probably used because its physical characteristics make it hard to distinguish from normal ginger constituents.

Definite proof of the guilt of this compound was found by pharmacological and chemical studies made by M. I. Smith, of the National Institute of Health. Chemists of the Prohibition Bureau had found a similar substance in suspected extracts of ginger. Doctor Smith's studies were made with various animals. Symptoms of a paralysis similar to those caused in men and women who drank the extract were produced in animals by the technical triorthocresyl phosphate. The adulterated ginger extracts probably contained 2 per cent of the phosphate. The compound has a remarkably specific action on the motor nerves, Dr. Smith found.

CASTOR OIL AS A MOTOR LUBRICANT

The use of castor oil as a lubricant for automobile and airplane motors becomes more and more general. Through the efforts of Mr. Andre the cultivation of castor oil plants has increased in Morocco and Algeria in the last three or four years. The results obtained have been very satisfactory and castor oil is used to an ever increasing extent. It is hoped that mineral oils will be practically discarded for lubricating purposes as time goes on.

The acidity of castor oil has been one of its chief disadvantages. Now, castor oil neutralized by triethylamine prepared for this purpose by Miss Francois, is used. The triethylamine is a viscous liquid formed by mixing primary, secondary, and tertiary amines and it can be used to conteract exactly the free acid in castor oil. The oil thus neutralized is washed with water, filtered, and dried. It has lost none of its lubricating properties and is indefinitely stable.

—*Industrial and Engineering Chemistry.*

BACTERIOPHAGE THERAPY

Care in selecting races of bacteriophage, destroyer of disease germs, is essential for its successful use in the treatment of diseases, its discoverer, Professor F. d'Herelle of the Yale University School of Medicine, said at the New York Academy of Medicine on October 27.

Bacteriophage therapy is still in its infancy and many studies are still necessary before we will learn all the results that we may anticipate, but what has already been done in many diseases justifies the belief that this is the specific treatment par excellence and that it will attain a wider and wider application.

Bacteriophage is a parasite that is not able to develop except by penetrating into the interior of a living germ of bacterium, secreting a bacterial solvent, and then reproducing itself by feeding on the dissolved germ. Because of its destructive action on germs, it is being used in the treatment of certain diseases, especially dysentary. Very powerful, less active and very weak races of bacteriophage has been isolated.

Any attempt at treatment with any type of bacteriophage of low potency is to court certain defeat. The *sina qua non* of success is the utilization of the bacteriophage races selected with care.

Bacteriophage normally appears in the body of the patient at about the time when he shows signs of recovery from the illness. Treatment by bacteriophage is the best specific treatment because it leads to recovery through a mechanism identical with that of natural recovery.

ANALYSIS OF DRINKING WATER

It is necessary to issue supplementary instructions and explanations regarding the sending of water samples to the State Board of Health. The various kinds of water analyses and the limitations of each must be clearly understood. An understanding of the following explanations will save much delay and correspondence in getting the sample to the proper laboratory.

There are many purposes for which people desire such information and feel that an analysis is what is wanted. The following list covers the main subjects for which this department frequently receives requests for water examination:

(1) Bacteriological analysis of well and spring drinking water.
(2) Analysis of creek water for wading and swimming.
(3) Analysis of creek water for watering stock.
(4) Analysis of creek water below sewer discharge lines.
(5) Analysis of well water for minerals or taste (hardness, iron, sulphur, etc.)
(6) Analysis where malicious poisoning of well is suspected.
(7) Analysis of water for industrial use or steam production.
(8) Analysis of water for fish raising.
(9) Examination of water insects in shallow wells.
(10) Analysis of water for ice-making.

In the above list only classification No. 1, "Bacteriological Analysis of Well and Spring Drinking Water" is handled by the State Board of Health. Bacteriological tests such as those carried on as routine by the state Board of Health have no value in determining the use of creeks for swimming, stock watering or fish raising. Where information regarding mineral content of water is desired a chemical analysis is required and must be made in an analytical chemical laboratory.

Request for a bacteriological analysis of well or spring drinking water must be made to the State Board of Health and a special sterilized bottle together with instruction sheet and information blank will be mailed. Samples sent in medicine bottles, soft drink bottles, fruit jars, etc., cannot be used for bacteriological tests and will only result in loss of time and expenses to the person sending them.

—*Georgia's Health.*

LABORATORY HINTS FOR THE DOCTOR

For the past two years the State Board of Health Laboratory has been making routine agglutination test for typhoid, paratyphoid, Brill's disease, undulant fever and tularemia on all liquid specimens of blood except for Wassermann test only. This work has increased so rapidly that it soon became impossible to make a complete agglutination test on every specimen because of insufficient equipment and personnel. The present policy is to make only such agglutination tests as are requested or indicated by the history.

Since nearly all liquid blood speciments are submitted in the Wassermann outfit regardless of the type of examination desired, the information blank furnished with this outfit has been so modified that the physician can specifically indicate on this blank just what he desires. Only tests specifically indicated are made, unless there is some special reason to go further. It should be stated, however, that the so-called "spot" tests are made routinely on all specimens. Since the spot test is not sufficiently accurate itself for diagnostic use, it is not reported to the physician. If, however, the trial test is positive or suspicious a complete titration test is then made and the result reported. If the trial test is negative, no report is made. For example, suppose the physician requests an agglutination test for typhoid fever only. A complete titration test for typhoid is made accordingly, but in addition trial tests for Brill's, tularemis and undulant fever are made. If all the trial tests are negative, only the typhoid agglutination will be reported. If, however, a positive trial for Brill's disease is obtained, then a complete titration for Brill's is made and, if positive, is reported as such.

Blood cultures are also made on request. Since this may require several days, the findings on the culture are reported separatively as soon as completed. If the physician desires a Wasserman or Kahn test on the same specimen, he must so indicate in the proper place on the blank. Unless he does so, no Wasserman test will be made.

—*Georgia's Health.*

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909. Breslich, Ernest R. The teaching of mathematics is secondary schools. Volume I. Technique. Chicago, Ill., The University of Chicago Press (1930) vii, 239, p. illus. 8°.

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910. Brueckner, Leo J. Tools and techniques of diagnosis in arithmetic. Educational outlook, 4:200-9, May, 1930. tables.

Describes three distinct methods of educational diagnosis, the general or survey technique; the analytical technique; the psychological technique; and the suitable tools to be used with each.

911. Christofferson, H. C. A professional course for the training of geometry teachers. Mathematics teacher, 23: 289-99, May, 1930. illus.

The discussion falls under three major headings: objectives, subject-matter, and professionalization of subject-matter.

912. Hassler, Jasper O. and Smith, Rolland R. The teaching of secondary mathematics. Ed. by Earle Raymond Hedrick. New York, The McMillan Company, 1930. xi, 405 p. 12°.

913. McCormick, Joseph P. Teaching geometry in the junior high school. Bulletin of high points in the work of the high schools of New York City, 12: 30-34, April, 1930.

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916. Orleans, Joseph B. The value of examination papers to the teacher. Mathematics teacher, 23: 300-7, May, 1930.

Continued form March number.

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SCIENCE

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923. Natural Science. Junior-senior high-school clearing house, 4: 445-500, April, 1930.

The entire number of this periodical is devoted to the subject of natural science, with an editorial by Philip W. L. Cox.

Contains: 1. Why study science? by Watson Davis; 2. A three-year science sequence as a fundamental need in the junior high school, by George C. Wood; 3. The purposes of exploration and orientation in secondary education demand science as required in the junior high schools, by Morris Meister; etc.

924. Ullrich, Fred Theodore. The status of science instruction for the preparation of elementary teachers in four-year curricula in teachers colleges and normal schools. Nature and science education review, 2: 107-26, April, 1930.

925. Wickenden, William E. The college of applied science. School and Society, 31: 581-85, May 3, 1930.

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EDUCATION OF RACIAL GROUPS

NEGROES

1257. Johnson, Charles S. The Negro in American civilization: a study of Negro life and race relations in the light of social research. New York, H. Holt and Company (1930), xiv, 538 p. tables 12°.

1258. McAllister, Jane Ellen. Training of Negro teachers in Louisiana. New York City, Teachers College, Columbia University, 1929. 95 p. 8°. (Teachers college) Contribution to education, no. 364.) BIBLIOGRAPHY

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