West Virginia University
Bulletin

Series 38, No. 8—II February 1938

THE WEST VIRGINIA ACADEMY OF SCIENCE

Proceedings of The Huntington Meeting 1937

Entered as second-class matter July 15, 1929, at the post-office at Morgantown, West Virginia, under the Act of August 24, 1912

Issued Monthly

PROCEEDINGS

of

THE WEST VIRGINIA ACADEMY OF SCIENCE

Volume 11

The Fourteenth Annual Session

MARSHALL COLLEGE

HUNTINGTON WEST VIRGINIA

April 30 - May 1, 1937

PUBLISHED BY WEST VIRGINIA UNIVERSITY
MORGANTOWN
1938

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MEMBERS OF THE WEST VIRGINIA ACADEMY OF SCIENCE

Albert, C. E., acting president, Davis and Elkins College, Elkins.
*Albert, Mabel M. (Mrs.), Ramsey Junior High, Bluefield.
*Allen, James C., president, Marshall College, Huntington.
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Ambler, C. H., prof. of history, W. V. U., Morgantown.
†Ammons, Nelle P., instructor in botany, W. V. U., Morgantown.
Anson, Charles P., prof. of social science, Potomac State School, Keyser.
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Bailey, Sebie, science teacher, High School, Fairmont.
Bailey, Wayne, teacher of biology, High School, Rock.
Bell, Raymond, teacher, High School, Smithers.
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†Bergy, Gordon A., prof. of pharmacy, W. V. U., Morgantown.
Bibbee, P. C., prof. of zoology, Concord State College, Athens.
Bird, Ralph, chemist, Athens.
†Blackwell, A. C., prof. of chemistry, Morris Harvey College, Charleston.
Bloss, James R., physician, 418 11th Street, Huntington.
Boggess, Grace, teacher, High School, Farmington.
Bonar, Ross, principal, High School, Buckhannon.
Bowers E. V., prof. of psychology, Marshall College, Huntington.
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†Brooks, Maurice, instructor in biology, W. V. U., Morgantown.
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†Colwell, Rachel H., prof. of home economics, W. V. U., Morgantown.
†Colwell, Robert C., prof. of physics, W. V. U., Morgantown.
†Core, Earl L., asst. prof. of botany, W. V. U., Morgantown.
Craig, F. Waldo, State Department of Agriculture, Charleston.
†Cramblet, W. H., president, Bethany College, Bethany.

* Member elected at the Huntington meeting, April 1937.
† Member of the American Association for the Advancement of Science.

Cushman, M. S., head, dept. of history, Concord State Teachers College, Athens.
Cutright, Frank, prof. of biology, Concord State College, Athens.
Cutright, Samuel C., student, Concord State College, Athens.
Dadisman, A. J., prof. of economics, W. V. U., Morgantown.
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†Davis, Hannibal A., assoc. prof. of mathematics, W. V. U., Morgantown.
Dawson, H. Donald, prof. of chemistry, Bethany College, Bethany.
Dawson, Hubert, chemist, Boomer.
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†Eiesland, John A., prof. of mathematics, W. V. U., Morgantown.
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Fenton, C. C., prof. of pathology, W. V. U., Morgantown.
Ferry, James F., land-use planning specialist, Morgantown.
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Forbes, Raymond, teacher of chemistry, High School, Oak Hill.
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Forman, A. H., prof. of electrical engineering, W. V. U., Morgantown.
Fox, Robert K., asst. prof. of chemistry, Bethany College, Bethany.
†Franzheim, Charles M., Wheeling.
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Ohlson, H. C., teacher of science, High School, Huntington.
Oliver, Joe, teacher of mathematics, High School, Smithers.
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†Utterback, W. I., prof. of biology, Marshall College, Huntington.
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Vest, G. Ellis, teacher, High School, Bluefield.
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Wagner, John R., prof. of chemistry, Glenville State College, Glenville.
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White, Raymond C., graduate student, W. V. U., Morgantown.
White, Ryland, Fairmont State College, Fairmont.
Wiles, I. A., physician, Glencoe, Ill.
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Wimer, Ralph P., teacher of science, High School, Parsons.
†Winter, John E., prof. of psychology, W. V. U., Morgantown.
Wolfe, Russell, physician, Elkins.
Woddell, W. S., dept. of chemistry, Concord State College, Athens.
Woods, Roy C., prof. of education, Marshall College, Huntington.
Yost, A. W., teacher, High School, Farmington.
Zucchero, Peter J., teacher of biology, High School, Morgantown.

THE MINUTES OF THE FOURTEENTH ANNUAL MEETING

THE FOURTEENTH annual meeting of the West Virginia Academy of Science was called to order by the president, Frank Cutright, at 10 a. m. on April 30, 1937, at Marshall College, Huntington, West Virginia.

The president made a brief report on his activities and on the program of the Academy during the year just ended. The secretary in a brief report mentioned the published *Proceedings*, the inactivity in certain colleges, the number of A. A. A. S. members, the letter to Superintendent Trent which the last session had ordered written, and the publishing of the Richmond check-list. The treasurer reported on the financial condition of the Academy at some length and advised that his books were in readiness for the Auditing Committee.

The following report of the Executive Committee was read:

THE EXECUTIVE COMMITTEE REPORT

"The Executive Committee of the West Virginia Academy of Science wishes to report that: (1) Invitations have been received from West Virginia University and from Potomac State College for the Academy to hold its 1938 meeting on their respective campuses; (2) the Executive Committee wishes to express its appreciation of the work of H. F. Rogers, Wallace Smith, Mildred Hadden, and all others concerned with the Junior Academy project, and thanks them for the report made to the Committee; (3) the Committee has again agreed to pay one hundred dollars as its share of the publication costs of the Proceedings; (4) the Committee has agreed that the vice-president in the future will be in charge of publicity for the meetings; (5) applications for A. A. A. S. research grants should be received and award made within three months following this meeting.

"The Executive Committee wishes to make the following recommendations: (1) That the next annual meeting be held at West Virginia University, May 6 and 7; (2) that the secretary be instructed to publish the Constitution and Bylaws of the Academy, brought up to date, in the next issue of the *Proceedings;* (3) that the Membership Committee be requested to make a special effort to contact those members who will be dropped at this meeting as being in arrears."

The report was accepted.

Mr. A. J. Dadisman reported for the Legislative Committee, calling attention to the fact that as there had been no regular session of the Legislature during the past year, there was no opportunity for the Committee to function.

This report was accepted.

Mr. Wallace Smith reported for the Junior Academy Committee as follows:

THE JUNIOR ACADEMY COMMITTEE REPORT

"At the meeting of the West Virginia Academy of Science on the first Friday in May of 1936 at Bethany our receipts and disbursements were as follows:

"Received from fees, $54.00; subsidy from the Senior Academy, $30.00, making a total of $84.00 received.

"Disbursements were: $50.00 for printing; $51.21 for postage, stationery, and refunds, making a total of $101.21. This left a deficit of $17.21.

"In order to move forward with a clean slate, your treasurer gave his personal check for this deficit.

"During the past twelve months we have used 500 letterheads, 1000 envelopes and as many 1½c stamps, 100 1c cards, and 100 3c stamps in mailing out the Junior News Letter and other literature. At least two mailings went to each high school and junior high school in the state as well as to dozens of individuals. The cost of this has been donated personally by your treasurer.

"The Junior News Letter has had only five issues at $10 each. Thus we have a total expenditure to date of $50.

"The receipts since the report made to the Senior Academy on the first Friday in May of 1936 at Bethany are $11 from fees and dues.

"At the meeting of the Senior Academy last year the Junior Academy was voted a subsidy of $30 for the Junior News Letter and $10 for awards. The awards are to be made available at this meeting.

"When this is paid, the Junior Academy will have a deficit of $9 on this date.

"In view of these deficits, we earnestly urge each and every one of you to make it your business to secure new club members and individual members with increased effort at all times."

The report was accepted.

Chairman R. C. Patterson made a brief report for the Membership Committee, returning the names of nine proposed new members. These had previously been approved by the Executive Committee. They were elected and are indicated by names starred in the complete membership list on page 6.

In the absence of C. R. Orton, the Academy's delegate to the Atlantic City meeting of the American Association for the Advancement of Science, his report was read by the secretary. The report follows:

THE ACADEMY CONFERENCE REPORT

"The Academy Conference of the American Association for the Advancement of Science was held in Haddon Hall, Atlantic City, on December 28, 1936.

"After the election of Dr. Ernest C. Faust of the Louisiana Academy as president, Edgar C. L. Miller of the Virginia Academy as vice-president, and the re-election of S. W. Bilsing as secretary, the meeting proceeded to reports and discussion of its business, with Dr. Faust in the chair.

"Dr. H. E. Enders of the Indiana Academy reported for the Committee on Disposition of Grants. It appears that many academies did not ask for their 1935 and 1936 grants under the old regulations. The Executive Committee therefore passed the following recommendations:

'At the recent meeting of the Executive Committee of the American Association for the Advancement of Science the following vote was passed. You will note that this action is in accord with previous action except that: (1) the sum of each research grant for 1936-37 is to be based upon the number of members in good standing in both the state academy and in the A. A. A. S.; (2) the academy is asked to report to the A. A. A. S. the number of members common to both organizations. These changes have been asked by some academies and are approved by the Executive Committee. Furthermore, another vote passed at the Executive Committee meeting provides that when the amount of the research grant has been determined as based upon the academy organizations, the research grants shall then be forwarded to the proper officers in each academy and disbursed directly to the academy. Reports of the research assignments made by the academy are to be sent in accordance with the vote quoted herewith. We sincerely hope that this arrangement will be an improvement and that it will be welcomed by the academies.'

This Academy should follow the recommendations closely.

"It was recommended that each academy prepare a general form for applications for grants from members; also to formulate a policy for approving grants. To this end the regulation governing applications for grants from the Research Fund proposed by the Indiana Academy of Science is presented with the thought that it may be helpful to other academies in the preparation and approval of grants."

(Here follow the tentative regulations submitted to the Indiana Academy of Science by the Committee on Research November 5, 1936.)

Regulations Governing the Application for Grants from the Research Fund of the Indiana Academy of Science

'Applicants for grants from the Research Fund of the Indiana Academy of Science or from that portion of the Research Fund of the American Association for the Advancement of Science that has been allotted by the Association to the Indiana Academy should include in their application a full statement of their academic training and career, of the character of their research problem and their proposed methods of attack, and of the use to which they wish to apply the grants requested. Applicants should include written statements from responsible workers in the field in which the applicant wishes to work, certifying as to the importance of the investigation, to the applicant's ability to prosecute it to a definite conclusion, and to the reasonableness of the estimate of the cost.

'Applicants are reminded that the research funds of the Academy are quite small and that they should make their requests as definite and moderate as possible. Other things being equal, the Committee will favor small grants to a larger number of applicants, rather than large grants to a very few.

'The recipient of a grant is required to submit semi-annually an expense account covering the funds placed at his disposal, together with a statement of the work accomplished. The mid-year report may be brief. The final report should be reasonably complete and should be filed with the Research Committee not fewer than ten days in advance of the regular annual fall meeting of the Academy.

'The Indiana Academy of Science shall have first call on any publication paper or papers reporting results of investigations for which the Academy has borne any part of the expense.

'Applications for grants may be made at any time, but to insure prompt action they should be submitted to the Committee at least ten days before the regular fall meeting of the Academy (November).

'While a grant for a second year (but no longer) may be made, no preference will be shown any applicant because of his previous award. Each applicant for a second grant must file a second application, including an account of the disposition of the first grant, what was accomplished by it, and for what purpose a second grant is requested.

'When a grant, or any portion thereof, is used for the purchase of equipment, such apparatus or equipment is to remain the property of the Indiana Academy of Science to be loaned, awarded, or retained, as the Academy may direct.'

"On the conclusion of the discussion regarding reports from the recipients of awards, it was moved and passed that such reports should be made annually through the Academy officials to the A. A. A. S. The type of report is left to the Academy but at least it should contain sufficient information to enable the A. A. A. S. to judge of the progress which is being made by each grantee.

"There followed two-minute reports from each Academy representative. The report from the West Virginia Academy of Science, prepared by Secretary Vest, follows:

'1. *The West Virginia Junior Academy of Science.* The West Virginia Academy in common with many other state academies is sponsoring a Junior Academy among the high schools of the state. Very substantial progress has been made, there being at present about 30 chapters. Annual meetings have been largely attended and in all other ways successful. The Academy is of the opinion that this is proving a most worth-while project.

'2. *The State Biological Survey.* In May 1934 the Academy voted to initiate a biological survey of the state. An executive committee was appointed from the membership of the Academy to have charge. Certain persons in strategic positions, not members of the Academy, were later added. The Survey has been active since that time and an enormous amount of work has since been done. Specimens of all kinds are constantly being collected, identified, and filed, a catalog of the biological literature of the state is being compiled, etc. This work the Academy is aiding by grants of money as well as by the efforts of individual members. In this connection the Academy hired a collector and sent him into the field during the summer of 1935. His findings will be published in the form of a check-list in the near future.

'3. *Wild-Life Preservation.* The Academy is trying by every means at its command to modify the severity of the 'vermin-killing contests' which are raging in practically every county in West Virginia. This has proved to be a very delicate matter but the committee has succeeded in introducing a few modifications in the lists, and we hope to make further progress in the future.

'4. *The Brooks Memorial Garden.* In memory of Fred E. Brooks the Academy is sponsoring the establishment of a Wild-Flower Memorial Garden in Watoga State Park, Pocahontas county, West Virginia. This is being done in cooperation with the National Park Service. In accordance with our plans the vegetation of the area is to be preserved in its natural state; and only native species may be used for plantings. This project has been in progress for several years, and most satisfactory progress is being made.' "

The Academy Conference Report was accepted.

There was no report from the Activities Committee.

Chairman P. D. Strausbaugh made the following report for the F. E. Brooks Garden Committee:

THE F. E. BROOKS MEMORIAL ARBORETUM

"Your committee on the Fred E. Brooks Memorial Arboretum wishes to report further progress. During the past year the committee has held three meetings at Watoga and one in the office of Mr. T. M. Cheek in Charleston. Arrangements were made with Mr. Gladwin Cales of Hinton, to make a topographic survey of the tract set aside for the arboretum. It may be of special interest to the members of the Academy to know that Mr. Cales very generously donated his time and labor to this task and completed the survey. We are also indebted to Capt. Hill, the park superintendent, and to Mr. Belladonna, the park engineer, both of whom gave Mr. Cales valuable assistance.

"Using the data obtained in the survey made by Mr. Cales, Mr. W. J. Thompson of the College of Engineering at West Virginia University prepared a topographic map of the area. Such a map was necessary in the formulation of plans for the further development of the arboretum.

"Mr. T. M. Cheek, park procurement officer, has manifested a very live interest in the project and has made some very helpful suggestions. He hopes to use CCC labor to carry out the program of development, and plans have been made for the following features:

1. A system of trails through the arboretum is to be developed. The topography of the area is such that it is deemed unwise to undertake much grading of the slopes, as this might bring about erosion. However, the undergrowth is to be removed so that visitors can readily follow the trail without risk of tearing clothing.

2. Erection of a shelter house at the entrance to the arboretum. Here, if desired, provision may be made for the registration of visitors. It has also been suggested that this would be a very fitting place in which to mount a properly-framed picture and brief biography of Fred E. Brooks.

3. Placement of a bronze tablet upon a permanent marker set by the side of the main road passing by the arboretum. The marker is to be built of native stone, and the bronze tablet would bear some simple inscription such as:

THE
FRED E. BROOKS
MEMORIAL ARBORETUM

"Your committee feels that some system of labeling the more interesting plants along the trail will be necessary if the arboretum is to be of maximum educational value. Considerable thought has been given to this matter and several plans have been discussed. A suggestion made by Mr. Cheek has the approval of your committee. According to this suggestion, the Academy would provide a little folder in which all the species in the arboretum would be listed. After some of the names there would be a number and wherever these were found, the visitor would know that somewhere along the trail that plant would be indicated by an identical aluminum number attached to the plant, or to a stake set close by the plant. A quantity of these folders could be kept in the shelter house where they might readily be obtained by any visitor wishing to study the plant life in the arboretum.

"Mr. Cheek and the members of your committee agree that the natural conditions of the park, as a whole, should be maintained throughout in so far as this is possible. The arboretum will always be a part of the park, and the general policy for the maintenance of the park likewise should be the policy governing the development of the arboretum. In the area of approximately 500 acres set aside for the arboretum, there are now in the neighborhood of 200 species of plants. Other native species should and will be introduced at

suitable places where they may thrive best. We believe, however, that such introductions should not include any exotics or cultivated plants.

"If the members of the Academy approve of what your committee has done and of the proposals indicated in this report, it must be obvious that funds will have to be provided for a bronze tablet, a supply of aluminum numbers, the printing of folders, and other items that may be involved in such a program of development. We would also remind the members of the Academy that we have been very fortunate in having the gratuitous services of Mr. Cales and Mr. Thompson, and I am tempted to suggest that we express our appreciation to these gentlemen by inviting them to become members of the Academy with full remission of the customary dues for the first year.

"While your committee may have been more deliberate; may have made progress more slowly than you might have wished, we have the assurance of Mr. Cheek that the Academy has done well not to rush this project; that better results will be achieved by reason of the fact that we have made haste slowly."

The Fred E. Brooks Memorial Arboretum Committee
E. Meade McNeill
R. B. Dustman
P. D. Strausbaugh, chairman

This report was accepted with the especial thanks of the Academy for the excellent work done.

In the absence of W. W. Hodge, the secretary reported for the Committee to Award the A. A. A. S. Grant, stating that the award for the past year had been made to Mr. Earl Core of West Virginia University. The grant is to be used by Mr. Core in making a comprehensive revision of the Millspaugh check-lists of West Virginia flora.

The report was accepted.

President Cutright then appointed the following committees:

COMMITTEES FOR 1937-38

Nominations Committee: Earl Core (chairman), M. S. Cushman, S. B. Talbot.

Resolutions Committee: A. B. Brooks (chairman), Hazel Cameron, J. S. V. Allen.

Auditing Committee: J. E. Winter (chairman), Roy Woods, Samuel Morris.

After a short intermission President James E. Allen of Marshall College welcomed the Academy. Following a few remarks on the

value and responsibility of science in our present-day life, he expressed the welcome of the college and of the city and urged the members to return for some portion of Marshall's centennial celebration if possible.

Vice-president Harris then introduced President Cutright, who replied to the welcome on behalf of the Academy. Following this reply he delivered the presidential address, "A Great Source Book".

After President Cutright's address Mr. W. A. Gresh, a representative of the State Conservation Commission, addressed the Academy on scientific methods as applied by the Commission.

A meeting of the State Biological Survey Committee was held at noon.

Beginning at 1:30 p. m. the various sections held their meetings. The papers presented are listed in the program printed on page 23.

At 6:15 the dinner of the Academy was held at the Governor Cabell Hotel. Dean Charles Tippetts was the guest of the Academy and spoke briefly following the dinner.

The principal address of the meeting was delivered Friday evening in the College auditorium by Dean Charles S. Tippetts of the School of Business Administration, University of Pittsburgh. His subject was "Our Economic Future."

Following this address an informal reception for the members and guests of the Academy was held in the College parlors. The members of the Chi Beta Phi Sigma, the Chi Beta Phi, and the Kappa Delta Pi were responsible for this most pleasant affair.

The second business meeting was held Saturday morning, May 1. Chairman A. B. Brooks read the following report of the Resolutions Committee:

THE RESOLUTIONS COMMITTEE REPORT

"Resolved: that the West Virginia Academy of Science express its warmest appreciation of the efforts of agencies in and about the city of Huntington in preparing so adequately for its fourteenth annual meeting. In particular does the Academy appreciate the efforts of the president and the faculty of Marshall College, the local newspapers, the local manufacturing concerns which opened their plants for inspection, the sponsors of the Junior Academy of Science, and many others who contributed so generously toward making this session a notable and enjoyable occasion; also of the members of those organizations who so kindly entertained the members and their guests at the reception."

The report was accepted.

In the absence of Chairman Reese, Professor Strausbaugh reported for the West Virginia Biological Survey Committee, stating that Mr. Maurice Brooks was elected chairman for next year, and Professor R. C. Patterson, secretary.

This report was accepted.

Professor A. J. Dadisman read the following report of the Committee on Preservation of Wild Life:

THE PRESERVATION OF WILD LIFE

1. Inasmuch as The West Virginia Biological Survey is proceeding with a program of constructive inquiry into the problems of wild life in West Virginia, we commend the retiring chairman, Dr. A. M. Reese, and those associated with him, and urge an equally energetic continuance of such effort.

2. The Biological Section of the Academy of Science is carrying out a most successful program of education through encouragement of practical studies of the needs of wild life in this state and through the presentation of reports and papers for publication in the Proceedings of the Academy. In our opinion wild-life preservation is more surely secured through educational methods, built on scientific foundations, than in any other way. We only wish to suggest, in this connection, that as wide publicity as possible be given the findings of investigators in the wild-life field.

3. We recognize the fundamental work being done by the various departments of biology in the several institutions of the state and in this case also urge the dissemination of findings as widely as circumstances permit.

4. We warmly commend the progressive work of the West Virginia Conservation Commission, which is not only prosecuting the lines of conservation work initiated in former years but is launching out into new fields by the establishing of such divisions as State Parks and Game Management.

5. Federal agencies, through projects involving soil conservation and game preservation and propagation, are offering opportunities for cooperation of a sort not anticipated. All agencies interested and concerned with the conservation of wild life may here join forces in advancing a project which would be impossible except through this unexpected opportunity. This should be capitalized on by sportsmen's organizations, by departments of the state, and by counties, as well as by all institutions of learning.

6. The committee desires to emphasize its belief in the educational method and in a more complete cooperation of all agencies than has heretofore existed.

A. B. Brooks, chairman

This report was accepted.

Professor J. E. Winter reported for the Auditing Committee as follows:

THE AUDITING COMMITTEE REPORT

"Your Auditing Committee wishes to report that it has examined the books of the treasurer and has found everything in order."

This report was accepted.

Mr. Wallace Smith then read the following report:

THE JUNIOR SPONSORS SECTION REPORT

"We wish to submit the following facts in regard to the Junior Sponsors Section.

"The program for the group was excellent: one of the most interesting, best balanced, and most valuable in presenting worthwhile, usable material that we have heard at the Academy of Science.

"The attendance was very poor—nine sponsors being present.

"We explain the poor attendance by the following:

"There are in all only about 25 sponsors, about half of whom are attending this Convention.

"Some of the sponsors found it necessary to attend the meeting of the Junior Academy.

"A few of the sponsors wished to attend the other groups of the Senior Academy.

"Since these facts discourage the formation of a permanent Junior Sponsors Group, we suggest the following alternatives:

"First, drop the proposed group entirely.

or

"Second, change the name of the group to High-School Teachers Group, and with it as a basis make a concerted drive to enroll as members teachers of science in high and junior high schools in the state. This proposed group could have conservation as a basis and background for all its study, or could include teaching methods, club procedures, etc."

Carmelita Cunningham
George G. Kerr
Virginia W. Fisher

After considerable discussion the report was accepted, and it was agreed by the members that the small number present at the meeting of the Junior Sponsors Group evidently indicated little interest on the part of those for whom this program was arranged. This group meeting was therefore ordered discontinued. At the same time the Academy commended Miss Hadden and Mr. Smith for their work in connection with this program.

The section chairmen reported as follows:

Biology, 38 present; R. C. Patterson, chairman. Chairman for 1938, S. B. Talbot.

Chemistry, 35 present; L. J. Todd, chairman. Chairman for 1938, Charles Lazzell.

Geology and Mining, 6 present; J. H. C. Martens, chairman. Chairman for 1938, J. H. C. Martens.

Mathematics and Physics, 25 present; R. P. Hron, chairman. Chairman for 1938, J. K. Stewart.

Social Sciences, Group I, 30 present; E. L. Lively, chairman. Chairman for 1938, A. J. Dadisman.

Social Sciences, Group II, 19 present; Roy Woods, chairman. Chairman for 1938, J. E. Winter.

These reports were accepted.

Chairman R. C. Patterson made an additional report for the Membership Committee, returning the names of six additional proposed new members. These were approved by the Academy and are indicated in the general membership list.

Professor R. P. Hron then read a resolution which had been sent from the Mathematics and Physics Section for the action of the Academy. There was considerable comment on this resolution. However, at the end of the discussion, no motion having appeared, the matter was dropped.

The secretary then read the following additional report of the Executive Committee:

(1) In accordance with the report submitted by P. D. Strausbaugh on behalf of the F. E. Brooks Garden Committee, the Executive Committee recommends that Mr. Gladwin Cales of Hinton and Mr. W. J. Thompson of West Virginia University be invited to become members of the Academy will full remission of the customary dues for the first year as an expression of the Academy's appreciation of their service. Also, that in order to carry out the plans formulated by the Garden Committee, the Academy make available such money as is required and as the Executive Committee feels the Academy is able to put into this project; (2) the Executive Committee recommends that publication in the *Proceedings* of papers by members be limited to one paper per member per year."

This report was accepted.

President Cutright then appointed the following committees to serve for the coming year:

Legislative: A. J. Dadisman (chairman), J. E. Judson, J. Buhl Shahan.

Junior Academy: Bernice Collins (senior counsellor), Virginia Fisher, Wallace Smith, J. E. Judson.

Membership: H. A. Davis (chairman), T. H. Gilbert, J. E. Judson.

Activities: Paul Price (chairman), Nelle Ammons, John R. Wagner.

F. E. Brooks Garden: P. D. Strausbaugh (chairman), E. Meade McNeill, R. B. Dustman.

A. A. A. S. Grant: W. W. Hodge (chairman), E. L. Lively, B. R. Weimer.

State Biological Survey: A. M. Reese (chairman), Frank Gilbert, J. E. Judson, S. B. Talbot, H. D. Bond, B. R. Weimer, C. M. Roberts, E. R. Grose, E. Meade McNeill, L. M. Peairs, R. C. Patterson, C. L. Shilliday, A. P. Handlan, H. W. Shawhan, A. B. Brooks.

Preservation of Wild Life: A. B. Brooks (chairman), P. C. Bibbee, A. J. Dadisman, N. B. Green, S. B. Talbot.

Mr. Earl Core made the following report for the Nominations Committee:

"Your Committee recommends that the following men be elected to serve as officers of the Academy for the coming year: for president, T. L. Harris; for vice-president, Wallace Smith; for secretary, J. E. Judson; for treasurer, C. G. Brouzas; for member of the Committee on Publications, H. A. Davis."

This report was accepted, and the secretary was instructed to cast the ballot of the Academy for these men.

Mr. Cutright then introduced the new president, who spoke briefly and pledged his best effort on behalf of the Academy.

The meeting then adjourned; afterward excursions were made by members to the plants of the Fesenmeier Brewing Company and of the Owens-Illinois Glass Company.

THE GENERAL PROGRAM OF THE HUNTINGTON MEETING

FRIDAY, APRIL 30, COLLEGE AUDITORIUM

Greetings by President Jas. E. Allen of Marshall College. Reply, followed by the Presidential Address: "A Great Source Book," by Frank Cutright.

THE MEETINGS BY SECTIONS

Biology

(Botany, Zoology, Physiology, Medicine, Agriculture)

Earl L. Core: The genus Carex in West Virginia.

Maurice Brooks: A revised check-list of the birds of West Virginia.

Vernon Lewis Merrill: The black widow spider.

N. Bayard Green: Food of some West Virginia salamanders.

Clement C. Fenton: A study of testicular neoplasms.

W. I. Utterback: Locomotion in freshwater mussels, (Naiades).

Geo. A. Emerson: The David crude drug collection at West Virginia University.

A. M. Reese: "Vermin" campaigns.

Walter H. Schaefer: Hypophysectomy and thyroidectomy of snakes.

A. B. Brooks and Robt. C. Patterson: A preliminary check-list of West Virginia mammals.

G. S. Dodds and Hazel C. Cameron: The reorganization of bones in the healing of rickets.

B. R. Weimer and Chas. Phillips: The preliminary report of the effect of thyroxin on the reconstruction of turbelaria.

D. W. Northup, S. J. Klyza, and G. A. Emerson: Effects of inorganic ions on motility of ciliates.

N. Bayard Green: Notes on some salamanders from Tucker and Randolph counties.

S. Benton Talbot: Life-history studies on schistosome Cercariae (by title).

Chemistry

(Chemistry, Chemical Engineering, Pharmacy)

Earl C. H. Davies: Directional crushing of silicic-acid gel at definite temperatures.

A. J. W. Headlee and Samuel Morris: Demonstration of a simple method of fractionating natural gas.

John R. Wagner: The annual Chemistry day.

Garry Weingarten and J. B. Conn: A study of the ethylene diamine method for the qualitative separation of cobalt and nickel.

J. R. Cummings and J. B. Conn: The preparation of morpholine ethanol and similar substances.

Gordon A. Bergy: The application of absorption bases in the pharmaceutic, cosmetic, and industrial arts.

Geology and Mining

(Geology, Archæology, Geophysics, Coal, and Oil Engineering)

John B. Lucke: An I. C. White museum.

Paul H. Price: Undeveloped resources of West Virginia

E. T. Heck: Correlation and stratigraphy of the Pottsville series of eastern Fayette, southeastern Nicholas, and western Greenbrier counties.

R. C. Tucker: A structural map of the Charleston district in the Oriskany sandstone.

Mathematics and Physics

(Mathematics, Astronomy, Physics, Mechanical Engineering, Electrical Engineering)

J. S. V. Allen: Vapor lamps.

Wallace Smith: The place of astronomy in training high-school science teachers.

L. H. Gibson: A course in welding for college students.

J. K. Stewart: Some configurations of points and lines.

J. K. Stewart: A group of 18 points on a cubic curve of Genus One.

R. C. Colwell: The vibration of metal plates.

M. L. Vest: Notes on two related families of conics.

J. A. McCaskey: Studies on a circular thin plate orifice.

Social Sciences, Group I

(Philosophy, Philology, Economics, History, Sociology)

Jas. T. Laing: Social classes among West Virginia Negroes.

A. J. Dadisman: A shorter work week.

C. C. Regier: Dutch Mennonites in Russia.

C. G. Brouzas: Greek diplomacy immediately before the Peloponnesian war.

T. L. Harris: Some sociological conditions and problems in Great Britian.

M. S. Cushman: Huey Long and the United States Senate, 1932.

Henry M. Dater: The unpublished diary of Albert Gallatin in West Virginia, 1785.

Social Sciences, Group II

(Education, Psychology)

Andrew Leitch: The effect of restricted entrance to freshmen on the intellectual caliber of a college student body.

E. V. Bowers and Roy Woods: A study of the Experiential factor in objective test scores.

R. E. Hyde: The unemployed school teachers of West Virginia.

J. B. Shouse: The reliability of college grades.

Frank White: Intelligence and choice of teaching fields.

J. E. Winter: Status of experimental psychology in our universities.

The Junior Sponsors Group

Maurice Smith: Taming wild birds (Lantern).

M. P. Shawkey: The conservation program in West Virginia.

Daisy Chapman: Herbarium projects for high-school science clubs.

Lyell V. Douthat: Some interesting and instructive demonstrations in physics.

J. E. Judson: The wild flower used by the Indians for medical purposes.

THE DINNER PROGRAM, FRIDAY, APRIL 30

Address by Dean Charles S. Tippetts of the School of Business Administration, University of Pittsburgh: "Our Economic Future."

THE CONSTITUTION OF THE WEST VIRGINIA ACADEMY OF SCIENCE

ARTICLE I—*Name.* This organization shall be known as the West Virginia Academy of Science.

ARTICLE II—*Object.* The object of the Academy shall be the encouragement of scientific work in the State of West Virginia.

ARTICLE III—*Membership.* Membership of this Academy shall consist of active members and corresponding members. Active members shall be residents of the State of West Virginia who are interested in scientific work. They shall be of two classes, to wit: national members, who are members of the American Association for the Advancement of Science as well as of the West Virginia Academy of Science, and local members, who are members of the West Virginia Academy of Science but not of the Association.

Corresponding members shall be persons who are actively engaged in scientific work not resident in the State of West Virginia. They shall have the same privileges and duties as active members.

For election to any class of membership the candidate must have been nominated in writing by two members, one of whom must know the applicant personally; and he must receive a majority vote of the executive committee and a three-fourths vote of the members of the Academy present at any session.

ARTICLE IV—*Fees.* Each member shall pay in advance an annual fee of one dollar ($1.00) to the Treasurer of the Academy, due at each annual meeting; and in addition, each new member shall pay an initiation fee of one dollar ($1.00), due at the time of his election to membership.

ARTICLE V—*Officers.* The officers of the Academy shall be a president, a vice-president, a secretary, and a treasurer. These officers shall be elected at the annual meeting, from among the active members in good standing, on the recommendation of a nominating committee of three appointed by the president.

The Executive Committee, consisting of the four officers and the president of the previous year, shall have the authority to fix the time and place of the meetings and to transact such other business as may need attention between the meetings of the Academy.

The secretary and treasurer only shall be eligible to re-election for consecutive terms. The term of the secretary shall be three years.

ARTICLE VI—*Standing Committees.* The standing committees shall be as follows:

A Committee on Membership consisting of three members appointed annually by the president.

A Committee on Publications consisting of the president, secretary, and a third member chosen annually by the Academy.

A Committee on Legislation consisting of three members appointed annually by the president.

ARTICLE VII—*Meetings.* The regular meetings of the Academy shall be held at such time and place as the Executive Committee may select. The Executive Committee may call a special session, and a special session shall be called at the written request of twenty members.

ARTICLE VIII—*Publications.* The Academy shall publish its transactions as well as other papers which the Committee on Publications deems suitable. All papers presented to the Academy for publication shall be of a scientific nature. All members shall receive the publications of the Academy *gratis.*

ARTICLE IX—*Sections.* Members, not less than ten in number, by special permission of the Academy may unite to form a section for the investigation of any branch of science. Each section shall bear the name of the science which it represents, thus: the Section of Geology and Mining of the West Virginia Academy of Science.

Each section is empowered to perfect its own organization as limited by the Constitution and Bylaws of the Academy.

ARTICLE X—*Amendments.* This Constitution may be amended at any regular meeting by a three-fourths vote of all active members present provided a notice of that amendment has been sent to each member ten days in advance of the meeting.

BYLAWS

I—The following shall be the order of business:

1. Call to order.
2. Reports of officers.
3. Report of the Executive Committee.
4. Reports of standing committees.
5. Election of members.
6. Reports of special committees.
7. Appointment of special committees.
8. Unfinished business.
9. New business.
10. Election of officers.
11. Program.
12. Adjournment.

II—No meeting of this Academy shall be held without 30 days' notice having been given by the secretary to all members.

III—Twelve members shall constitute a quorum of the Academy for the transaction of business. Three of the Executive Committee shall constitute a quorum for the Executive Committee.

IV—No bill against the Academy shall be paid without an order signed by the president and the secretary.

V—Members who allow their dues to be unpaid for two years, having been annually notified of their arrearage, shall be dropped from membership by the executive committee at the time of the annual meeting. Upon payment of arrearage former members will be reinstated.

VI—The president shall appoint annually an Auditing Committee of three who shall examine and report in writing upon the account of the treasurer.

VII—The financial year shall end on April 1 of each year. The accounts of the secretary-treasurer for the year shall be available to the Auditing Committee at the annual meeting.

VIII—In case a section adjourns without electing a chairman for the succeeding meeting, or in case the chairmanship of a section becomes vacant between meetings through removal of the chairman from the state or otherwise, the president of the Academy shall appoint the chairman for the next meeting of the section, and do so at as early a date as possible.

IX—These Bylaws may be amended or suspended by a two-thirds vote of the members present at any meeting.

ARRANGEMENT BY SECTIONS

Biology: botany, zoology, physiology, medicine, agriculture.

Chemistry: chemistry, chemical engineering, pharmacy.

Geology and Mining: geology, coal and engineering, State Road Commission, building material, geophysics, archaeology.

Mathematics and Physics: mathematics, astronomy, physics, mechanical engineering, electrical engineering.

Social Sciences: philosophy, psychology, education, economics, sociology, history.

Papers Read at the Huntington Meeting

The Biology Section

THE GENUS CAREX IN WEST VIRGINIA*

EARL L. CORE

Department of Botany, West Virginia University

TWENTY-SEVEN SPECIES and varieties of the genus *Carex* were enumerated by Millspaugh in his "Flora of West Virginia", published in 1892 by the West Virginia Agricultural Experiment Station as Bulletin No. 24. Four years later Millspaugh and Nuttall in their "Flora of West Virginia", issued as Publication No. 9, Botanical Series, by the Field Columbian Museum, included 49 species and varieties, while in 1913 Millspaugh, in his third "Flora of West Virginia", published as Volume 5(A) of the West Virginia Geological Survey, listed 57 species and varieties. Since 1913 additional extensive investigations have brought to light numerous species not heretofore reported and have added to our knowledge of the geographical distribution of the others, while the publication of Mackenzie's scholarly monograph on the genus, issued as Volume 18, Parts 1 to 7, of North American Flora, has made possible a revision of the nomenclature in this large and extremely difficult genus.

A few species listed by Millspaugh have been omitted from this list because it was discovered that the specimens on which the records were based had been misidentified.

In view of these facts it was thought that the preparation of a new treatment of the genus, in so far as it is represented in West Virginia, might prove of value to the student. Sixty-three species are admitted here.

The unisexual, mostly monœcious flowers present such slight variations that the specific characters are in large part based on the scales, mature perigynia, and the character and disposition of the inflorescences, while even here the diversity is so small as to render the genus an extremely critical one.

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* Conribution No. 2 from the Herbarium of West Virginia University.

KEY TO THE SPECIES

1. Plants bearing both staminate and pistillate flowers in the same spikes, hence the spikes mostly uniform in appearance; stigmas 2, achenes compressed.
   2. Staminate flowers at the base of the spikes.
      3. Perigynia with thin-winged margins.
         3a. Perigynia ascending.
            4. Perigynia less than 2 mm broad.
               5. Perigynia 5 mm or more long.
                  6. Leaves 3 mm or less wide; spikes 3-9, pointed ..... 1. *C. scoparia*
                  6. Leaves more than 3 mm wide; spikes 8-14, blunt ..... 2. *C. tribuloides*
               5. Perigynia less than 5 mm long
                  6. Perigynia thin and scale-like, scarcely distended over the achenes.
                     7. Perigynia appressed or ascending 2. *C. tribuloides*
                     7. Perigynia loosely ascending or recurved ..... 3. *C. projecta*
                  6. Perigynia not thin and scale-like, obviously distended over the achenes.
                     7. Tips of perigynia distinctly exceeding the subtending scales ... 4. *C. cristatella*
                     7. Tips of perigynia about equalled by the subtending scales ..... 6. *C. fœnea*
            4. Perigynia 2 mm or more broad.
               5. Tips of perigynia exceeding the subtending scales.
                  6. Perigynia one-fourth to one-third as broad as long ..... 1. *C. scoparia*
                  6. Perigynia about half as broad as long ..... 5. *C. festucacea*
               5. Tips of the perigynia about equaled by the subtending scales ..... 6. *C. fœnea*
         3a. Perigynia horizontally spreading or reflexed when mature ..... 7. *C. interior*
      3. Perigynia not thin-winged.
         4. Perigynia with serrulate beaks or margins 8. *C. brunnescens*
         4. Perigynia smooth throughout ..... 9. *C. trisperma*
   2. Staminate flowers at the top of the spikes.
      3. Spikes green or nearly so when mature.
         4. Sheaths tight, not or but slightly septate-nodulose dorsally.
            5. Nerve-like margins of the perigynia inflexed.
               6. Beak of perigynia smooth .....13. *C. retroflexa*
               6. Beak of perigynia serrulate.
                  7. Perigynia tapering, or but little contracted into the beak .....10. *C. rosea*

7. Perigynia abruptly contracted into the beak.
8. Leaf-blades averaging 2.5 mm wide; spikes with 6-20 perigynia; perigynia 3-4.5 mm long ..... 11. *C. convoluta*
8. Leaf blades averaging little more than 1 mm wide; spikes with 2-6 perigynia; perigynia 2-3 mm long ..... 12. *C. radiata*

5. Margins of the perigynia slightly or not at all inflexed.
6. Inflorescence 2-4 cm long ..... 14. *C. Muhlenbergii*
6. Inflorescence 0.7-1.5 cm long.
7. Perigynia elliptic-ovate, round-tapering at base, broadest below the middle ..... 15. *C. cephalophora*
7. Perigynia cordate-deltoid, broadest at the truncate-cordate base.. 16. *C. Leavenworthii*

4. Sheaths conspicuously green-and-white-mottled and septate-nodulose dorsally, loose, membranaceous and usually easily breaking ventrally.
5. Leaf blades, 3-6 mm wide, perigynia flat ventrally ..... 17. *C. aggregata*
5. Leaf blades, 5-10 mm wide, perigynia with raised border ventrally ..... 18. *C. sparganioides*

3. Spikes yellowish or tawny when mature (in *C. conjuncta* yellowish-green)
4. Perigynia with body abruptly contracted into the beak; culms not flattened in drying.
5. Leaves equaling or exceeding the culm. 19. *C. vulpinoidea*
5. Leaves shorter than the culm ..... 20. *C. annectens*

4. Perigynia with body tapering into the beak (in *C. conjuncta* somewhat abruptly contracted, but the culms becoming flattened in drying).
5. Perigynia tapering into a slender beak much longer than the body.
6. Sheaths cross-rugulose ventrally; prolonged upward at mouth beyond base of blade, not thickened at mouth ..... 22. *C. stipata*
6. Sheaths not cross-rugulose ventrally; not prolonged upward at mouth beyond base of blade, thickened at mouth ..... 23. *C. laevi-vaginata*

5. Perigynia contracted into a beak not longer than the body ..... 22. *C. conjuncta*

1. Some of the spikes bearing only pistillate flowers.
   2. Achenes lenticular or plano-convex; stigmas 2.
      3. Scales aristate or subulate-tipped; pistillate spikes all peduncled ..... 24. *C. gynandra*
      3. Scales not aristate; if subulate-tipped, the upper spikes mostly sessile.
         4. Pistillate spikes erect ..... 26. *C. stricta*
         4. At least the lower pistillate spikes nodding or curved ..... 25. *C. torta*
   2. Achenes trigonous; stigmas 3.
      3. Spikes solitary, terminal.
         4. Spikes without leafy bracts.
            5. Leaves lanceolate, 2-4 cm broad ..... 28. *C. Fraseri*
            5. Leaves grass-like, much narrower.
               6. Spikes staminate at tip, few flowered ..... 27. *C. leptalea*
               6. Spikes staminate at base, many flowered ..... 55. *C. squarrosa*
         4. Spikes subtended by long leafy bracts.
            5. Scales all bract-like overtopping the perigynia ..... 34. *C. Willdenowii*
            5. Only the lowest scales overtopping the perigynia ..... 35. *C. Jamesii*
      3. Spikes two or more.
         4. Perigynia not rigidly bidentate.
            5. Terminal spike bearing some pistillate flowers.
               6. Perigynia ascending.
                  7. Spikes mostly sessile or nearly so.
                     8. Spikes mostly remote; leaves glabrous ..... 51. *C. granularis*
                     8. Spikes approximate or overlapping; leaves, at least the sheaths, hairy.
                        9. Perigynia smooth.
                           10. Perigynia much flattened; blades often glabrous ..... 29. *C. hirsutella*
                           10. Perigynia nearly orbicular in cross-section; blades usually pubescent ..... 30. *C. caroliniana*
                        9. Perigynia very hairy ..... 31. *C. virescens*
                  7. Spikes mostly peduncled, spreading or drooping.
                     8. Bracts with long sheaths; perigynia bluntly angled.
                        9. Perigynia less than 4 mm long, beakless ..... 32. *C. gracillima*

9. Perigynia more than 4 mm long, beaked .....52. *C. debilis*
8. Bracts sheathless; perigynia sharply angled .....39. *C. prasina*

6. Perigynia wide-spreading or reflexed .....33. *C. Shortiana*

5. Terminal spike staminate throughout.

5a. Lowest foliaceous bract of the inflorescence sheathless or with short colored sheaths.

6. Perigynia pubescent.
7. Leaves and culms softly pubescent .....38. *C. hirtifolia*
7. Leaves and culms glabrous.
8. Leaves mostly basal, the culms nearly naked.
9. Plant strongly stoloniferous, the elongate stolons scaly-bracted and creeping .....37. *C. pennsylvanica*
9. Plant cæspitose or slightly stoloniferous, the basal leafy shoots strongly ascending .....36. *C. communis*
8. Culms leafy .....54. *C. scabrata*

6. Perigynia glabrous.
7. Leaves lanceolate, 1.5-3 cm broad, evergreen; culms bearing numerous colored sheaths and slender, remote spikes .....40. *C. plantaginea*
7. Leaves linear, less than 1.5 cm broad.
8. Perigynia beakless.
9. Pistillate spikes on capillary peduncles, wide-spreading or drooping .....39. *C. prasina*
9. Pistillate spikes sessile or short-peduncled, erect ....54. *C. scabrata*

5a. Lowest foliaceous bract of the inflorescence a distinct green sheath.

7. Perigynia nerveless, or at least not uniformly nerved from base to summit.
8. Perigynia 6-9 mm long .....52. *C. debilis*
8. Perigynia 4.5-6.5 mm long ...53. *C. flexuosa*
7. Perigynia with numerous uniform nerves from base to summit.
8. Perigynia sharply angled.
9. Basal leaves 1-3 cm broad; pistillate spikes sessile and erect .....41. *C. platyphylla*

9. Basal leaves narrower; pistillate spikes on capillary peduncles.
   10. Basal leaves 6-10 mm broad ..... 42. *C. laxiculmis*
   10. Basal leaves 2-5 mm broad ..... 43. *C. digitalis*
8. Perigynia obtusely angled.
   9. Perigynia fusiform, tapering about equally to the tip and the base.
      10. Perigynia with elevated ribs; scales smooth.
         11. Bract-sheaths essentially smooth on edges; beak of perigynia straight or nearly so ..... 44. *C. laxiflora*
         11. Bract-sheaths strongly serrulate on edges; beak of perigynia abruptly bent.
            12. Leaf-blades 7-30 mm wide; pistillate scales obovate-orbicular, very truncate .. 46. *C. albursina*
            12. Leaf-blades 3.5-15 mm wide; pistillate scales mucronate to long-awned ... 45. *C. blanda*
      10. Perigynia closely impressed-nerved; scales rough-awned.
         11. Sheaths pubescent . 47. *C. Hitchcockiana*
         11. Sheaths glabrous .. 48. *C. oligocarpa*
   9. Perigynia oblong-ovoid, obovoid, or glabrous, rounded to the base.
      10. Perigynia impressed-nerved.
         11. Leaves thin, soft, scarcely glaucous .. 49. *C. grisea*
         11. Leaves thick, firm, very glaucous .... 50. *C. glaucodea*
      10. Perigynia with elevated ribs ..... 51. *C. granularis*

4. Beak of perigynia rigidly bidentate.
   5. Staminate spike solitary or the terminal only partly staminate.
      6. Perigynia truncate or abruptly rounded above to long subulate beaks.
         7. Perigynia longer than the scales. 55. *C. squarrosa*
         7. Perigynia shorter than the scales. 56. *C. Frankii*
      6. Perigynia subulate, ovoid or globose, if abruptly beaked the terminal spike staminate.
         7. Pistillate spikes oblong-cylindric.
            8. Mature perigynia less than 12 mm long.
               9. Pistillate spikes 1.5-2 cm thick; perigynia 7-10 mm long ..... 57. *C. lurida*
               9. Pistillate spikes 1-1.3 cm thick; perigynia 5-7 long.. 58. *C. Baileyi*
            8. Mature perigynia more than 12 mm long ..... 59. *C. lupulina*
         7. Pistillate spikes globose or subglobose.
            8. Staminate scales prolonged into rough-awns ..... 57. *C. lurida*
            8. Staminate scales not rough-awned.
               9. Perigynia lanceloate, tapering to the beak ..... 61. *C. folliculata*
               9. Perigynia broader, abruptly contracted to the beak .... 60. *C. intumescens*
   5. Staminate spikes 2 or more.
      6. Culms spongy at base, bluntly angled above; leaves prominently nodulose ..... 63. *C. rostrata*
      6. Culms scarcely spongy at base, sharply-angled above; leaves slightly or not at all nodulose ..... 62. *C. vesicaria*

1. *Carex scoparia* Schkukr; Willd. Sp. Pl. 4:230, 1805. Low ground or even dry open soil, rarely in woods throughout the state.

Lewis: Stonecoal Creek, *W. V. U. Bot. Exped.;* Fayette: Nuttallburg, *Nuttall;* Monongalia: Falling Run, *Millspaugh* 230; Hampshire: Hanging Rock, *Frye* 352; Wetzel: between Hundred and Burton, *Haught* 563.

2. *Carex tribuloides* Wahl. Kongl. Vet. Acad. Handl. (II) 24:145. 1803. Low meadows and rich open woods, throughout the state.

Tucker: Red Creek Plains, *Core* 4761; Monongalia: Greer *Spangler;* Webster: Cowen, *Core* 1596; Summers: Brooks, *Boone* 663; Harrison: Duck Creek, *Martin;* Mineral: Burlington, *W. V. U. Bot. Exped.;* Pocahontas: Durbin,

Orton; Wirt: Reedy Creek,*Bartholomew;* Raleigh: Little Beaver Creek, *Core* 3122; Pocahontas; near head of Cheat River, *Core* 3396; Hampshire: Hanging Rock, *Frye* 240; Preston: Bretz, *Fling;* Wood: Kanawha Station, *Millspaugh* 294; Wetzel: between Hundred and Burton, *Haught* 575; Boone: Bigson, *W. V. U. Bot. Exped.*

3. *C. projecta* Mackenzie, Bull. Torr. Bot. Club 35:264. 1908. Damp soil, local.

Fayette: Nuttallburg, *Nuttall.*

4. *Carex cristatella* Britton; Britton & Brown, Illus. Fl. 1:357. 1896. Given in Gray's Manual, 7th edition, as *C. cristata* Schwein. Ann. Lyc. N. Y. 1:66. 1824. But this binomial had been used by Clairy in 1811 for a different species. Not reported by Millspaugh.

In damp meadows and thickets, along the Ohio.

Marshall: Sherrard, *W. V. U. Bot. Exped.;* Tyler: Sistersville, *Core.* The record of *Carex Bicknellii* Britton for West Virginia (Millspaugh, 1913, p. 223) is based on a mistaken identification. This species is not known to occur in the state.

5. *C. festucacea* Schkuhr; Willd. Sp. Pl. 4:242. 1805. Dry or rocky soil, rare. Not in Millspaugh.

Fayette: near Nuttallburg, *Nuttall;* Monongalia: Tibbs Run, *Sheldon.*

6. *C. fœnea,* Willd. Enum. 957. 1809. Dry woods and banks, local. Not reported by Millspaugh.

Mercer: Pinnacle Rocks, *W. V. U. Bot. Exped.;* Pendleton; North Fork Mt., *Core* 4629; Preston; near Manown, *Sheldon.*

7. *C. interior* Bailey, Bull. Torr. Bot. Club 20:426. 1893. *C. scirpoides* Schkuhr; (Willd. Sp. Pl. 4:237, in smaller part. 1805) Muhl. Desc. Gram. 225. 1817. Not *C. scirpoidea* Michx. 1803. Not in Millspaugh. Swampy meadows, local.

Cabell: near Huntington, *Gilbert* 318.

8. *C. brunnescens* Poir, in Lam. Encyc. Suppl. 3:286. 1813. *C. canescens* var. *vulgaris* Bailey, Bot. Gaz. 13:86. 1888. *C. brunnescens* var. *gracilior* Britton; Britton & Brown Ill. Fl. 1:351. 1896. Open woods and dry rocky banks, at high altitudes.

Pocahontas: Bald Knob, *Core* 4299; Randolph: summit of Rich Mountain, *Millspaugh* 444; Tucker: Canaan Valley, *Core* 2870; Pendleton: Spruce Knob, *Core* 3631; Grant: Stony River Dam, *Core* 2913.

9. *C. trisperma* Dewey, Am. Jour. Sci. 9:63. 1825. Damp woods and bogs, at higher elevations.

Preston: Cranesville Glades, *W. V. U. Bot Exped.;* Mineral: Elk Garden, *W. V. U. Bot. Exped.;* Randolph: The Sinks, *Core* 3582.

10. *C. rosea* Schkuhr.; Willd. Sp. Pl. 4:237. 1805. Dry open woods, common.

Wirt: Two Ripple road, *Bartholomew;* Hampshire: Hanging Rock, *Frye;* Fayette: Nuttallburg, *Nuttall;* Greenbrier: Keeney Knob, *W. V. U. Bot. Exped.;* Ohio: Oglebay Park, *Strausbaugh;* Wetzel: between Hundred and Littleton, *Haught* 436; Monongalia: Uffington, *Fling.*

11. *C. convoluta* Mackenzie, Bull. Torr. Bot. Club 43:428. 1916. Dry woods, local.

Monongalia: Dolls Run, *Core;* Fayette: near Nuttallburg, *Nuttall.*

12. *C. radiata* (Wahl.) Dewey; Chapm. Fl. S. U. S. 534. 1860. *C. radiata* Wahl.; Muhl. Descr. Gram. 224, as synonym. 1817. *C. rosea* var *radiata* Dewey. Am. Jour. Sci. 10:276. 1826. Dry woods, throughout the State.

Mineral: Neil's Gap, *Taylor* 164; Monongalia: Round Bottom, *Millspaugh* 176; Randolph: Point Mountain, *Millspaugh* 514; Webster: Camp Caesar, *Core.*

13. *C. retroflexa* Muhl.; Willd. Sp. Pl. 4:235. 1805. Dry, open woods, local.

Hampshire: Hanging Rock, *Frye* 533; Lewis: Stonecoal Creek, *W. V. U. Bot. Exped.*

14. *C. Muhlenbergii* Schkuhr.; Willd. Sp. Pl. 4:231. 1805. In dry fields.

Hardy: Reymann Memorial Farms, *W. V. U. Bot. Exped.;* Lewis: Leading Creek, *Millspaugh* 373; Randolph: Cricard, *Millspaugh* 473; Pocahontas: Green Bank, *W. V. U. Bot Exped.*

15. *C. cephalophora* Muhl.; Willd. Sp. Pl. 4:220. 1805. Dry ground, common throughout the state.

Harrison: Duck Creek, *Martin* 373; Monongalia: Easton, *Richards;* Pocahontas: Green Bank, *W. V. U. Bot. Exped.;* Summers: near Hinton, *Boone* 708; Hampshire: Hanging Rock, *Frye* 412; Wetzel: near Littleton, *Haught* 413; Wirt: near Owensport, *Bartholomew;* Lewis: Camden, *W. V. U. Bot Exped.;* Fayette: Nuttallburg, *Nuttall;* Greenbrier: Keeney Knob, *W. V. U. Bot. Exped.;* Preston: Lake Terra Alta, *W. V. U. Bot. Exped.*

16. *C. Leavenworthii* Dewey, Am. Jour. Sci. (II) 2:246. 1846. Damp woods and banks, local. Not reported by Millspaugh.

Ohio: Oglebay Park, *W. V. U. Bot. Exped.*

17. *C. aggregata* Mackenzie, Bull. Torr. Bot. Club 37:246. 1910. Rich woods, local.

Monongalia: Dolls Run, *Core.*

18. *C. sparganioides* Muhl.; Willd. Sp. Pl. 4:237. 1805. Woods and thickets, common.

Lewis: Wild Cat Run, *W. V. U. Bot. Exped.;* Fayette: Nuttallburg, *Nuttall;* Ohio: Middle Wheeling Creek, *Bartholomew;* Hampshire: Hanging Rock, *Frye* 532; Monongalia: Little Falls, *Core* and *Shaull;* Tyler: near Sistersville, *Core* 4105; Mineral: New Creek Mountain, *W. V. U. Bot. Exped.;* Pocahontas: Elk Mt., *W. V. U. Bot. Exped.*

19. *C. vulpinoidea* Michx., Fl. Bor. Am. 2:169. 1803. Swamps and wet meadows, common.

Harrison: near Clarksburg, *Judy;* Monongalia: Falling Run, *Millspaugh* 228; Hancock: near Chester, *Core* 1457; Roane: Vandal Fork, *W. V. U. Bot. Exped.;* Mercer: Dave's Fork, *W. V. U. Bot. Exped.;* Fayette: Nuttallburg, *Nuttall;* Pocahontas: Durbin, *Orton;* Wirt: near Elizabeth, *Bartholomew;* Hampshire: Hanging Rock, *Frye* 536; Summers: Brooks, *Boone* 680; Wetzel: near Littleton, *Haught* 411; Randolph: Cheat Bridge, *Sheldon* 2603.

20. *C. annectens* Bicknell. Bull. Torr. Bot. Club 35:492. 1908. *C. vulpinoidea* var. *ambigua* Barratt: Boott, Ill. Carex 125 pl. 406. 1862. *C. setacea*

var. *ambigua* Fernald, Rhodora 8:167. 1906. Dry soil, rare. Not reported by Millspaugh.

Webster: Price Glade, *Core*, 1641.

21. *C. conjuncta* Boott, Ill. 3:122. 1862. Moist meadows and thickets, rare. Not reported by Millspaugh.

Ohio: Oglebay Park, *Strausbaugh;* Monongalia: Dolls Run, *Core.*

22. *C. stipata* Muhl.; Willd. Sp. Pl. 4:233. 1805. Swamps and wet meadows, common.

Harrison: Shinnston, *Martin* 374; Mineral: Keyser, *Taylor* 122; Fayette: Nuttallburg, *Nuttall;* Randolph: Point Mountain, *Core* 2686; Hampshire: Hanging Rock, *Frye* 527; Monongalia: Dolls Run, *Core;* Lewis: near Camden, *W. V. U. Bot. Exped.;* Preston: Lake Terra Alta, *W. V. U. Bot. Exped.;* Summers: Keeney Knob, *Boone* 639.

23. *C. laevi-vaginata* (Kukenth.) Mackenzie, in Britton & Brown, Ill. Fl. ed. 2. 1:371. 1913. Swampy woods, local.

Lewis: Camden, *W. V. U. Bot. Exped.;* Cabell: Rickett's Place, *Gilbert* 319.

24. *C. gynandra* Schwein., Ann. Lyc. N. Y. 1:70. 1824. *C. crinita* var. *gynandra* Schwein. & Torr., Ann. Lyc. N. Y. 1:360. 1825. Swamps, throughout the State. Reported by Millspaugh as *C. crinita* Lam.

Mercer: Shawnee Lake, *McNeill;* Hampshire: Hanging Rock, *Frye* 1103; Pocahontas: Cranberry Glades, *W. V. U. Bot. Exped.;* Greenbrier: Keeney Knob, *W. V. U. Bot. Exped.;* Boone: Uneeda, *W. V. U. Bot. Exped.;* Wetzel: between Burton and Hundred, *Haught* 561; Wirt: near Elizabeth, *Millspaugh* 324; Monongalia: Uffington, *Fling;* Raleigh, Beckley Fair Grounds, *Strausbaugh;* Summers; near Talcott, *Boone* 715; Preston: Pisgah, *Hopkins.*

25. *C. torta* Boott.; Tuckerm. Enum. Meth. 11. 1843. Margins or rocky beds of streams.

Grant: Greenland Gap, *W. V. U. Bot. Exped.;* Fayette: Nuttallburg, *Nuttall;* Monongalia: Morgantown, *Ammons;* Preston: Reedsville, *Corbett;* Braxton: Little Birch, *W. V. U. Bot. Exped.*

26. *C. stricta* Lam. Encycl. 3:387. 1789. In swamps, uncommon.

Pocahontas: Green Bank, *W. V. U. Bot. Exped.*

27. *C. leptalea* Wahlenb., Kongl. Vet. Acad. Handl. (11.) 24:139. 1803. In bogs and swamps, not common.

Fayette: Nuttallburg, *Nuttall;* Monongalia: Halleck, *Anderson & Smith* 164; Pocahontas: Dunmore, *W. V. U. Bot. Exped.*

28. *C. Fraseri* Andrews, Bot. Rep. pl. 639. 1811. Rich mountain woods, rare. This sedge is so distinctive that it has been made by Mackenzie the basis for a new monotypic genus, *Cymophyllus* Britton & Brown, Illus. Fl. ed. 2. 1:441. 1913.

29. *C. hirsutella* Mackenzie, Bull. Torr. Bot. Club 50:349. 1923.

"*C. triceps* Michx. Fl. Bor. Am. 2:170. 1803," in sense of Millspaugh, 1913, p. 220.

This species appears in the 7th edition of Gray's Manual (p. 233) as *C. triceps* Michx. var *hirsuta* (Willd.) Bailey and is listed in Millspaugh (1913, p. 220) as *C. triceps* Michx. In Britton & Brown (edition 2. 1:414), Mackenzie

discussed it under the head of *C. complanata* Torr., but in his monograph on the group (North American Flora, 18:323), he separates the pubescent forms under the name *C. hirsutella* Mackenzie, leaving only the glabrate coastal plain forms under *C. complanata* Torr.

C. hirsuta Willd., Sp. Pl. 4:252. 1805. Not *C. hirsuta* Suter, 1802.

C. triceps var. *hirsuta* L. H. Bailey, Mem. Torr. Bot. Club 1:35. 1889.

"*C. complanata* Torr. & Hook.; Torr. Ann. Lyc. N. Y. 3:408. 1836". in sense of Mackenzie, Britton & Brown, Ill. Fl. ed. 2, 1:414. 1913.

A common species in dry thickets and pastures.

Roane: Vandal Fork, *W. V. U. Bot. Exped.;* Wetzel: near Littleton, *Haught* 517; Wood: Kanawha Station, *Millspaugh* 270; Monongalia: Easton, *Fling;* Hampshire: Hanging Rock, *Frye* 652; Wirt: Mouth of Reedy Creek, *Bartholomew* 276w; Putnam: Little Scary Creek, *W. V. U. Bot. Exped.;* Wayne: near Cyrus, *Gilbert* and *Gilbert* 325; Tucker: Canaan Valley, *Core;* Mercer: Brush Creek, *McNeill;* Tyler: The Jug, *Core* 4131.

30. *C. caroliniana* Schwein. Ann. Lyc. N. Y. 1:67. 1824. *C. triceps* var. *Smithii* Bailey, Bot. Gaz. 13:88. 1888. Fields and woodlands, local. Not in Millspaugh.

Brooke: mouth of Harmon Creek, *W. V. U. Bot. Exped.*

31. *C. virescens* Muhl.; Willd. Sp. Pl. 4:251. 1805. Woods and dry banks, fairly common.

Wetzel: near Littleton, *Haught* 374; Fayette: near Beckwith, *Core* 4232; Monongalia: near Dellslow, *Sheldon;* Mineral: New Creek Mountain, *W. V. U. Bot. Exped.;* Lewis: near Camden, *W. V. U. Bot. Exped.;* Preston: near Manown, *Sheldon.*

32. *C. gracillima* Schwein., Ann. Lyc. N. Y. 1:66. 1824. Woodlands and meadows, fairly common.

Fayette: near Nuttallburg, *Nuttall;* Randolph: near Elkins, *Core;* Wetzel: between Hundred and Earnshaw, *Haught* 464; Tucker: Canaan Valley, *Core.*

33. *C. Shortiana* Dewey. Am. Jour. Sci. 30:60. 1836. Moist meadows and low woods, local.

Monongalia: Aaron's Run, *Sheldon* 3587; Wirt: near Elizabeth, *Bartholomew.*

34. *C. Willdenowii* Schkuhr.; Willd. Sp. Pl. 4:211. 1805. Rocky woods, local.

Pocahontas: Green Bank, *W. V. U. Bot. Exped.;* Mineral: Allegheny Mt., *W. V. U. Bot. Exped.;* Mercer: Athens, *W. V. U. Bot. Exped.*

35. *C. Jamesii* Schwein., Ann. Lyc. N. Y. 1:67. 1824. Dry woods, local.

Fayette: near Nuttallburg, *Nuttall;* Wirt: mouth of Little Reedy Creek, *Bartholomew;* Ohio: Oglebay Park, *Strausbaugh.*

36. *C. communis* Bailey, Mem. Torr. Bot. Club 1:41. 1889. Dry open woods, common.

Monongalia: Dolls Run, *Core;* Morgantown, *Roush;* Ohio: Middle Wheeling Creek, *Bartholomew;* Tyler: The Jug, *Core* 4122; Wirt: near Owensport, *Bartholomew;* Grant: Stony River Dam, *Core;* Fayette: Kanawha Falls, *Core;* Pendleton: North Fork Mountain, *Core* 4632; Randolph: Roaring Plains, *Core.*

37. *C. pennsylvanica* Lam., Encyc. 3:388. 1789. *C. varia* Muhl.

Closely resembling, but less common than the preceding.

Cabell: Huntington, *Gilbert* 73; Fayette: Nuttallburg, *Nuttall;* Wirt: near Owensport, *Bartholomew;* Summers: Hinton, *Boone* 705; Hampshire: Hanging Rock, *Frye* 382.

38. *C. hirtifolia* Mackenzie. Bull. Torr. Bot. Club 37:244. 1910.

C. pubescens Muhl.; Willd. Sp. Pl. 4:281. 1805. Not *C. pubscens* Poir. 1789, nor *C. pubescens* Gilib. 1792. Thickets and moist meadows, along the Ohio. Not in Millspaugh.

Ohio: Oglebay Park, *Strausbaugh;* Tyler: Sistersville, *Core* 4133.

39. *C. prasina* Wahl, Kongl. Vet. Acad. Handl. (II.) 24:161. 1803. Moist meadows and thickets throughout the state.

McDowell: Brown's Creek, *W. V. U. Bot. Exped.;* Fayette: near Nuttallburg, *Nuttall;* Monongalia: Halleck, *Anderson and Smith* 165; Pocahontas: Cranberry Glades, *W. V. U. Bot. Exped.*

40. *C. plantaginea* Lam., Encyc. 3:392. 1789. Rich woods, in the higher elevations.

Fayette: near Nuttallburg, *Nuttall;* Randolph: Shaver's Mt., *Core.*

41. *C. platyphylla* Carey, Am. Journ. Sci. (II.) 4:23. 1847. Rich woods and banks throughout the state.

Tyler: The Jug, *Core* 4124; Mercer: near Athens, *W. V. U. Bot. Exped.;* Harrison: Shinnston, *Martin* 224; Monongalia: Quarry Run, *Sheldon;* Wirt: mouth of Little Reedy Creek, *Bartholomew* 321w; Summers: Hinton, *Boone* 717.

42. *C. laxiculmis* Schwein., Ann. Lyc. N. Y. 1:70. 1824. Rich woods and glades throughout the state.

Preston: Muddy Creek, *Core* 2817; Wetzel: Wolf Run, *Haught;* Fayette: Nuttallburg, *Nuttall;* Mercer: Athens, *W. V. U. Bot. Exped.*

43. *C. digitalis* Willd., Sp. Pl. 4:298. 1805. Woods and thickets, fairly common.

Mercer: near Athens, *W. V. U. Bot. Exped.;* Fayette: near Nuttallburg, *Nuttall;* Grant: Bayard, *Millspaugh* 943; Lewis: Wildcat Run, *W. V. U. Bot. Exped.;* Monongalia: Sturgisson, *Sheldon.*

44. *C. laxiflora* Lam., Encyc. 3:302. 1789.

C. anceps Muhl.; Willd. Sp. Pl. 4:278. 1805. *C. laxiflora* var. *patulifolia* Carey, in A. Gray, Man. ed. 2, 524. 1856. Rich woods, very abundant. The form previously separated as a variety (var. *patulifolia*) or a separate species (*C. anceps*) was regarded by Mackenzie (North Amer. Flora 18:254. 1935), as not distinct from *C. laxiflora.*

Braxton: Little Birch, *W. V. U. Bot. Exped.;* Ohio: Oglebay Park, *Strausbaugh;* Monongalia: Little Falls, *Millspaugh* 121; Randolph: Point Mountain, *Millspaugh* 516; Hampshire: Hanging Rock, *Frye* 397; Kanawha: Midland Trail, *Core;* Wetzel: near Littleton, *Haught* 399; Mercer: Ingleside, *Millspaugh* 1543; Fayette: Nuttallburg, *Nuttall;* Preston: Terra Alta, *Hopkins;* Tucker: Haddix Run, *Core* 2620; Marion: Fairview, *Fling;* Wirt: mouth of Little Reedy Creek, *Bartholomew;* Lewis: Camden, *W. V. U. Bot. Exped.;* Ritchie: Cairo, *Goodwin;* Doddridge: West Union, *W. V. U. Bot. Exped.;* Summers: Hinton, *Boone* 706.

45. *C. blanda* Dewey, Am. Jour. Sci. 10:45. 1825.

C. laxiflora var. *blanda* Boott, Ill. Carex 37. pl. 92. 1858. Rich wood, local.

Cabell: Roland Park, *Gilbert* 260; Monongalia: Mont Chateau, *Fling.*

46. *C. albursina* Sheldon, Bull. Torr. Bot. Club 20:284. 1893. *laxiflora* var. *latifolia* Boott, Ill. Carex 38, pl. 93. 1858. Not *C. latifolia* J. F. Gmel. 1791, nor *C. latifolia* Moench. 1794. Deep rich woods, common.

Ohio: Oglebay Park, *Strausbaugh;* Summers: Hinton, *Boone* 704; Monongalia: Dent's Run, *Core;* Wayne: near Wayne, *Harris;* Pocahontas: near Cass, *W. V. U. Bot. Exped.;* Tyler: The Jug, *Core* 4120; Lincoln: Hamlin, *Harris;* Wirt: near Owensport, *Bartholomew* 320w.

47. *C. Hitchcockiana* Dewey, Am. Jour. Bot. 10:274. 1826. Rich woods, local.

Monongalia: Marilla, *Post* 2548.

48. *C. oligocarpa* Schkuhr.; Willd. Sp. Pl. 4:279. 1805. Dry woods and thickets, local.

Wirt: Owensport, *Bartholomew* 317w; Mineral: Patterson Creek, *Core.*

49. *C. grisea* Wahl. Kongl. Vet. Acad. Handl. (II.) 24:154. 1803.

Reported in Millspaugh (1913, p. 221) as *C. amphibola* Steud (Syn. Pl. Cyp. 234. 1855) (*C. grisea* var. *angustifolia* Boott, Ill. 34. 1858). But our plants are more properly to be referred to *C. grisea.* Woods and thickets, fairly common.

Mineral: Burlington, *Cordray;* Fayette: near Nuttallburg, *Nuttall;* Lewis: Stonecoal Creek, *W. V. U. Bot. Exped.;* Hampshire: Hanging Rock, *Frye;* Monongalia: Dolls Run, *Core;* Wirt: near Elizabeth, *Bartholomew;* Tyler: Sistersville, *Core* 4104.

50. *C. glaucodea* Tuckerm.; Olney, Proc. Amer. Acad. 7:395. 1868. Open fields and meadows, local.

Mercer: near Athens, *W. V. U. Bot. Exped.*

51. *C. granularis* Muhl.; Willd. Sp. Pl. 4:179. 1805. Woods and meadows, local.

Monongalia: Uffington, *Fling;* Hardy: Reymann Memorial Farms, *W. V. U. Bot. Exped.*

52. *C. debilis* Michx. Fl. Bor. Am. 2:172. 1803. Woods and thickets. Intergrades with the next.

Fayette: near Nuttallburg, *Nuttall.*

53. *C. flexuosa* Muhl.; Willd. Sp. Pl. 4:297. 1805.

C. debilis var. *Rudgei* Bailey, Mem. Torr. Bot. Club 1:34. 1889. Open woods, thickets, and meadows, principally in higher elevations, common.

Randolph: Point Mountain, *Millspaugh* 515; Monongalia: Cheat View, *Fling;* Tucker: Blackwater River, *Millspaugh* 975; Fayette: near Nuttallburg, *Nuttall;* Preston: Gladesville, *Core* 2974; Pocahontas: Cranberry Glades, *W. V. U. Bot. Exped.*

There is not now available a specimen of *C. oblita* Stend (*C. venusta* Dewey var. *minor* Boeckl.) reported by Millspaugh (1913, p. 221) from Fayette county.

54. *C. scabrata* Schwein. Ann. Lyc. N. Y. 1:69. 1824. Moist woods and glades, generally at higher elevations.

Pocahontas: near Bald Knob, *W. V. U. Bot. Exped.;* Greenbrier: near White Sulphur Springs, *Core* 4275; Tucker: Canaan Valley, *Core;* Grant: Gormania, *Core* 3708;Monongalia: Tibbs Run, *Sheldon* 584.

55. *C. squarrosa* L., Sp. Pl. 973. 1753. Swamp and wet woods, throughout the state.

Mercer: near Athens, *W. V. U. Bot. Exped.;* Monongalia: near Morgantown, *Millspaugh* 217; Summers: near Bellpoint, *Boone* 700; Hampshire: Hanging Rock, *Frye* 654; Hardy: Baker, *Core* 3764; Wetzel: between Hundred and Burton, *Haught* 562; Jackson: Fair Grounds, *W. V. U. Bot. Exped.;* Pendleton: Franklin, *W. V. U. Bot. Exped.;* Lewis: Wild Cat Run, *W. V. U. Bot. Exped.;* Mineral: Burlington, *W. V. U. Bot. Exped.*

The report of *C. typhinoides* Schwein. for West Virginia (Millspaugh, 1913, p. 220) was based on a mistaken identification.

56. *C. Frankii* Kunth., Enum. Pl. 2:498. 1837. Swamps and meadows, common.

Harrison: Shinnston, *Martin* 164; Roane: Vandal Fork, *W. V. U. Bot. Exped.;* Monongalia: Falling Run, *Millspaugh* 227; Summers; near Bertha, *Boone* 699; Wetzel: near Littleton, *Haught* 543; *Wirts:* near Owensport, *Bartholomew;* Tyler: Sistersville, *Core* 4106; Randolph: near Harman, *Greenman;* Hampshire: Hanging Rock, *Frye* 226; Greenbrier: White Sulphur Springs, *W. V. U. Bot Exped.*

57. *C. lurida* Wahlenb., Sv. Vet.-Akad. Nya Handl. 24153. 1803. Swamps and wet woods, common.

Greenbrier: Organ Cave, *Core* 2014; Monroe: Cove Creek, *Core;* Webster: near Cowen, *Core* 1598; Hampshire: Hanging Rock, *Frye* 220; Preston: Reedsville, *Zucchero;* Monongalia: Falling Run, *Millspaugh* 236; Mercer: Dave's Fork, *W. V. U. Bot. Exped.;* Lewis: Vandalia, *W. V. U. Bot. Exped.;* Hardy: Mathias, *Core* 3767; Wirt: near Elizabeth, *Bartholomew* 1; Roane: Vandal Fork, *W. V. U. Bot. Exped.;* Braxton: Little Birch, *Harris;* Randolph: Ralston Run, *Core;* Grant: Mt. Storm, *Core* 3319; Harrison: Shinnston, *Martin;* Pocahontas: Williams River, *Core* 3427; Upshur: Adrian, *Sheldon;* Wood: Lockart's Run, *Millspaugh* 651; Wetzel: between Hundred and Littleton, *Haught;* Fayette: Marr Branch, *W. V. U. Bot. Exped.;* Summers: Brooks, *Boone* 698.

58. *C. Baileyi* Britton, Bull. Torr. Bot. Club 22:220. 1895. *C. lurida* var. *gracilis* Bailey, Mem. Torr. Bot. Club 1:11. 1889. Cool woods and meadows, local.

Tucker: along Blackwater, *Millspaugh* 978;Fayette: Marr Branch, *W. V. U. Bot. Exped.;* Randolph: Cheat Bridge, *Sheldon* 2605; McDowell: near Welch, *W. V. U. Bot. Exped.;* Pocahontas: Cranberry Glades, *W. V. U. Bot. Exped.*

59. *C. lupulina* Muhl.; Willd. Sp. Pl. 4:266. 1805. Swamps and wet woods, fairly common.

Wirt: Reedy Creek, *Bartholomew* 216w; Monongalia: Dunkard Creek, *Anderson and Smith* 346; Hampshire: Hanging Rock, *Frye;* Mercer: Shawnee Lake, *Core* 1844; Upshur: Buckhannon, *Millspaugh* 387; Preston: Bretz, *Fling;* Hardy: Lost River, *W. V. U. Bot. Exped.*

C. Grayii Carey, so far as is known, does not occur in West Virginia. The record in Millspaugh (1913, p. 219, as *C. Asa-Grayi* Bailey) was based on a mistaken identification.

60. *C. intumescens* Rudge, Trans. Linn. Soc. 7:97. pl. 9, f.3. 1804. Swamps and wet woods, principally in the mountains.

Webster: Camp Caesar, *Core* 1568; Kanawha: Beaver Park, *Greenlee;* Monongaiia: Halleck, *Anderson and Smith;* Pocahontas: Green Bank, *W. V. U. Bot. Exped.;* Randolph: Chenoweth Creek, *W. V. U. Bot. Exped;* Tucker: along Blackwater, *Millspaugh* 979; Fayette: near Nuttallburg, *Millspaugh;* Preston: Bretz, *Fling;* Mercer: near Athens, *W. V. U. Bot. Exped.*

61. *C. folliculata* L., Sp. Pl. 978. 1753. Wet woods and glades, in the mountains.

Preston: Cranesville Glades, *W. V. U. Bot. Exped.;* Tucker: along Blackwater River, *Millspaugh* 976; Pocahontas: Green Bank, *W. V. U. Bot. Exped.;* Mercer: Shady Springs, *W. V. U. Bot. Exped.*.

62. *C. vesicaria* L., Sp. Pl. 979. 1753. Meadows and low ground, local. Not in Millspaugh.

Raleigh: Glen Daniels, *W. V. U. Bot. Exped.;* Mercer: Shawnee Lake, *W. V. U. Bot. Exped.*

63. *C. rostrata* Stokes; With. Brit. Pl. ed. 2. 2:1059. 1787. *C. rostrata* var. *utriculata* (Boott) Bailey, Proc. Am. Acad. 22:67. 1886. Swamps and shallow water, local.

Tucker: Canaan Valley, *Core;* Pocahontas: Cranberry Glades, *W. V. U. Bot. Exped.*

A STUDY OF TESTICULAR NEOPLASMS

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ONE OF THE MOST INTERESTING studies in the field of oncology is that of testicular new growths. The microscopic picture which they present is so varied that considerable disagreement takes place as to their origin. A controversy as to their origin is still going on. The testis is not only *(13)* an organ of internal secretion, but also produces germ cells which may assume abnormal powers of growth and give rise to bizarre tumors containing almost any type of tissue of the body.

The etiology of tumors of the testis is unknown. They may manifest themselves at any age from infancy to over 80 years. The average age is about 32 years *(16)*. The condition is usually unilateral, the right being slightly more frequently involved than the left. In bilateral cases it is believed that the second testicle is affected as the result of metastasis from the organ primarily the seat of the disease. Hinman *(11)* states that neoplastic change is likely to occur 20 times as frequently in the undescended as in the normally placed gland. Heredity apparently plays no part in the incidence of testicular growths. Likewise, previous *(16)* venereal infection bears no relationship to its causation. Although the relationship of trauma in the etiology of tumors is disputed, about 25 percent of patients recall a previous testicular injury.

At the pathology laboratory of the University ten surgical specimens of testicular tumors were examined during a period of nearly eleven years. Only one of the cases was examined on the post-mortem table. A tumor of an undescended testicle of a dog was also studied.

Tumors may originate *(9)* in any of the various types of tissues encountered in the testis, such as the supporting tissue, the parenchyma, and the sex cells. Both benign and malignant forms are found.

Benign tumors of the gland are rare. They include such types as the fibroma, lipoma, myoma, chondroma, adenoma, and neoplasms originating in the interstitial cells.

The majority of testicular neoplasms are malignant. Ewing *(6)* is of the opinion that nearly all of the tumors of the organ develop from totipotent sex cells which are capable of giving rise to new growths containing derivatives of any of the three germ layers, and that tumors in which a single tissue is present represent a one-sided development of a teratoma.

There are three main forms of teratoma. They are the adult embryoma, the mixed tumors, and the embryonal carcinoma.

The adult embryoma is an infrequent tumor. Grossly, it is cystic and characterized by the presence of rudimentary-like organs. The dermoid variety *(6)* contains hair and structures of the skin;

microscopically, portions of organs, as liver and intestinal mucosa, and various tissues such as epidermis, hair, sebaceous glands, fat, muscle, and structures of the nervous system.

The microscopic study of our single tumor of this group reveals an adenomatous area with cells containing small, deeply staining nuclei in a clear cytoplasm. The cell boundaries are distinct. Large cystic areas are present in the rete testis. The cysts are lined by both columnar and squamous epithelium. The histological study does not suggest malignancy.

The adult embryomas grow slowly. They rarely undergo malignant change or metastasize.

The mixed tumors *(6)* comprise a large group of testicular tumors containing more or less embryonic structures derived from any of the three germ layers. They are soft, cellular growths consisting for the most part of epithelium and cysts. Other tissues such as cartilage, bone, muscle, embryonic connective tissue, elements of the nervous system, and carcinomatous cells may be included.

In this group three tumors were studied. The histological study of the first shows the presence of numerous cysts lined by a columnar epithelium. Epithelial cells of the squamous variety are arranged in masses. The stroma is embryonic in character and contains strands of smooth muscle.

The second tumor presents the following histological picture. Large amounts of cartilage as well as epithelial cells of glandular variety are observed. Some have an alveolar-like arrangement while some are grouped in the form of tubules. The stroma consists of embryonic connective tissue.

The third case is very interesting. The original tumor was removed from an infant, one of twins, at the age of seven months. It was attached to the bowel and left testicle and extended into the scrotum. The mass measured 5x2.5x2 cm. It was white in color and fibrous and firm in consistence. Microscopic examination reveals dense masses of epithelial cells of the squamous type, and large cysts lined by the same kind of epithelium. Very little keratinization is taking place. Hair follicles, sebaceous and sudoriferous glands are numerous.

The infant died at the age of fourteen months. The tumor had, in the meantime, recurred and grown to immense proportions. It was removed soon after death. It involved the entire scrotum including both testicles. The penis was obscured, only the tip of the glans projected above the mass. The growth measured 14x8.5x7.5 cm. and was covered by thickened, puckered skin of the scrotum. When the tumor was sectioned its contents were found to be soft, friable and hemorrhagic. The microscopic study of recurrent tumor differed from the original. Under the microscope it shows strands of embryonic muscle and nests of oval and round epithelial cells in alveolar-like arrangement. Large blood sinuses, with a

grouping resembling an angioma, are situated in a stroma of sarcomatous appearance. Massive hemorrhage and considerable necrosis are also observed.

The majority of the mixed tumors are malignant and give rise to metastases. More than 90 percent are fatal.

The embryonal carcinoma or seminoma of Chevassu *(2)* is the most frequent tumor of the testicle. Some consider it to be a spermatocytoma, a new growth arising from germinal cells although Ewing *(6)* looks upon it as a one-sided development of a teratoma. The growth is firm and rapidly replaces the normal structures. Late in its course it undergoes softening and central necrosis. Microscopically it is composed of large round or polyhedral cells resembling spermatocytes or small round cells resembling lymphocytes. The connective tissue stroma is frequently infiltrated with lymphocytes.

This series includes three cases of embryonal carcinoma in human patients as well as an example in an undescended testicle of a dog. The age of the patient in the first case was 52 years. The testis which was removed was enlarged to about three times the normal size. It was firm and tense. Upon sectioning, the cut-surface bulged beyond the line of incision and its color was pale yellow. The histological examination presents masses of round cells. They are mainly small in size. Some large round cells, polyhedral cells and spindle-shaped cells are also found. Mitotic figures are present but not numerous. The stroma is mostly loose in texture, but denser portions are also observed.

Our second tumor of this variety was obtained from a man of 49 years. The mass measured 5.5x5x4.5 cm. When it was incised the cut-surface was found to be light yellow in color and soft and necrotic in character. The cut-surface bulged. Upon microscopic examination, the tumor is found to be composed of large round and polygonal cells. The nucleoli are distinct. Numerous mitotic figures are also observed. Necrosis and hemorrhage are extensive. There is a slight infiltration of lymphocytes into the stroma.

The third tumor, a surgical specimen, was obtained from a man of 47 years. The mass measured 8x6.3x5.6 cm. The tunic was tense and cut with considerable resistance. The bulging cut-surface showed multiple pale yellow, softened nodules about 1.5 cm. in diameter. The histological examination presents masses of large round cells in an alveolar-like arrangement. The cells are nearly uniform in size. Many contain mitotic figures. Necrosis is very extensive.

The specimen obtained from a dog involved an undescended testicle situated deeply in the lumbar region just below the left kidney. It measured 7x5.5x5 cm. It was yellow and gray in color with multiple nodules projecting from the surface. Upon sectioning the organ, the cut-surface showed numerous round, grayish areas with softened centers. Microscopic examination reveals nests of large round and oval cells with vesicular nuclei. The connective

tissue stroma is variable in amount. In some portions of the section cords of cells resembling those of the liver are noted. However, most of the cells throughout the section resemble spermatocytes. The stroma is infiltrated with lymphocytes. An enlarged retroperitoneal lymph node and a suspicious-looking area in the liver were examined for metastases but they were not found. The right testis was situated in its normal position and unaffected.

A remarkable form of teratoma is the chorionepithelioma of the testis. This tumor *(8)* is exceedingly rare in the male. The morphology is identical with the more common tumor found in the uterus. Ferguson *(7)* Fortner and Owens *(8)*, and others have shown that in cases of malignant tumors of the testis a positive Ascheim-Zondek test is an aid to diagnosis. Patients with these tumors excrete from 50 to 50,000 mouse uits of Prolan A per liter of urine. The excretion in normal males is less than 50 units per liter of urine. If the tumor and metastases are completely extirpated, the excretion of Prolan A soon returns to the normal limits. With recurrence and the formation of new metastases its excretion becomes increased even before they manifest themselves clinically. The course of the disease and the results of treatment can be followed by this biological means.

Sarcoma of the testis is a very rare disease. We encountered a very large tumor of this type measuring 14x9x7 cm. It evidently arose from the supporting tissue of the gland because the gland itself was not involved in the growth but was compressed and partially surrounded by it. Histologically, its characteristics are those of the typical spindle cell sarcome.

The only case which was autopsied occurred in a white male of 53 years. After microscopic examination it was diagnosed as a lymphosarcoma. The origin of *(6)* lyphosarcoma of the testis should be from lymphoid tissue of the organ. This type of tissue is not normally found in the testis. Another possibility is that the tumor may be another example of one-sided development of a teratoma, a small round cell type of embryonal carcinoma. However the origin of the tumor is still undetermined. This type of tumor has been described by Ewing, Dew, and other observers.

The essential facts about the case are as follows: The left testicle which contained the tumor was removed surgically. Death occurred on the fifth post-operative day. The autopsy was performed soon after death. The mass involving the testis weighed 402 grams and measured 15x8x7 cm. Its consistence was quite soft. On sectioning, the tunic was greatly thickened and the interior cut with little resistance. The cut-surface was soft and pale gray in color. The incised surface bulged above the line of cutting. At autopsy metastases were found in the skin of the abdominal wall, the lower poles of both kidneys, about the capsule of the left kidney and in the retroperitoneal lymph nodes on the right side. The right testicle was not involved. It was small and atrophic.

Upon histological examination the testicular tumor and the metastases present practically the same picture. They show the presence of small round cells resembling lymphocytes. The cells vary in staining affinity. Occasional larger round cells are encountered. Mitotic figures are frequent. The connective tissue stroma is scanty.

Malignant tumors of the testicle *(13)* metastasize by way of lymphatic and blood vessels. They occur earlies in the lumbar lymph nodes and those along the spermatic vessels. The retroperitoneal lymph nodes are also involved early. The mediastinal and supraclavicular nodes are involved late in the course of the disease. Metastases by way of the blood stream are found in almost any organ of the body, such as the lungs, liver, brain, kidneys, spleen, and heart.

In conclusion, it may be stated that malignant tumors of the testis are uncommon and that they present a most varied histological appearance. A series of ten human cases and one canine example has been presented.

(The author wishes to express his indebtedness to Mr. F. L. Hawk for the microscopic preparations, to Dr. J. E. Andes for his aid in the autopsy, and to Dr. G. S. Dodds for the preparation of micro-photographs in connection with this paper.)

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THE DAVID CRUDE-DRUG COLLECTION AT WEST VIRGINIA UNIVERSITY*

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PHARMACOLOGY HAS NOT BEEN an exception to the general rule that all sciences must pass through a purely descriptive phase. Early progress was directed chiefly along the line of qualitative observation of the actions of the huge number of substances which have been used in medicine. During the past two or three decades the developments of quantitative pharmacology and of synthetic organic chemistry have been applied to medical pharmacology, with the result that many of the older therapeutic agents have been discarded for more desirable synthetic agents or purified extractives, which lend themselves to proper standardization and so increase the physician's confidence of obtaining a desired therapeutic effect uniformly from a known standard dose. Despite the tremendous number of synthetic agents constantly introduced,[1] the number of crude empirical drugs replaced is even greater, so that the end result has been a marked decrease in the number of therapeutic agents actually used. A further advantage is that knowledge of the newer agents is more easily correlated or organized in a scientific manner. Thus the old body of knowledge known as "Materia Medica" (implying an extensive study of unrelated therapeutic agents) is being replaced by the science of pharmacology, which is concerned chiefly with an intensive study of the mode of action of drugs and which relies on basic "academic" quantitative observation in preference to empiricism to aid in the development of substances having desired therapeutic properties with few undesired side-effects. It is an amusing commentary on the conservatism of some of the very medical schools in which the greatest progress has been made that the pharmacologist still holds the Chair of Materia Medica and Therapeutics.

If only because of the historical interest of the older materia medica, it would be undesirable to permit this material to be lost. In addition, however, the older materia medica is of peculiar interest because so many agents have not received modern pharmacological analysis. With so many efficacious pure chemical agents offering enticing problems for pharmacological research, pharmacologists have not been specially interested in analyzing the actions of these ingredients of "patent" medicines. It is possible that some of these neglected drugs would repay study by modern pharmacological methods.

Recognizing these facts Dr. Norman A. David, then head of the department of pharmacology at West Virginia University, in 1932 started a collection of crude drugs. This collection has since been

* First communication of a study of the pharmacological action of crude drugs of the David Crude-Drug Collection of West Virginia University.

[1] Council on Pharmacy and Chemistry of the American Medical Association: **New and Non-official Remedies, 1937.** American Medical Association, Chicago, 1937.

expanded into the present one containing over 450 specimens of different botanical crude drugs. The collections bears Dr. David's name in tribute to his services to the School of Medicine.

Specimens are displayed in wide-mouth 4-oz. glass bottles and are grouped alphabetically by their common names. Synonyms and botanical names (given below) are also noted on each label. In many cases different parts of a plant contain the active principle and are exhibited separately. Also, the form used commercially (cubed, powdered or shredded) is sometimes of interest and so is exhibited as well. The collection is used only incidentally in teaching; students are required to learn the sources only of the more important drugs. The collection is available to the students at any time for quick reference, however, and opportunity is offered for optional experimental work on any specimen. The chief contribution of the collection to the course in pharmacology is that it affords a better appreciation of the historical aspects of pharmacology in a way that cannot be taught adequately through lectures.

For convenience the collection is displayed in three groups as noted below.

A. IMPORTANT CRUDE DRUGS

Anamirta cocculus
Atropa belladonna
Cephaelis ipecachuana
Chenopodium ambrosioides
Cinchona succirubra
Claviceps purpurea
Digitalis purpurea
Ephedra sinica
Erythroxylin coca
Papaver somniferum
Physostigma venenosum
Pilocarpus jaborandi
Rhamnus purshiana
Ricinus communis
Scopola carniolica
Strophanthus kombe
Strychnos nux-vomica
Urginea maritima

B. LESS IMPORTANT CRUDE DRUGS

Abrus precatorius
Acer spicatum
Achillea millefolium
Aconitum napellus
Acorus calamus
Adiantum pedatum
Adonis vernalis
Aesculus hippocastanum
Agrimonia eupatoria
Agropyron repens
Aletris farinosa
Alkana tinctoria
Allium sativum
Alnus serrulata
Aloe perryi
Aloe vera
Alpinia officinalis
Althea officinalis
Ambrosia artemisiaefolia
Amomum melegueta
Anacyclus pyrethrum
Andropogon arundinaceus
Anethum graveolens
Angelica archangelica
Anthemis nobilis
Apium graveolens
Apocynum androsaemifolium
Apocynum cannabinum
Aralia hispida
Aralia nudicaulis
Aralia racemosa
Arctium lappa
Arctostaphylos uva-ursi
Areca catechu
Arisaema triphyllum
Aristolochia reticulata
Aristolochia serpentaria
Arnica montana
Artemisia abrotanum
Artemisia absinthum
Artemisia dracunculus
Artemisia pauciflora
Asarum canadense
Asclepias syriaca
Asclepias tuberosa
Asparagus officinalis
Aspidosperma quebracho blanco
Avena sativa
Baptisia tinctoria
Barosma betulina
Barosma serratifolia
Berberis vulgaris
Betonica officinalis
Betula lenta
Bixa orellana
Boldu boldus
Borago officinalis
Brassica campestris
Brassica nigra
Brauneria pallida
Brunfelsia hopeana
Bryonia alba
Calendula officinalis
Cannabis sativa
Cannela winterana
Capsella bursa pastoris
Capsicum annum
Capsicum fructescens
Carica papaya
Carthamus tinctorius
Carum carvi
Carya sulcata
Caryophyllus aromaticus
Cassia acutifolia
Cassia angustifolia
Cassia senna

Castalia odorata
Castanea dentata
Castela nicholsoni
Cathartocarpus fistula
Caulopyllum thalictroides
Ceanothus americana
Cedronella triphylla
Celastrus scandens
Centuarium cyaneum
Cephaelis acuminata
Ceratonia siliqua
Cetraria islandica
Chamaelirium lutea
Chelidonium majus
Chelone glabra
Chimaphila maculata
Chimaphila umbellata
Chionanthus virginica
Chondrodendron tomentosum
Chondrus crispus
Chrysanthemum cinerariaefolium
Cichorium intybus
Cicuta maculata
Cimicifuga racemosa
Cinchona calisaya
Cinchona ledgeriana
Cinnamomum cassia
Cinnamomum loreirii
Cinnamomum zeylanicum
Citrullus colocynthis
Citrus aurantium
Citrus aurantium sinensis
Citrus medica limonum
Cnicus benedictus
Cochlearia officinalis
Coix lachryma-jobi
Cola nitida
Colchicum autumnale
Collinsonia canadensis
Comptonia peregrina
Conium maculatum
Convallaria majalis
Coptis trifolia
Corallorhiza odontorhiza
Coriandrum sativum
Cornus florida
Cornus rugosa
Corynanthe yohimbi
Coumarouna spp.
Cracca virginiana
Crataegus oxyacantha
Crocus sativus
Croton elutria
Cucurbita pepo
Cuminum cyminum
Cunila origanoides
Curcuma longa
Curcuma zedoaris
Cusparia angustura
Cusparia trifoliatum
Cypripedium pubescens
Cytisus scoparius
Daphne gnidium
Daphne mezereum
Dasystephana saponaria
Datura stramonium
Delphinium ajacis
Delphinium staphisagria
Derris elliptica
Dicentra canadensis
Dioscorea villosa
Drimys winteri
Drosera rotundifolia
Dryopteris filix-mas
Dulacea ovata
Elletaria cardamomum
Epigoea repens
Epipremnum pinnatum
Equisetum arvense
Equisetum hiemale
Erigeron canadensis
Eriodictyon californicum
Eryngium aquaticum
Erythraea centaurea
Eucalyptus globulus
Eugenia jambolana
Eupatorium perfoliatum
Eupatorium purpureum
Eupatorium urticaefolium
Euphorbia hirta (piluliifera)
Euphrasia officinalis
Fabiana imbricata
Ferula sumbul
Foeniculum vulgare
Fragaria vesca
Fraxinus americana
Fraxinus nigra
Fraxinus ornus
Fucus vesiculosus
Galega officinalis
Galium aparine
Gaultheria procumbens
Gelsemium sempervirens
Genista tinctoria
Gentiana lutea
Geranium maculatum
Geum rivale
Glechoma hederacea
Glycyrrhiza glabra typica
Gnaphalium obtusifolia
Gossypium herbaceum
Grindelia camporum
Guarea rusbyi
Haematoxylon campechianum
Hagenia abyssinica
Halymenia palmatus
Hamamelis virginiana
Hedeoma pulegioides
Helianthemum canadense
Helianthus annus
Helleborus foetidus
Helleborus nigra
Hepatica hepatica
Hibiscus abelmoschus
Hordeum sativum
Humulus lupus
Hydrangea arborescens
Hydrastis canadensis
Hyoscyamus niger
Hypericum perforatum
Hyssopus officinalis
Icthyomethia piscipula
Ilex verticillata
Ilex paraguayensis
Illicium vera
Imperatoria ostruthium
Inula helenium
Ipomea orizabensis
Ipomea purga
Iris florentina
Iris germanica
Iris pallida
Iris versicolor
Jateorrhiza palmata
Jeffersonia diphylla
Juglans cinerea
Juglans nigra
Juniperus sabina
Juniperus virginiana
Krameria triandra
Lactuca sativa
Lactuca virosa
Larix americana
Laurus nobilis
Lavendula vera
Lawsonia inermis
Leontodon taraxacum
Leonurus cardiaca
Levisticum officinale
Liatris spicata
Linum usitatissimum
Lippia dulcis
Lobelia inflata
Lycopodium clavatum
Lycopus virginicus
Mallotus phillipinensis
Malva sylvestris
Maranta arundinacea
Marrubium vulgare
Marsdenia condurango
Matricaria chamomilla
Melilotus officinalis
Melissa officinalis
Menispermum canadense
Mentha piperita
Mentha spicata
Menyanthes trifoliata
Mitchella repens
Mucuna pruriens
Myrica cerifera
Myristica fragrans
Nepeta cataria

Nigella sativa
Ocimum basilicum
Oenanthe phellandrium
Operculina turpethum
Origanum majorana
Oryza sativa
Ostrya virginiana
Oxydendrum arboreum
Paeonia officinalis
Panax quinquefolia
Papaver rhoeas
Passiflora incarnata
Paulinia cupana
Pectorales spp.
Petroselinum sativum
Phalaris canariensis
Phoradendron flavescens
Phytolacca americana
Picramnia spp.
Pimenta officinalis
Pimpinella anisum
Pimpinella saxifraga
Pinus strobus
Piper angustifolia
Piper cubeba
Piper methysticum
Piper nigrum
Plantago major
Podophyllum peltatum
Pogostemon heyneanus
Polygala senega
Polygonatum biflorum
Polygonum aviculare
Polygonum bistorta
Polyporus officinalis
Polytrichum juniperinum
Populus nigra
Populus tremuloides
Potentilla tormentilla
Premna arborea
Prunus amygdalus amara
Prunus amygdalus dulcis
Prunus serotina
Prunus spinosa
Ptelea trifoliata
Pterocarpus santalinus
Pulmonaria officinalis
Pusatilla vulgaris
Punica granatum
Quassia amara
Quercus alba
Quercus tinctoria
Quillaja saponaria
Rhamnus cathartica
Rhamnus frangula
Rheum officinale
Rhus aromatica
Rhus glabra
Rhus toxicodendron
Roripa armoracea
Rosa canina
Rosa centifolia
Rosa gallica
Rosmarinus officinalis
Rubia tinctoria
Rubus nigrabaccus
Rubus occidentalis
Rumex crispus
Rumex obtusifolia
Ruta graveolens
Sabbatia angularis
Salix nigra
Salvia polystachya
Sambucus canadensis
Sanguinaria canadensis
Santalum album
Sarracenia purpurea
Sassafras variifolium
Satureja hortensis
Schoenoculon officinalis
Scrophularia nodosa
Scutellaria laterifolia
Selenicereus grandiflorus
Senecio aureus
Serenoa serrulata
Sesamum indicum
Sideritis spp.
Simaba cedron
Simaruba amara
Simaruba americana
Simaruba sorbus
Sinapis alba
Smilax tamnoides
Solanum carolinensis
Solanum dulcamara
Solanum tuberosum
Solidago odora
Spathyema foetida
Spigelia marilandica
Stellaria media
Stillingia sylvatica
Strychnos ignatii
Swertia chirayita
Symphytum officinale
Tamarindus indica
Tanacetum vulgare
Teucrium scordium
Thea chinensis
Theobroma cacao
Thuja occidentalis
Thymus serphyllum
Thymus vulgaris
Tiarella cordifolia
Tilia europea
Toluifera balsamum
Trifolium pratens
Trigonella foenum-graecum
Trilisa odoratissima
Trillium erectum
Tsuga canadensis
Turnera diffusa
Tussilago farfara
Ulmus fulva
Urtica dioica
Ustilago segetum (maydis)
Vaccinium myrtillus
Valeriana officinalis
Veratrum album
Veratrum viride
Verbascum thapsus
Verbena hastata
Verbena officinalis
Veronica officinalis
Veronica virginica
Vetiveria zizanoides
Viburnum opulus
Viburnum prunifolium
Viola odora
Viola tricolor
Xanthorrhiza apiifolia
Xanthoxylum americana
Xanthoxylum clava herculis
Zea mays
Zingiber officinale

Also the following miscellaneous substances from plant and animal sources:

Calamus draco
Cantharis vesicatoria
Coccus cacti
Formica rufa, ova
Hiera picra (Aloe et Cannela)
Mylabris cichorii
Quercus infectoria
Red argols
Rhus semialata

C. CRUDE MEDICINAL GUMS

Abies abies
Abies balsamea
Acacia catechu
Acacia senegal
Acacia seyal
Anogeissus latifolia
Astragalus gummifer
Boswellia carterii
Callitris quadrivalvis
Commiphora myrrha
Dorema ammoniacum
Eucalyptus rostrata
Euphorbium resinifera
Ferula foetida
Garcina hanburyi
Guaiacum sanctum
Ourouparia gambir
Picea mariana
Pinus palustris
Pistacea lentiscus
Pseudotsuga mucronata
Pterocarpus marsupium
Shorea wiesneri
Stercula campanulata
Styrax benzoin

DESTRUCTION OF "VERMIN"

A. M. REESE
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TO MANY OF US who are interested in all forms of life as animals and plants rather than as game, the wide-spread campaign for the destruction of so-called "vermin" is a most disturbing feature of our present-day ideas of conservation.

At the annual science meeting at Atlantic City December, 1936, both the American Society of Zoologists and the Ecological Society of America passed resolutions condemning these "vermin"-destroying campaigns, and similar action was taken in 1931 by the American Society of Mammalogists.

Not only in many states and in certain provinces of Canada are these campaigns being conducted, but federal agencies are at work destroying the mammalian predators in large numbers, as is shown by the following figures for 1936, recently received from the U. S. Biological Survey: coyotes, 64,566; wolves, 1,115; bob-cats and lynxes, 6,980; ocelots, 6; stock-killing bears, 173; and mountain lions, 287; a total of 73,127.

What effect upon the population of noxious rodents this wholesale destruction of their enemies may have remains to be seen. Indeed, the ease with which the balance of nature may sometimes be disturbed is a fact seldom appreciated by others than trained naturalists.

According to the Emergency Conservation Committee the "vermin" destroyed in 1935 and in an "eastern state" totaled 514,225. Among these animals, it may be noted, were 69,780 "ground squirrels", probably our attractive little chipmunks.

In West Virginia, according to our Conservation Commission, there were killed in the 1936 "vermin" contest 319,586 animals. It is interesting and encouraging to note that in this list the only snakes named are water snakes, rattlers, and copperheads; and the only hawks are the Sharp-Shinned, Cooper's and the Goshawk. This is a step in the right direction, but in so far as the hawks are concerned it is scarcely more than a gesture unless a penalty be laid and enforced for killing any other than the three hawks just mentioned. The reason for this is that *very* few hunters or sportsmen know one hawk from another, especially at a distance or on the wing. The writer has been ridiculed for making this statement, but the following experiment, tried on two or three occasions by Dr. Dadisman and others, proved the statement to be correct. On one occasion seven mounted specimens of our common hawks were placed in a row and given numbers. Eleven intelligent sportsmen, who were present, were asked to name the seven hawks by numbers. They were allowed to examine and handle the birds as much as they desired. Five of the eleven failed correctly to name a single bird, and only one man named as many as five of the seven hawks.

If these experienced hunters could not tell the hawks apart at touching distance, how many ordinary men and boys could tell them apart at long range? And how many of those appointed to receive and check the animals killed would know which hawks should be credited to the killers' accounts?

According to the writer's opinion it would be better to remove all of the hawks from the "vermin" list.

Field experiments on quail, carried on by Paul Errington and others for five years in Wisconsin and Iowa, seem to prove that the matter of cover is more important than the number of predators in the neighborhood. Errington says (American Forests, January, 1935): "I do not intend any statement of mine to mean that under no circumstances could predators have influence upon quail populations. I make no pretence of knowing all there is to know about the matter. Natural relationships are too complex to permit of any hard and fast generalities. But the data from five years' work make it apparent, nevertheless, that the influence which the differences in predatory numbers may have had on the survival of quail populations studied has been so slight as to be unmeasureable. Certainly the importance of predator control in the management of the northern bob-cat has been grossly overestimated, while a deplorable lack of attention has been given the manipulation of food, cover, and covey ranges. Indeed the public tendency has been to emphasize the negligible predator factor to the virtual exclusion of management measures that really count.

"Man himself, by means of his intelligence and modern hunting equipment, is about the only predator of which I know efficient enough to reduce the bob-white population much below the normal winter carrying capacity of the land."

If the money and energy now being expended in "vermin" extermination could be used in more constructive and scientific ways, all forms of wild life would be benefitted, and the sportsman, the farmer, and the nature lover would all profit.

DIRECTIONAL CRUSHING OF SILICIC-ACID GEL AT DEFINITE TEMPERATURES*

EARL C. H. DAVIES

Department of Chemistry, West Virginia University

A VARIETY OF EXPERIMENTS, at room temperatures, has previously† indicated that in silicic-acid gels the cracks developed during syneresis are similar to those in glass and do not show parallel fibers or natural planes of cleavage.

These gels are essentially hydrated silicon dioxide (sand), which is widely distributed in the form of many of the important rocks and minerals, constituting nearly one-half of the earth's crust. When these gels are being formed, the hydrated silicon dioxide is collodially soluble in water and, together with similar hydrated iron oxide and other sludge, can flow around any rock particles. Therefore the setting and the aging of these silicic-acid gels in the laboratory to some extent parallel the slower setting during rock formation. Following heavy rains river water is loaded with soil colloids, including hydrated silicon dioxide and hydrated iron oxide, as well as with larger rock particles. New Orleans alone removes about 36,000 tons of silt per year from the water of the Mississippi River to give the city a pure drinking water. When the river water flows into the ocean, both colloidal particles and the larger ones are deposited because of the combined coagulating effect of the ocean salts and the change in rate of movement of the water. The precipitated rock substance is distributed uniformly over the ocean floor near the river mouth and is held down and bound together by a thin gelatinous coating, eventually forming sedimentary rocks on the ocean floor. Petrified wood was formed by hydrated silica replacing the plant tissue. Very fine particles of hydrated silica in the lung tissue are responsible for the dreaded disease "silicosis", which predisposes the lungs to tuberculosis.

The commercial silica gel is prepared by mixing suitable concentrations of waterglass and an acid. After the gel has set for a sufficient length of time it is thoroughly washed with water and dried at a definite temperature. All these steps are carefully controlled so that the final product will be porous and yet not too brittle. Among the many uses of silica gel, as an absorbent, are the recovery of gasoline from natural gas and the operation of the non-mechanical refrigerator.

In all such cases the changes which take place during the setting and aging of silicic-acid gels determine the behavior and properties of the final product.

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* Most of the experiments referred to are from results obtained by Kester Wilson in this laboratory.

† Earl C. H. Davies, Proc. W. Va. Acad. of Science, 9: 64-66 (1935).

For the present experiments all gels were made by mixing equal volumes of density 1.16 waterglass (Philadelphia Quartz E Brand) and six normal hydrochloric acid. At room temperature of about 25° C. such a mixture "sets" in about 15 minutes, while at lower temperatures setting is much slower. The time for setting varies not only with temperature but with the kind of acid, concentrations, and relative proportions of waterglass and acids.

When the above mixture is made at room temperature the temperature rises about 7.5° C. Therefore, when constant temperature is to be maintained it is essential to cool the two components about 7.5° below oven temperature. After mixing, the hydrated silica sol will then be about the same temperature as the oven. For the present series of experiments gel mixtures were discarded when the temperature immediately after mixing was not within one degree of that of the oven. The "oven" consisted of a specially adjusted electric refrigerator for low temperatures and a Freas electric oven for the higher temperatures.

Cubical gel blocks were exactly five centimeters along each edge. They were cut by wire cutters developed in this laboratory. Crushing was accomplished by a special arrangement of a platform balance. Lead shot falling on one pan caused the gel block on the other pan to be crushed against a wooden shelf supported just above the gel.

EFFECT OF MOIST AND OF DRY AIR

When silicic-acid gel sets and ages, the small colloidal crystals of silica grow; the gel undergoes internal contraction; water is squeezed out and collects on the surface as drops as a result of the dehydration of the at first highly hydrated silica particles; the gel becomes harder; but, finally, it loses so much water that it becomes brittle.

In order to be sure that these changes were the result of internal forces and not of surface drying, identical gels were made, and after setting for a little more than 4½ hours they were cut into cubes. Some of these blocks were put in a desiccator over water and others over phosphorus pentoxide (one of the best drying agents). Crushing strengths were tried for each set after leaving the cut blocks in the desiccators, at constant temperatures. At 10° C., after four hours the 5^3 cm. blocks kept over water showed a crushing strength of 99 centigrams, those over phosphorus pentoxide 101 cg., while after 5.4 hours the corresponding values were 104 cg. and 101 cg. Blocks kept at 12° C. for 336 hours showed average crushing strengths of 202 cg. over water and 201 cg. over the phosphorus pentoxide. These results showed that it makes but little difference whether the gel blocks age in a moist or in a dry atmosphere and that the toughening depends on internal changes rather than a drying out process. As a further proof of this, gels kept covered with water after setting until they were cut showed practically the same increase in crushing strength as identical gels not covered with water.

COMPARISON BETWEEN GELS CUT IN UPRIGHT POSITION AND ON THE SIDE

The gel cutters previously developed in this laboratory consist essentially of rigid frames on which are strung violin E strings, accurately spaced and provided with "tuning" knobs. Gels are first cut into slabs by a horizontal cutter and then into blocks with a vertical cutter. Distances between wires were measured with vernier calipers. Part of the gels were cut into slabs while they were in the "upright" position in which they had "set". Other identical gels were turned on their sides before cutting into slabs, then cut into blocks. Crushing tests on 142 such blocks showed that, within the experimental error, it made no difference which of these procedures were used, providing the gel was not too soft.

INFLUENCE OF TEMPERATURE ON THE CRUSHING STRENGTHS

Table 1, containing data from over 300 crushing tests, shows that the toughening of silicic acid gels increases with time for temperatures between 10° C. and 40° C. Furthermore, the rate of

TABLE 1—*Effect of time and temperature on the crushing strength of 5^3 cm. cubes of silicic-acid gel*

No. of blocks crushed	Temperature C°	Hrs. before crushing	Centigrams necessary for crushing
42	10	4.25	67.5
24	12	4.33	74.4
20	12	6.30	83.9
24	12	8.33	96.5
36	12	12.33	104.7
8	12	16.37	108.6
4	12	336.	206.4
8	21	4.33	87.5
24	21	6.33	95.6
22	21	8.33	102.4
8	30	3.25	91.1
12	30	4.25	94.3
6	30	5.25	100.3
14	40	1.23	79.3
16	40	1.75	86.9
12	40	2.21	92.5
12	40	3.22	96.7
12	40	4.22	103.5
8	40	5.22	107.9

increase is much more rapid at the higher temperatures. For example, gels about 4.3 hours old showed average crushing strengths of 67.5 centigrams when kept at 10° C., 74.4 cg. at 12°, 87.5 cg. at 21°, 94.3 cg. at 30°, and 103.5 cg. at 40° C.

These results indicate that the growth of the silica crystals and the dehydration process accompanying syneresis occur similarly at all ordinary temperatures, but that the rate of change increases with temperature.

DIRECTIONAL CRUSHING

Previous experiments in this laboratory showed the breaking strengths of gel cubes kept at room temperatures to be nearly the

same, whether the crushing force was applied perpendicularly to the original top surface of the gel or in either of the other two possible directions. This force would be greatest in the direction in which fibrils run. Present results, shown in Table 2, obtained at carefully controlled temperatures, confirm this. However, there does

TABLE 2—*Directional crushing strengths for 5³ cm cubes of silicic-acid gel*

Temperature C°	Hours before Crushing	Across the Container	Vertical	Lengthwise
12	4.33	75.8 cg.	75.9 cg.	78.4 cg.
12	6.30	83.6	85.7	83.5
12	8.33	95.6	97.1	98.2
12	12.33	107.9	103.2	105.8
12	16.37	108.5	105.3	109.6
	Average	94.3	93.4	95.2
21	4.33	88.3	86.7	87.3
21	6.33	96.0	94.2	96.6
21	8.33	96.7	105.7	103.0
	Average	93.7	95.5	95.6
Average for	12° and 21°	94.0	94.5	95.4
30	3.25	91.9	90.3	
30	4.25	94.4	94.2	
30	5.25	100.7	96.1	
	Average	95.6	93.5	
40	1.75	87.1	86.9	
40	2.25	93.0	92.1	
40	3.25	97.9	93.4	
40	4.25	103.2	101.0	
40	5.25	107.0	108.7	
	Average	97.6	96.4	
Total	Average	95.3	94.7	

seem to be some slight tendency toward an orientation of the gel fibrils in the directions of greatest tension, namely, lengthwise > across > vertical. Gels run at 12° and at 21° C. were set in rectangular containers of sufficient length to make 4 or 8 blocks. Those kept at 30° and at 40° C. were put in circular containers yielding 4 blocks. In all cases the gels were set over mercury, so that there was no chance for vertical tension while the greatest pull during aging was in the lengthwise direction.

SUMMARY

When first setting, silicic-acid gels consist of highly hydrated silicon dioxide. A study of the crystal growth and dehydration of these particles, taking place during aging of the gel, gives a better understanding of the formation of the many silica rocks, the preparation of commercial silica gel, and the possible behavior of very fine silica in the lungs during "silicosis".

Comparison of the toughening of gel cubes kept over water with those kept over phosphorus pentoxide shows that it is the result of internal changes and not of drying. The growth of silica crystals in the gel and the dehydration accompanying syneresis occur at all ordinary temperatures, but the rate of change increases with temperature.

Directional crushing experiments at carefully controlled temperatures seem to show some slight tendency for the crystals to line up in the directions of greatest tension: e. g., lengthwise > across > vertical.

The Geology and Mining Section

AN I. C. WHITE MUSEUM

JOHN B. LUCKE
West Virginia Geological and Economic Survey and West Virginia University

"THE EARTH IS THE GEOLOGIST'S LABORATORY" is perhaps a truism. Yet to examine any appreciable fraction of the earth's surface is a privilege denied to most people. Experience has shown that the best substitute for travel is to bring the earth to the laboratory in the form of specimens of minerals, rocks, fossils, and ores. Properly described, attractively displayed, and carefully preserved, well-chosen specimens grouped in museums serve as a convenient means of bringing geology to the public.

The present paper is an attempt to demonstrate the need for a West Virginia State Museum building. Ample support may be forthcoming only when the facts are known. In the active history of our State Survey every county has been scoured by one or more field parties. Operated as it has been from inadequate, borrowed office space, the Survey accomplished much in its county reports and other researches. But countless opportunities to collect valuable specimens of West Virginia's mineral wealth were lost forever because there was not space available even to store them, much less to display them in well-ordered cases. With opportunity for assembling specimens from our own state goes the equal chance of obtaining treasures from all parts of the world through the medium of exchange.

West Virginia may be said to have about the poorest facilities for museum education in geology of any state in the union. A few statistics may serve to establish this statement substantially as fact. Since the geologic knowledge of each state is closely related to the activity of its Geological Survey (or equivalent body), it may be pertinent to inquire into the extent to which other states have provided for State Surveys and museum exhibitions.

Ten states have official State Museums located (with one exception) at the state capitol. (The dates following the states are the founding dates of the State Surveys*).

Colorado	1929
Florida	1907
Georgia	1890
Kentucky	1854
New York	1836
New Jersey	1864
North Dakota	1895
Pennsylvania (2nd)	1874

Vermont (no State Survey, but State Museum and staff at Montpelier)

* State Survey figures from National Research Council Bulletin 88, by M. M. Leighton, 1932.

The New York, Pennsylvania, and New Jersey State Museums are old and justly famous. They were established as official repositories for the collections of field parties, representative of the state, and are maintained as such, in spite of the large privately-endowed museums found in Buffalo, Pittsburgh, Philadelphia, New York City, and other cultural centers. So highly does New York regard the importance of its museum that reports are issued as Bulletins of the New York State Museum rather than the Geological Survey or similar publications. The world-famous colored glass reproductions of Paleozoic marine life in the Albany museum are an outstanding example of the educational opportunities for a tax-supported state museum.

In the charters of eighteen other State Surveys, provision is made for state collections to be housed in the museums of the state universities but for the use of the general public:

Alabama	1848	Ohio	1900
Idaho	1919	Oklahoma	1908
Iowa	1892	South Carolina	1901
Kansas	1888	South Dakota	1893
Maryland	1896	Texas	1909
Minnesota	1911	Virginia	1908
Nebraska	1919	Washington	1921
Nevada	1929	Wisconsin	1897
New Mexico	1927		

In most of these states the curators are faculty members of the state universities, but the museums are not operated solely for the benefit of the university students.

Eleven additional states (many without any State Surveys) have no State Museums but are liberally supplied with displays maintained by their larger universities. Most of these large collections are found in tax-supported state institutions.

New Hampshire—Dartmouth
Connecticut—Yale
Wyoming—University of Wyoming
California—University of California and others
Illinois—University of Illinois and others
Indiana—University of Indiana and others
Louisiana—Louisiana State University
Massachusetts—Harvard and others
Michigan—University of Michigan
Missouri—Missouri School of Mines and others
Tennessee—Vanderbilt University.

Of the eleven remaining states, seven have small college collections, inadequate for museum purposes.

Montana, Utah, and Maine	(no State Surveys)
West Virginia	1897
Arizona	1916
Mississippi	1906
Arkansas	1923

West Virginia University has a collection too small even for teaching purposes, and most of the specimens cannot be preserved or displayed in the space available.

Such a purely statistical comparison would indicate to the layman that our state has lagged far behind all but a handful of the other states in the Union. To the geologist, however, this position is far more reprehensible because of the long and honorable record of the West Virginia Geological Survey. None of the states grouped near West Virginia as regards museum facilities can compare with our record of up-to-date maps and reports. The State Survey, in cooperation with the U. S. Geological Survey, has mapped the entire state, both topographically and geologically. Only eight other states are mapped topographically today. With the single exception of New York, they are all much smaller and more accessible than West Virginia. In none of these states has a complete set of county geologic reports been compiled, although much good work has been done in other lines. Every county in West Virginia has been so reported, with one exception, and that report is now being prepared for the presses. Fourteen geologic folios of the U. S. Geological Survey Atlas have been published, wholly or in part in West Virginia, a degree of attention accorded few other states.

Perhaps none of the above accomplishments have served to enhance the geologic stature of West Virginia as much as the numerous classic writings of the late Dr. I. C. White, principally in coal and oil geology. To an extent not always appreciated, mention of our state to other geologists inevitably carries a picture of coal, oil and gas, and Dr. White. The studies of this prolific West Virginian made our State Survey world famous and paved the way for our enviable position in geologic research and industrial importance. It is seldom possible for one man so profoundly to alter the destiny of a large area as I. C. White did as State Geologist.

The benefits of his work, however, were almost entirely restricted to industry. So lucrative were his consulting activities that he received no salary for most of his years of Survey labor. This may in some way account for the high productivity of the Survey in economic fields and the nearly complete neglect of its educational functions. That a State Survey must serve the state's industries is obvious, but to engage solely in economic pursuits on the theory that it must justify its appropriations in cash benefits is open to question.

Probably no educational institution can justify its expenses in dollar and cent benefits. The results attained are to be found in the mental equipment and outlook of those exposed to its facilities and influence. Leaving aside all question of how the change is

accomplished, it seems imperative that our State soon recognize the broader duties of the State Survey. This can be accomplished only by a clear recognition of the nearly complete lack of educational facilities to bring geology to the public. The present Survey staff, augmented by the cooperation of other professional geologists throughout the state, is amply competent to initiate such a broad educational program as soon as possible. It will be possible only when an adequate geology building is provided. This building should perhaps be built around a central State Museum, which the writer proposes be named "The I. C. White Museum".

It is unthinkable that geology should long continue in a subordinate position educationally, in a state whose successful development has so overwhelmingly hinged on the mineral industries. The first step in the proposed program must be the widespread realization of this vital need. It is believed that support will not be found lacking, when the benefits to the state and nation of a State Museum building can clearly be demonstrated.

POTTSVILLE CORRELATIONS OF SOUTHEASTERN WEST VIRGINIA*

E. T. HECK†

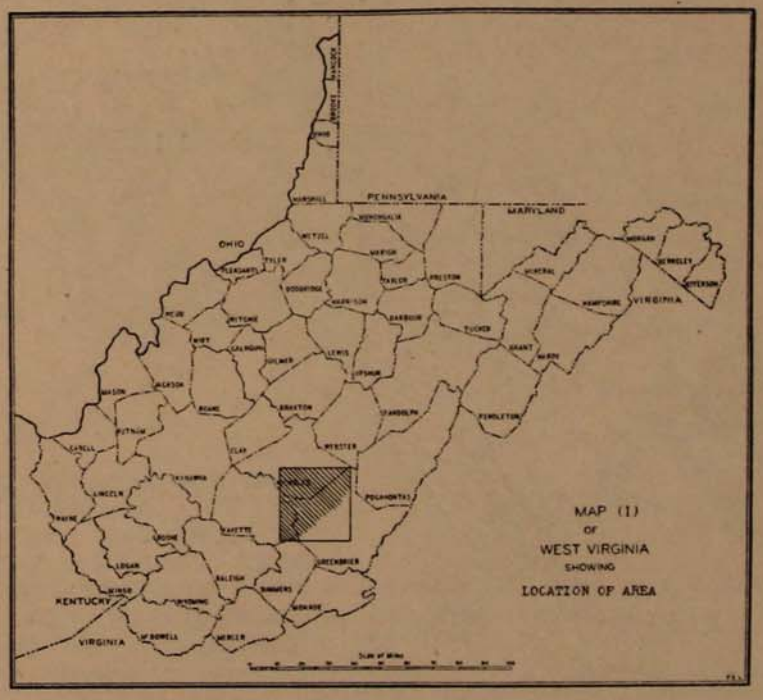
West Virginia Geological Survey, Morgantown

THE OUTCROPPING ROCKS of the area studied with the exception of the Quaternary sand, gravel, and clay along the large stream valleys, are all of Carboniferous age. Only the Pennsylvanian and Mississippian periods are represented.

The following table gives the classification of the rocks exposed in the region:

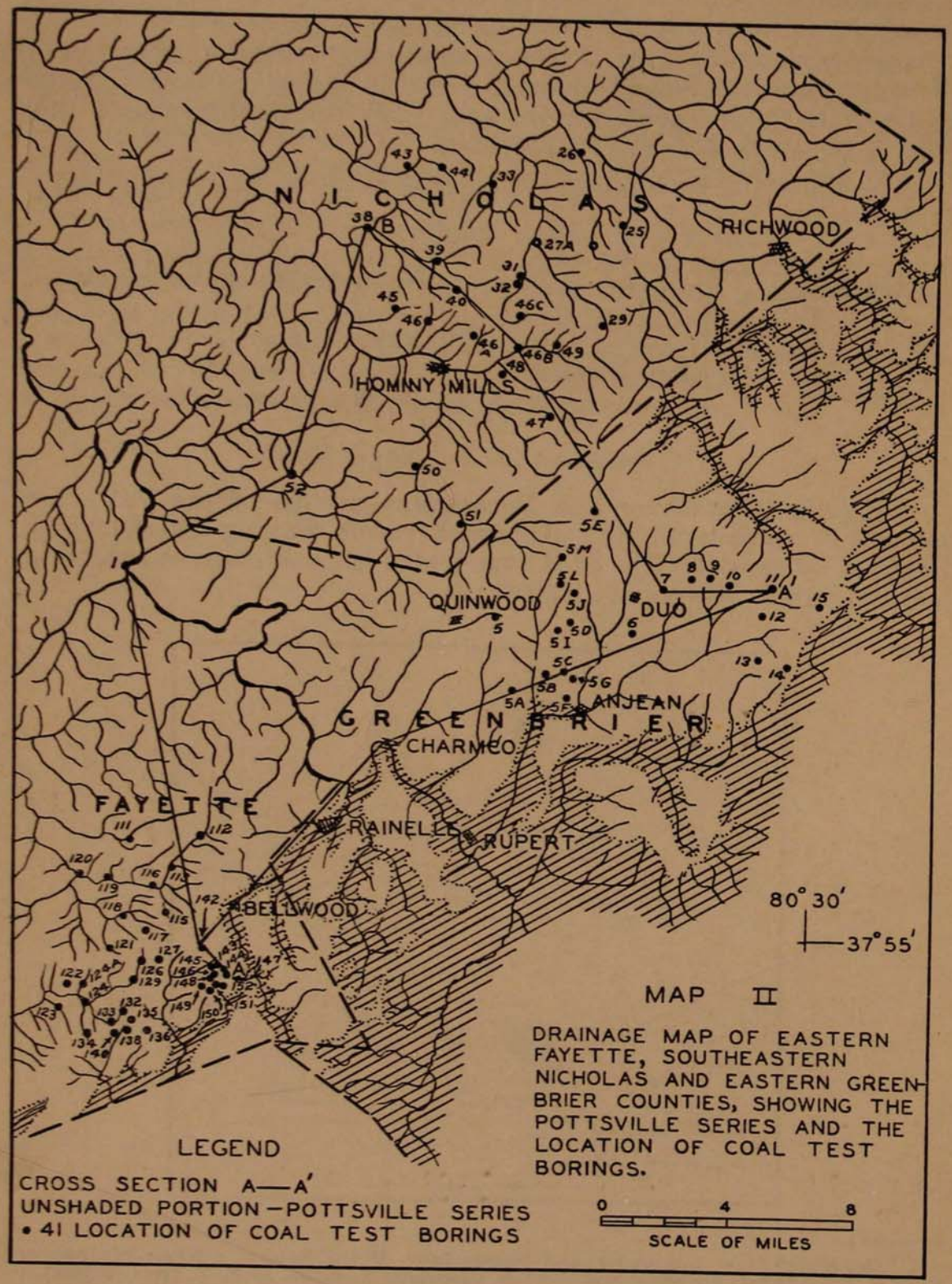
Age	*Period*	*Series*
Quaternary	Recent	Unconsolidated stream deposits
Paleozoic	Pennsylvanian	Pottsville
		Kanawha group
		New River group
		Pocahontas group
	Mississippian	Mauch Chunk

Only the New River and Pocahontas groups of the Pottsville series are considered, the Kanawha group having been largely removed by erosion. The area over which the correlations extend is approximately 500 square miles.



* Condensed from Correlation and Stratigraphy of the Pottsville Series of Eastern Fayette, Southeastern Nicholas, and Western Greenbrier Counties, by E. T. Heck, presented to the Faculty of West Virginia University, January, 1937, in partial fulfillment of the Degree of Master of Science.

† Grateful acknowledgement is made for use of records and for assistance of a varied character proffered by numerous coal and lumber companies as well as by public agencies and many individuals.



MAP II

DRAINAGE MAP OF EASTERN FAYETTE, SOUTHEASTERN NICHOLAS AND EASTERN GREENBRIER COUNTIES, SHOWING THE POTTSVILLE SERIES AND THE LOCATION OF COAL TEST BORINGS.

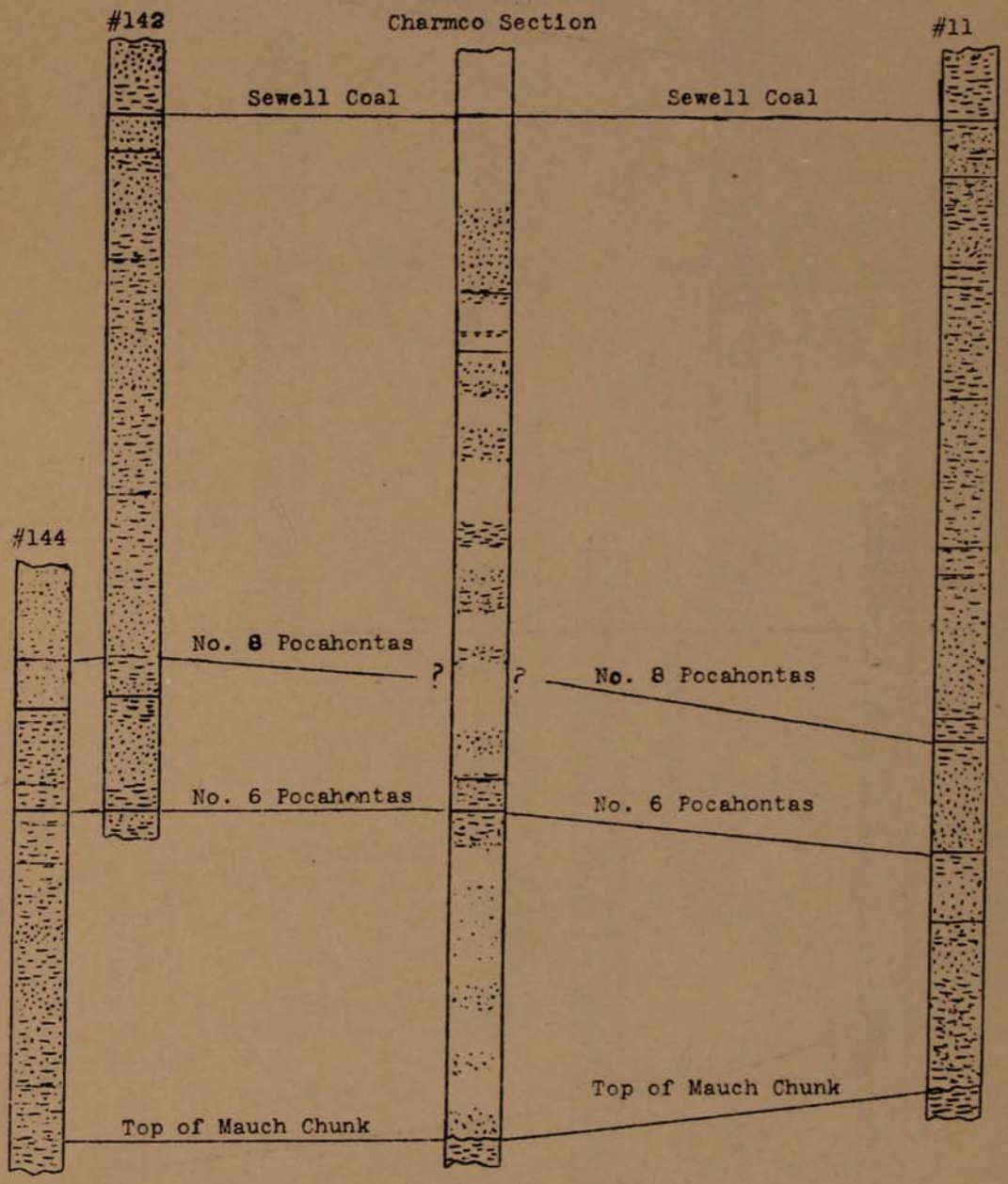


Diagram of Coal Test Borings and Sections Along Line A to A' (See Map II.)
Showing in Cross-Section Form Vertical
Relation of Special Horizons.
Formation Symbols Standard.
Blank Spaces in Section = Concealed.

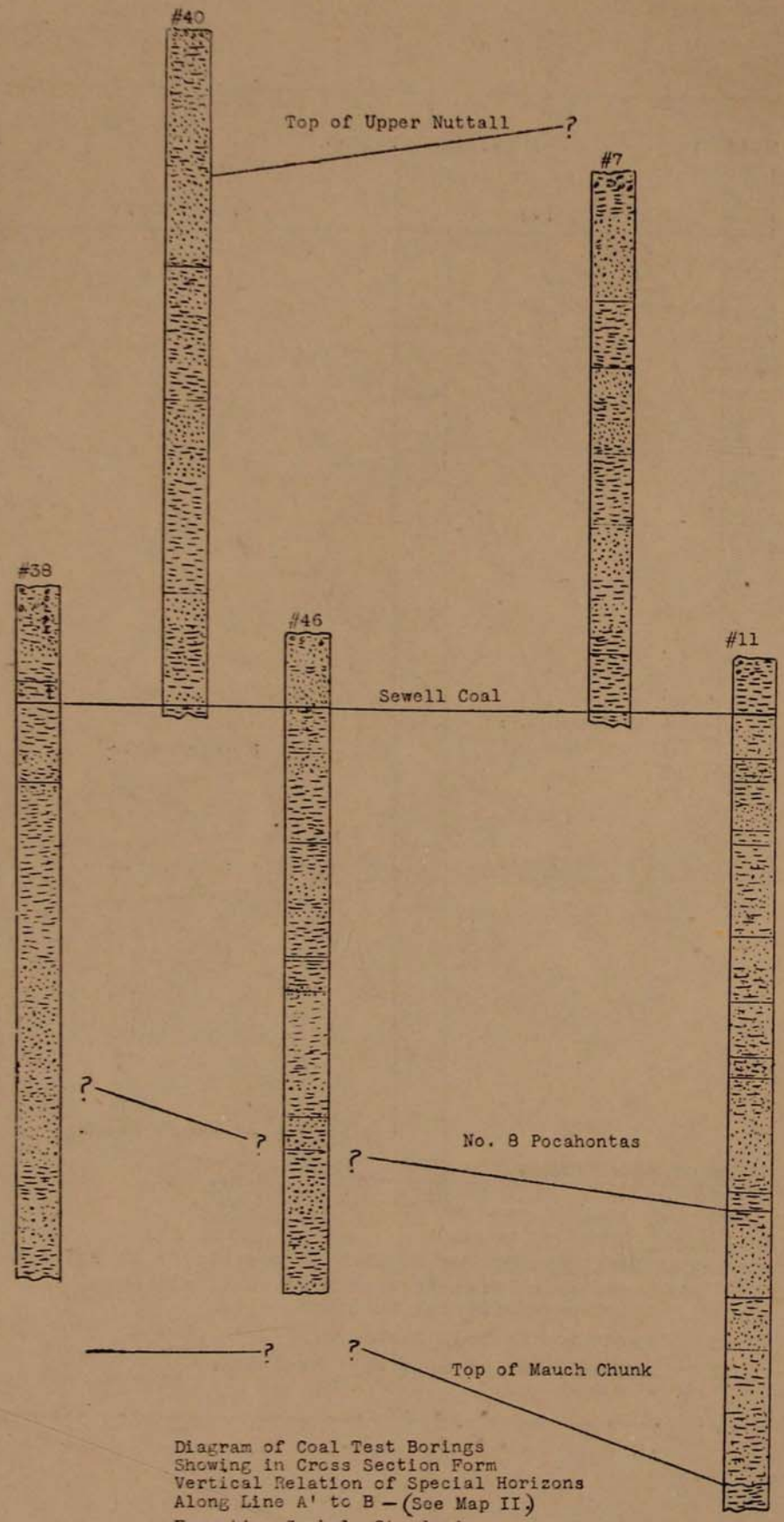


Diagram of Coal Test Borings
Showing in Cross Section Form
Vertical Relation of Special Horizons
Along Line A' to B — (See Map II.)
Formation Symbols Standard.

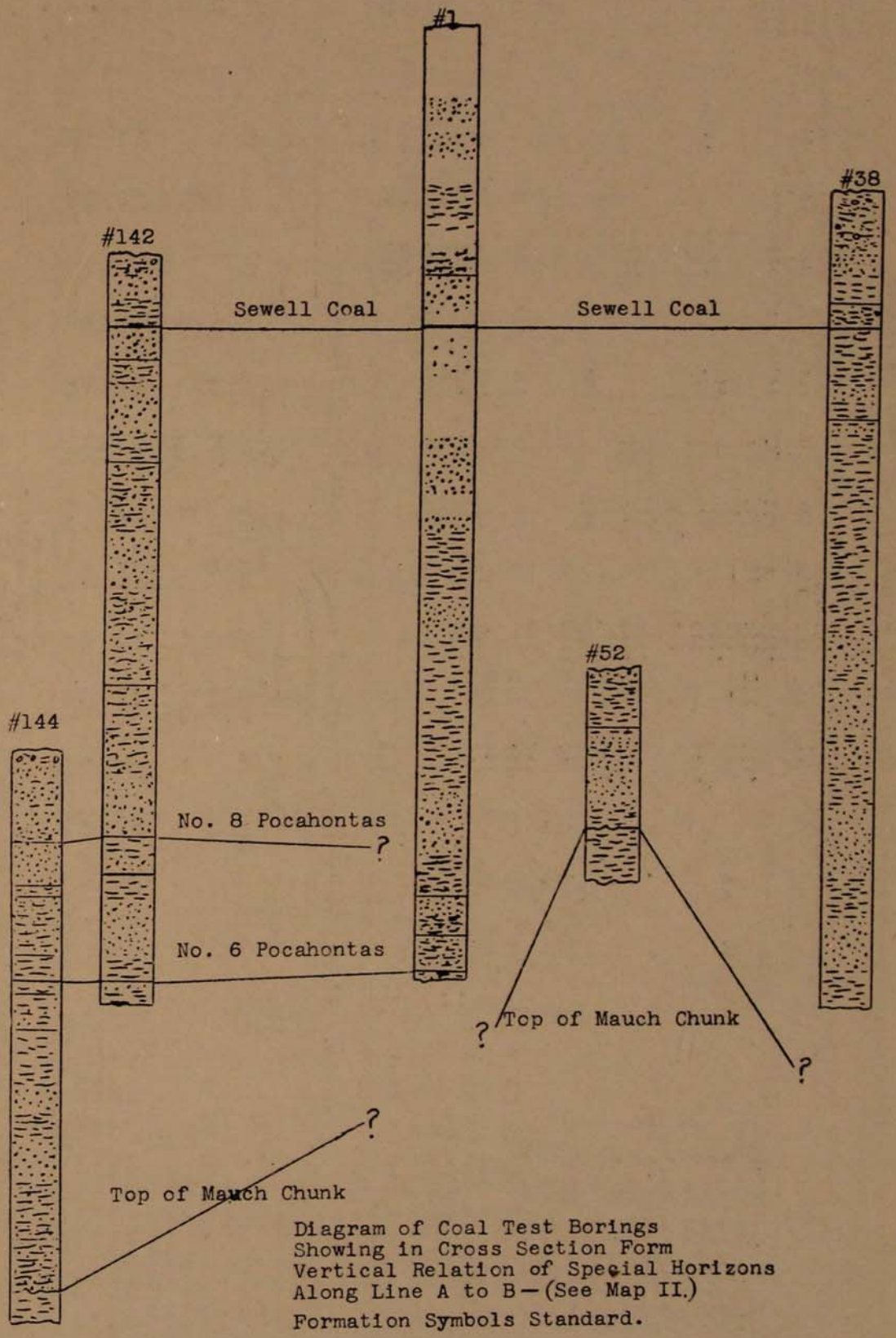


Diagram of Coal Test Borings
Showing in Cross Section Form
Vertical Relation of Special Horizons
Along Line A to B — (See Map II.)
Formation Symbols Standard.

Intervals Below Sewell Coal, Greenbrier County (With Coal Thickness)

(A)	Sewell Int.	Sewell Th.	Welch Int.	Welch Th.	Little Raleigh Int.	Little Raleigh Th.	Beckley Int.	Beckley Th.	Fire Creek Int.	Fire Creek Th.	No. 8 Pocahontas Int.	No. 8 Pocahontas Th.	No. 6 Pocahontas Int.	No. 6 Pocahontas Th.	No. 3 Pocahontas Int.	No. 3 Pocahontas Th.	Top Mauch Chunk Int.
1 Mrs. E. T. Martin No. 1							*212?	4	398?	FC	441?	14	449?	29			503+
5 Margarette Coal Co. No. 1					*130	28D	258	18	305	29							390+
5A Leckie Coal Co. No. 4	0	60	AB		142	—	272	—	359?								
5B Leckie Coal Co. No. 2							*265	—	350	—	443	—					
5C Leckie Coal Co. No. 1					*165	—	264	—	330	—	426	—	507?	—	593?	—	
5D Leckie Coal Co. No. 8							278?	—	*330	—							
5E Gauley Coal Land Co. No. 30	0	41															
5F Leckie Coal Co. No. 6							*270	—	323	—							
5G Leckie Coal Co. No. 7							*260	—	AB	CO							
5H Leckie Coal Co. No. 5					*145	—	273	—	357	—							
5I Leckie Coal Co. No. 3					*145	—	AB	—	352	—	428?	—					
5J Leckie Coal Co. No. 10	0	—	AB		160	—	280	—									
5L Leckie Coal Co. No. 11	0	—	65	—													
5M Leckie Coal Co. No. 12	0	—	77	—	192?	—	281	—									
6 Raine Lumber & Coal Co. No. 5	0	48	AB	CO	156	49D	253	12	349?	CO	AB	CO	524	28S			
9 Raine Lumber & Coal Co. No. 3	0	139S	38	2	108?	11D											
11 Raine Lumber & Coal Co. No. 2	0	38	AB		142	10	285	54D	394?	6	497	BS	590	10	705	BS	775
12 Gauley Coal Land Co. No. 3							*285	28D	382	BS	AB		584	1			
13 Gauley Coal Land Co. No. 1									*365	2	AB		573	42D	694	1	814
14 Gauley Coal Land Co. No. 2							*285	38	349	14	503	44D	589	12	683	1	804+
15 Raine Lumber & Coal Co. No. 1													590	42S	692	28S	790
Charmco Section	0	51			140								500	40			740

Intervals Above Sewell Coal, Greenbrier County (With Coal Thickness)

(A)	Top Upper Nuttall Int.	Iaeger "B" Int.	Iaeger "B" Th.	Iaeger "A" Int.	Iaeger "A" Th.	Hughes Ferry Int.	Hughes Ferry Th.	Lower Iaeger Int.	Lower Iaeger Th.	Castle Int.	Castle Th.	Sewell "B" Int.	Sewell "B" Th.	Sewell "A" Int.	Sewell "A" Th.	Sewell Int.	Sewell Th.
5E Gauley Coal Land Co. No. 30						270	15	219	1	119	18	AB		38	15	0	41
5J Leckie Coal Co. No. 10														33	—	0	—
5L Leckie Coal Co. No. 11										104	—	AB		31	—	0	—
5M Leckie Coal Co. No. 12										100	—	AB		23	—	0	—
7 Raine Lumber & Coal Co. No. 4	500	452	BS	349	3	299	10	246?	FC	153	15	AB		54	24	0	42
8 Raine Lumber & Coal Co. No. 6				329	3	277	18	225	46D	144	16	AB		45	16	0	47
9 Raine Lumber & Coal Co. No. 3										167	13	AB		87	7	0	139S
10 Raine Lumber & Coal Co. No. 7				331	4	279	13	AB		150	10	AB		67	6	0	30
Quinwood Section		396	—	AB	—	279	24	239	36D	117	12	60	6	*30	24	0	

Legend:
(A)—No. on Map II.
*—Interval of coal seam to Sewell Coal calculated, and other intervals based on it.
Int.—Interval measured in feet.
Th.—Thickness measured in inches.

AB.—Absent.
BS—Black Slate.
D—Dirty.
CO—Apparently cut out.
FC—Fire Clay.
S—Slate partings included in measurement.

Intervals Below Sewell Coal, Fayette County (With Coal Thickness)

(A)		Sewell Int.	Sewell Th.	Welch Int.	Welch Th.	Little Raleigh Int.	Little Raleigh Th.	Beckley Int.	Beckley Th.	Fire Creek Int.	Fire Creek Th.	No. 8 Pocahontas Int.	No. 8 Pocahontas Th.	No. 6 Pocahontas Int.	No. 6 Pocahontas Th.	No. 3 Pocahontas Int.	No. 3 Pocahontas Th.	Top Mauch Chunk Int.
111	Beury No. 3							*236	5	372	46							
112	N. R. & P. No. 19									*360	18S	450?	BS	511	43S			
113	N. R. & P. No. 20									*360	12			516	17S	631	8	714+
115	N. R. & P. No. 22							*235	12	331	3	AB						
116	N. R. & P. No. 18							228	3	*360	64S	423	46S	510	34S			
117	N. R. & P. No. 2							250?	BS	AB		*440	BS					
118	N. R. & P. No. 1							283	6	*350	6	439	55S	532	22			
119	N. R. & P. No. 5					*165	7S	266	13	340	BS	407	43					
120	N. R. & P. No. 21							*234	7S	AB		394	54S					
121	N. R. & P. No. 17					133	6	AB		*340	9	388	36S					
122	N. R. & P. No. 15					162	13S	AB		AB		*410	54S					
123	N. R. & P. No. 14									374?	4S	415	44S	*510	8			
124	N. R. & P. No. 10											427?	8	*510	26S			
124A	N. R. & P. No. 11							AB		*340?	8	AB						
125	N. R. & P. No. 4					AB		AB		AB		410?	4S	*510	19			
126	N. R. & P. No. 3					138	4	AB		AB		*390	4	525?	21			
127	N. R. & P. No. 23							AB		341?	7	414?	9	*510	6	602?	6	
129	N. R. & P. No. 12											*390	26S	510	10			
132	N. R. & P. No. 8									339	2	412?	5	*510	57S			
133	N. R. & P. No. 9									365?	8	428?	12	*510	18	614	2	
134	N. R. & P. No. 13									351	5	389	24S	*510	9	607	4	
135	N. R. & P. No. 7											*390	5	AB				
136	N. R. & P. No. 16													*510	56S			
138	N. R. & P. No. 6													*510	14	619	32S	
140	N. R. & P. No. 24													*510	20S	616	20	
142	Bellwood Coal Co. No. 4	0	3	32	2	148	BS	270	6	337	FC	389	27D	508	47			
143	Bellwood Coal Co. No. 6													510	48S	612	18	
144	Bellwood Coal Co. No. 1											380	2	*510	206S	599	25D	744
145	Bellwood Coal Co. No. 7											382	24	*510	98S			
146	Bellwood Coal Co. No. 9											393	18	*510	128S			
147	Bellwood Coal Co. No. 10											388	15	*510	117S			
148	Bellwood Coal Co. No. 8											394	24	*510	118S			
149	Bellwood Coal Co. No. 12											401	25	*510	88S			
150	Bellwood Coal Co. No. 3													*510	128S			
151	Bellwood Coal Co. No. 11													*510	57			
152	Bellwood Coal Co. No. 2									350?	13	404?	7	*510	107S			

Legend:
(A)—No. on Map II.
N. R. & P.—New River & Pocahontas Consolidated Coal Co.
*—Interval of coal seam to Sewell Coal calculated, and other intervals based on it
Int.—Interval measured in feet.
Th.—Thickness measured in inches.

AB—Absent.
BS—Black Slate.
D—Dirty.
CO—Apparently cut out.
FC—Fire Clay.
S—Slate partings included in measurement.

Intervals Below Sewell Coal, Southeastern Nicholas County (With Coal Thickness)

(A)	(B)	Sewell Int.	Sewell Th.	Welch Int.	Welch Th.	Little Raleigh Int.	Little Raleigh Th.	Beckley Int.	Beckley Th.	Fire Creek Int.	Fire Creek Th.	No. 8 Pocahontas Int.	No. 8 Pocahontas Th.	No. 6 Pocahontas Int.	No. 6 Pocahontas Th.	No. 3 Pocahontas Int.	No. 3 Pocahontas Th.	Top Mauch Chunk Int.	
25	28	0	15	47	7	AB	CO	207	16S	267	BS								
27	24	0	1			?													
32	2	0	44	20	13	117	BS												
38	1	0	54S			72?	14S	?		?		?		?				532+	597°
39	13	0	25S	30	4	84	FC	173	5										
46	14	0	27	24	13														
46B	8	0	52	38	7	116?	3	?		?		?		?				583+	
46C	22A	0	43	48	7														
50	6			*43	16	130	BS	?		?		?						370+	527°
51	7					135?	*BS	*292?	BS	366?	5	446?	4	?				550+	
52	5							*288?	FC	301	9							382	

Intervals Above Sewell Coal, Southeastern Nicholas County (With Coal Thickness)

(A)	(B)	Top Upper Nuttall Int.	Iaeger "B" Int.	Iaeger "B" Th.	Iaeger "A" Int.	Iaeger "A" Th.	Hughes Ferry Int.	Hughes Ferry Th.	Lower Iaeger Int.	Lower Iaeger Th.	Castle Int.	Castle Th.	Sewell "B" Int.	Sewell "B" Th.	Sewell "A" Int.	Sewell "A" Th.	Sewell Int.	Sewell Th.
25	28								196	40S	AB	CO	AB	CO	AB	CO	0	15
26	26										117	13	AB	CO	AB	CO	0	60S
27	24								202	13	96	33S	AB	CO	AB		0	1
27A	21												68	15S	AB	CO	0	41S
30	23A										AB		AB	CO	20	11	0	22
31	11										AB		78	44S	AB	CO	0	43
32	2												67	45S	19	27S	0	44
23	25										92?	6S	74	24S	AB		0	40
38	1														37	9	0	54S
39	13										114	4S	72	3	7	13	0	25S
40	12	487	428	10	—	—	308?	7	203	10	100	24	63?	—	AB		0	93S
41	19						297	46S	195	18	*100	48S						
43	3		406	FC	AB		299	2	208	12	125	22	AB	CO?	34	6	0	26
44	27	469	401	4	329	21S	AB		203?	15	*115	27	AB					
45	16				330	7	287	4	212	11S	AB	CO	AB		30	13	0	34
46	14												AB		25	13	0	27
46A	15						265?	7	204?	FC	AB	CO?	AB	CO?	7	18	0	26
46B	8												AB		AB		0	52
46C	22A										AB	CO?	AB	CO	AB	CO	0	43
47	29										129	1	AB	CO?	AB	CO?	0	38
48	17										AB	CO	AB	CO	AB	CO	0	38S
49	18										93	6	AB		AB		0	48

Legend:
(A)—No. .on Map II.
(B)—Gauley Coal Land Co. No.
*—Interval of coal seam to Sewell Coal calculated, and other intervals based on it.
Int.—Interval measured in feet.
Th.—Thickness measured in inches.

AB—Absent.
BS—Black Slate.
D—Dirty.
CO—Apparently cut out.
FC—Fire Clay.
S—Slate partings included in measurement.
°—Thickness found in nearby oil test.

The area under consideration lies entirely within the plateau region and is part of the New River and Pocahontas coal field described in numerous publications. Drainage is of a dendritic type.

In eastern Fayette county the writer has obtained records of 36 coal-test borings. In southeastern Nicholas county the records of 25 coal-test borings were obtained. The portion of this paper dealing with Greenbrier county is based upon the field work of both the writer and Dr. Paul H. Price, state geologist, and is supplemented by a study of the records of 23 coal-test borings.

Map I gives the location of the area with respect to the State of West Virginia. Map II shows the area in more detail and on it the region in which rocks of Mississippian age outcrop has been shaded to distinguish it from the region in which the Pennsylvanian rocks outcrop. In addition, three cross-sections are represented to show pictorially the vertical relationship of the rocks from southern Fayette county into Greenbrier county; from southern Fayette county into Nicholas county, and from Greenbrier county into Nicholas county. The intervals of "key-beds" above and below the Sewell coal are given in table form.

GENERAL ACCOUNT

The Pottsville series of the Pennsylvanian, representing the base of this system and lying just over the Mauch Chunk series of Mississippian age, comprises the youngest formation of the region. The Pottsville series was first named and described by Pennsylvania geologists from its occurrence at Pottsville, eastern Pennsylvania, where it is composed of numerous conglomeratic sandstones accompanied by anthracite coal seams. Later it was subdivided by Dr. I. C. White into the Upper Pottsville or Kanawha group, the Middle Pottsville or New River group, and the Lower Pottsville or Pocahontas group. Custom has sanctioned the use of the geographic names last mentioned because of their relation to the Kanawha and New River coal fields of southern West Virginia and to the Pocahontas coal field of southern West Virginia and Virginia. The Pottsville series is represented in eastern Fayette county by the lower three-fourths of the New River group and the Pocahontas group; in southeastern Nicholas county by a few basal members of the Kanawha group, the New River group, and a small part of the Pocahontas group; and in western Greenbrier county by the basal members of the Kanawha group, the New River group, and the Pocahontas group.

The disappearance of the Pocahontas group needs further mention. At the base of the Pottsville series there is an unconformity, general and as extensive as the series itself. North and west of southern West Virginia, in addition to the thinning of the beds between the coal seams, a greater and greater number of the basal members of the Pottsville series are absent. In the north and northwest part of the territory of this report the Pocahontas

group is entirely absent, and it is doubtful if all the basal members of the New River group are present.

The following quotation from Price[1] ably summarizes the history of the deposition of the Pottsville rocks. "At the close of the Mauch Chunk time there existed a broad low coastal plain, bordering a vast expanse of shoals, ferruginous mud-flats, with ripple-marks, mud-cracks, rain-prints, and in some localities fossil tracks. This was followed by an orogenic movement producing subsidence under loading, with stability at intervals, sufficient for a growth of vegetation to form coals. The early subsidence was most pronounced along the east shore with a westward transgression of the sea."

As shown by the borings in Nicholas county (see table of intervals) there is strong evidence of an ancient drowned valley of Mauch Chunk time, or, interpreted another way, it is evidence of an ancient monadnock on the Mauch Chunk peneplain. It is the only example in southeastern West Virginia to come to the writer's attention, of major topographic relief of that period.*

An excellent discussion of the nomenclature of the Pottsville Series is given by Reger[2]. The member names used in southern West Virginia are used in this report as shown in the following general section:

GENERAL SECTION, POTTSVILLE SERIES

	Thickness (feet)	*Total* (feet)
New River Group (940 ft.)		
Sandstone, *Upper Nuttall*, massive to heavy and current-bedded, grayish-white to brown	100 to 50	50
Shale, dark, sandy	0 to 20	70
Coal, Iaeger "B", multiple-bedded, soft	1 to 0	70
Sandstone, *Lower Nuttall*, massive, medium-grained, gray to brown	50 to 100	170
Coal, Iaeger "A", slaty	1 to 0	170
Shale, *Upper Iaeger*, dark	50 to 40	210
Coal, Hughes Ferry, single bedded	1 to 2	212
Shale, sandy	0 to 5	217
Sandstone, Middle Iaeger, grayish-white, medium-grained	10 to 45	262
Shale, sandy	40 to 10	272
Coal, Lower Iaeger, double-bedded	0 to 2	274
Fire clay shale	0 to 1	275
Sandstone, *Lower Iaeger*, gray and brown	5 to 15	290
Shale, Lower Iaeger, dark-gray	5 to 35	325
Sandstone, *Harvey Conglomerate*, medium-grained to coarse, grayish-white to brown, lenticular	60 to 20	345
Shale, *Sandy Huff*, dark-gray	5 to 25	370
Coal, Castle, single-bedded, soft, columnar	2 to 0	370

* It may be stated here that the report of E. V. d'Invilliers for the Gauley Coal Land Company made in 1900 was very complete for the Gauley or Sewell Coal seam over much of Greenbrier and Nicholas counties, but as stated by him, the account of other seams was "wholly conjectural." No part of this paper is directly traceable to Mr. d'Invilliers' report, but no doubt much of the material taken from the files of the Gauley Coal Land Company originated with him.

[1] Price, Paul H., Pocahontas Report, W. Va. Geol. Survey, p. 66, 1929.

[2] Reger, D. B., Webster Report, W. Va. Geol. Sur., p. 141 and 559-561, 1920.

Sandstone, *Guyandot*, massive, grayish-white, coarse-grained	30 to 50		420
Shale, *Skelt*, sandy, and dark	0 to 5		425
Coal, Sewell "B", slaty, impure	0 to 3		428
Shale, sandy	20 to 30		458
Coal, Sewell "A", double-bedded, soft, columnar	0 to 2		460
Sandstone, *Lower Guyandot*, massive, coarse-grained, grayish-white	10 to 30		490
Shale, *Hartridge*, dark, with plant fossils, carrying fresh- or brackish-water fossil shells	0 to 5		495
Coal, Sewell, generally double-bedded, soft, columnar	2 to 7		502
Shale, gray, sandy, lenticular	40 to 5		507
Sandstone, *Welch*, massive to current-bedded, grayish-white	20 to 45		552
Shale, dark, argillaceous, lenticular	0 to 3		555
Coal, Welch, multiple-bedded, soft, columnar	0 to 2		557
Shale, gray, sandy	0 to 5		562
Sandstone, *Upper Raleigh*, heavy to current-bedded, grayish-white to brown	75 to 50		612
Coal, Little Raleigh "A", impure	0 to 1		613
Shale, sandy, lenticular	0 to 25		638
Coal, Little Raleigh, multiple-bedded, soft, columnar	4 to 2		640
Shale, sandy, lenticular	15 to 5		645
Sandstone, *Lower Raleigh*, massive to current-bedded, lenticular	50 to 100		745
Coal, Beckley "Rider"	0 to 2		747
Shale, dark-gray, argillaceous, lenticular	0 to 20		767
Coal, Beckley, multiple-bedded, soft, columnar	0 to 3		770
Sandstone, *Quinnimont*, lenticular	0 to 70		840
Shale, *Quinnimont*, dark-gray, siliceous to argillaceous, laminated, lenticular	40 to 5		845
Coal, Fire Creek, "Quinnimont", multiple-bedded, soft, columnar	0 to 7		852
Shale, sandy, with sandstone layers	10 to 28		880
Coal, Little Fire Creek, multiple-bedded, soft, columnar	0 to 2		882
Sandstone, *Pineville*, massive to current-bedded	30 to 50		932
Shale, sandy	20 to 0		932
Coal, No. 9 Pocahontas, multiple-bedded, soft, columnar	2 to 0		932
Shale and sandstone mixed	15 to 4		936
Coal, No. 8 Pocahontas, impure, soft, columnar	0 to 4		940
Pocahontas Group (306 feet)			
Sandstone, *Flattop Mountain*, massive, to current-bedded, medium-grained, micaceous, bluish-gray to brown	10 to 40		980
Shale, *Rift*, dark-gray, with argillaceous and siliceous layers	10 to 0		980
Coal, No. 7 Pocahontas, multiple-bedded, soft, columnar	0 to 4		984
Shale, gray and sandy	0 to 5		989
Sandstone, *Pierpont*, massive to current-bedded, medium-grained, hard, micaceous, bluish-gray to light-gray	40 to 20		1009
Shale, sandy, alternating with sandstone	0 to 10		1019
Shale, *Royal*, buff, sandy, with fresh- or brackish-water fossil fauna	5 to 0		1019
Coal, No. 6 Pocahontas, multiple-bedded, soft, columnar	0 to 5		1024
Shale, sandy	0 to 5		1029
Sandstone, *Eckman*, massive to current-bedded, medium-grained, buff to bluish-gray	40 to 20		1049
Coal, No. 5 Pocahontas, soft, columnar	0 to 1		1050
Shale, sandstone, and dark shale, with plant fossils abundant	0 to 20		1070
Coal, No. 4 Pocahontas, multiple-bedded, soft. columnar	0 to 2		1072

Shale, sandy	0 to 5		1077
Sandstone, *Upper Pocahontas*, massive to heavy-bedded, medium-grained to coarse	0 to 30		1107
Coal, No. 3 Pocahontas "Rider"	2 to 0		1107
Shale, dark, with plant fossils abundant, and fresh- or brackish-water fossil fauna	0 to 10		1117
Coal, No. 3 Pocahontas, multiple-bedded, soft, columnar	0 to 5		1122
Shale, gray and sandy	10 to 0		1122
Sandstone, *Lower Pocahontas*, generally massive medium-grained, when shaly often carries 18" to 24" of slaty coal *(No. 2 Pocahontas "A")* near middle	0 to 25		1147
Shale, gray and sandy	10 to 0		1147
Coal, No. 2 Pocahontas, multiple-bedded, soft	0 to 2		1149
Shale, gray	0 to 15		1164
Sandstone, *Vivian*, massive- bluish-gray, medium-grained, lenticular	0 to 30		1194
Coal, No. 1 Pocahontas, generally single-bedded, soft, columnar	0 to 2		1196
Shale and sandstone to top of *Mississippian*, or red shales of *Mauch Chunk*	0 to 50		1246

TOPOGRAPHIC EXPRESSION

The topography of the Pottsville series in the area, as in all other parts of the state in which the series outcrops in a large degree, is rough, rugged, and mountainous. The thick, massive sandstones and conglomerates, cut across by streams, leave standing huge cliffs which make bold shoulders along their valley and from which much talus accumulates on the slopes. This is reflected by the coal-test borings in that they always report from 10 to over 40 feet of "surface" or "boulders and clay." Invariably the series produces a very poor soil unfit for cultivation, so that the land is seldom cleared. In regions not cut across by roads, this talus material masks the bed-rock, and coal prospecting must be done by coring or by digging deep trenches.

CONTACTS AND UNCONFORMITIES

The contact of the New River group of the Pottsville series with the overlying Kanawha group is at the top of the prominent Upper Nuttall sandstone. This is a good horizon at which to make the division because the sandstone is very massive and persistent, and there is little evidence of widespread disconformity.

The contact of the New River group with that of the underlying Pocahontas group is not so well marked in this region. It is at the base of the No. 8 Pocahontas coal and at the top of the Flattop sandstone.

Slight local disconformities, revealed by the temporary absence of coal beds and of sandstone or shale members, occur at many localities within the area. These, however, are rather small in extent and do not warrant description. In this area, as in other parts of the state, there is evidence of a marked unconformity at the contact of the Pottsville series with that of the Mauch Chunk. That a considerable period of time elapsed from the close of the latter period before the deposition of Pottsville sediments was begun, as mentioned under the "General Account" above is also

evidenced by the marked contrast in the conditions accompanying sedimentation, the soft, red shales of the Mauch Chunk being succeeded by the heavy, coarse, gray to grayish-white and current-bedded sandstones and coal seams of the Pottsville.

There appears to be a complete absence of faults in the territory of this report.

FOSSIL LIFE

In the Pottsville series throughout southern West Virginia, fossil plants are abundant and well preserved in the shales associated with the coals, and often in the sandstones. They have been widely studied by many authorities.[3]

In contrast to the plant life is the scarcity of marine, brackish, or fresh-water fauna. As pointed out by Lucke,[4] erroneous conclusions as to conditions of depositions may be drawn from the lack of fossils.

Fossil shells of the genus Lingula have been reported from roof shales of almost every persistent coal of the New River and Pocahontas groups. In Greenbrier county Price has noted fish teeth, fish scales, and coprolites in the roof shales of the Sewell coal, his identification being verified by Dana Wells, cooperating paleontologist for the West Virginia Geological Survey.

CORRELATION

Because of the great amount of thinning in a northward and north-westward direction across the area, the problem of proper correlation is much complicated. If it were not for the great amount of prospecting by the various coal companies, detailed correlation would be well nigh impossible.

The Sewell coal is by far the most continuous single member of the series in this area. The writer has compiled tables of intervals based on Sewell coal, for the more persistent members, as shown in coal-test borings and key sections. These tables follow on subsequent pages.

In addition to the tables, nine selected coal-test boring records have been drawn in columnar form and placed side by side to represent cross-sections. The borings have been carefully chosen to be representative, but are on such a small scale that some details are not shown.

As shown on Map II, the location of the three "cross-sections" form a rough triangle and are spaced to show the relationship of one part of the area to the other.

In the table of "Intervals below the Sewell coal, Greenbrier county", the intervals shown for borings 11 to 15 inclusive should be reduced by at least ten percent. The writer was able to find parts of the core from each boring, and as plainly shown by the cores, the holes were drilled at a considerable angle to the bedding.

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[3] See Vol. VA, Part II, W. Va. Geol. Sur., 1913, for a discussion of many of these plants by David White.

[4] Lucke, J. B., Bottom Conditions in a Tidal Lagoon, Journal of Paleontology, p. 106-107, January, 1935.

The Mathematics and Physics Section

VAPOR LAMPS

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THIS PAPER is a brief discussion of some of the theoretical and practical considerations in connection with the subject of vapor lamps. The information was obtained during three months of research work in the summer of 1936 at Nela Park in Cleveland.

Let us begin with the mechanical equivalent of light and the development of the energy utilization ratio for varying wave-lengths of light.

The visible spectrum extends from 4000 to 7000 Angstroms, approximately; with the greatest visibility (i. e., unity) at 5560 A. Obviously this is the wave-length which yields the greatest amount of useful light for the least amount of energy. 0.00161 watt produces one lumen of light in the yellow-green (5560 A); and this is called the mechanical equivalent of light. The reciprocal of this number, 621 lumens per watt, is called the maximum luminous equivalent per watt of radiated energy. This quantity decreases as the wave-length diverges from the yellow-green, because of the decreasing visibility factor, which ultimately reaches zero at the limits of the visible spectrum.

Considering a given source of light:

Let W equal the total energy radiated (in all wave-lengths).

Let W_k equal the total energy radiated between l_1 and l_2, the wave-length limits of the visible spectrum. Let E_l equal the intensity of radiation for the wave-length, l.

Since the total radiant energy is equal to the sum of the energy radiated in all wave-lengths, we must integrate:

$$W = \int_0^\infty E_l \, dl$$

In the visible region we have:

$$W_k = \int_{l_1}^{l_2} E_l \, dl$$

Let k equal the visible light emitted per unit area and $\vee_l$ equal the visibility factor and $\overline{\vee}_l$ its average value over the visible wave-lengths. Then:

$$k = 621 \int_{l_1}^{l_2} \vee_l E_l \, dl = 621 \, \overline{\vee}_l \int_{l_1}^{l_2} E_l \, dl$$

The ratio of the visible light to the total radiated energy is called the specific luminous efficiency:

$$k_s = \frac{k}{W} = \frac{621 \int_{l_1}^{l_2} \bar{y}_1 E_l \, dl}{\int_0^{\infty} E_l \, dl}$$

The ratio of the light emitted per unit area to the energy emitted per unit area in the visible region is called the optimum luminous efficiency:

$$k_o = \frac{k}{W_k} = \frac{621 \int_{l_1}^{l_2} \bar{y}_1 E_l \, dl}{\int_{l_1}^{l_2} E_l \, dl} = \frac{621 \, \overline{\bar{y}_1} \int_{l_1}^{l_2} E_l \, dl}{\int_{l_1}^{l_2} E_l \, dl} = 621 \, \overline{\bar{y}_1}$$

k_o would give the luminous efficiency for a very special source of light—a source which emits radiation only within the visible spectrum. The more practical efficiency is represented by the energy utilization ratio, e.

$$e = \overline{\bar{y}_1} \frac{k_s}{k_o} = \frac{\overline{\bar{y}_1} \cdot W_k}{W}$$

This is a ratio of the effective radiation, as it would be measured by the eye, to the total radiation emitted.

The above theory and figures have been reproduced with permission from "Production of Light from Discharges in Gases" by Dr. Saul Dushman.

The research engineer wishes to increase this numerator while the denominator is kept as small as possible. If no restrictions are placed upon the color of the light, the engineer will choose a color that is very close to yellow-green in order that $\overline{\bar{y}_1}$ will be large. This is actually being done.

The numerator may also be increased by making W_k larger. This is done by taking some of the ultraviolet radiation, which is useless ($\bar{y}_1 = 0$) as far as the eye is concerned, and converting this invisible radiation into visible light by means of fluorescent powders. Such lamps can be made more than five times as efficient as our present incandescent lamps. In other words, e, the utilization ratio, is five times as great for this new type of light source.

A less efficient fluorescent source is one employing neon gas. I believe the visible radiation from the neon discharge has been increased by 150 percent by converting its resonance radiation (744 A and 736A) into visible light through fluorescence.

Assuming that the 736 A quantum is responsible for some of the fluorescence, one must explain how such a quantum with seven times the energy of a visible quantum could give up its energy so that part of it would be converted into visible light. Surely we could not expect seven unexcited atoms of the fluorescent solid to

meet at a common point with the 736 A quantum, dividing its energy into seven equal parts and resulting in seven visible quanta.

Perhaps the quantum meets one atom, excites it, and also ejects a photoelectron. But a study of the fluorescent materials disclosed that none of them was known to be photoelectric. However, the mechanics of this process offered a possible solution; and so I mentioned this idea to Dr. Arthur H. Compton when he visited the laboratories in the capacity of a consulting physicist. He immediately suggested photoconductivity, which occurs in certain crystals. When a quantum strikes an atom within the crystal, the atom is excited and an electron may be ejected from the atom but not from the crystal. The electron travels through the interstices of the crystal, giving rise to currents.

Here, then, was a possible mechanism for extracting the energy from the 736 A quantum, but it allowed only one-seventh of its energy to be absorbed and re-radiated by the atom—the other six-sevenths going to the electron, and finally into heat.

I next suggested that perhaps two-sevenths of the original energy is being extracted from the quantum if it bounces off the first atom after giving up one-seventh, and then strikes a second atom and excites it with another seventh of its original energy. That is, perhaps the Compton effect obtained. Here was a unique situation—suggesting the Compton effect as an explanation of this phenomenon to Dr. Compton, himself, the discoverer of the effect.

This addition to the theory seemed tenable to Dr. Compton, but the effect is not properly called by the name, Compton, when it occurs under these conditions—it is, of course, called the Raman effect.

In searching for a method of testing whether or not the Raman effect were entering into this fluorescent phenomenon, I was reminded that the Raman effect produces polarized light. A rough check indicated the presence of polarized light from the fluorescent material, in this case; but the experiment was not considered to be conclusive, since other conditions existed which might possibly have produced the polarization. Lack of time prevented a more thorough investigation of this subject.

We turn next to the actual vapor lamp.

Although I asked for other lamps, I was allowed to take only two from the laboratories. This was permitted only because there were no new principles in this particular lamp, which is a neon discharge tube. The reason for such caution lies in the intense competition in this lamp-development field.

This particular discharge lamp was filled with neon to a pressure of approximately 4 mm of mercury. Ordinary Svea metal (iron) electrodes, the same as are used in neon signs, were sealed into the glass tube; after which the lamp was sealed to the manifold of an exhaust bench.

The first lamp of this kind that I made was "torched" with a gas flame while it was on exhaust, so that water vapor would be driven from the inside wall of the tube. After several exhausts, bombardments, and flushings with neon, the tube was filled with neon and sealed-off from the exhaust manifold. The spectrum of the discharge through this tube was not neon entirely, as was expected, but mostly hydrogen. The conclusion was that the "torching" process had not been complete; and as a result, some water vapor which had been left in the lamp decomposed, giving hydrogen gas. The hydrogen spectrum was much stronger than that of the neon spectrum, since the ionization potential of neon is 21.47 volts while that of hydrogen is 13.5 volts.

An electric oven was substituted for the gas burner, and the temperature was raised to about 400° C. This process eliminated the water vapor and the hydrogen discharge.

Some of the finished lamps operated but a few hours before they flickered, and finally failed to operate. In these cases sputtering at the electrodes had entrapped so much of the gas that the lamp could no longer function. When a heavy positive ion strikes the cathode there is a tendency for it to dislodge particles from the electrode. These particles carry molecules of the gas to the wall of the tube and there entrap the gas, thus decreasing the pressure within the tube until it fails to operate.

Sputtering may be decreased by covering the exposed edges of the electrodes with an insulating cap, by increasing the area of the electrodes, by decreasing the voltage across the tube, by increasing the initial pressure of gas, and in other ways.

One must have a high "striking" potential for starting a discharge lamp. Leakage reactance transformers are used to supply a high starting voltage, and then, a lower voltage for the continuous operation of the neon sign. As soon as the secondary current begins to flow, the flux leakage path begins to function, which converts the secondary into a choke coil, thus decreasing the voltage and preventing excessive current through the discharge lamp.

There are many interesting applications of discharge lamps. I was very much interested in Professor Hron's paper on "Electric Tube Lights" which appeared in the 1935 Proceedings of The West Virginia Academy of Science. Professor Hron discussed the use of discharge tubes in advertising and in colored lighting.

Colored lighting can be accomplished much more efficiently with gaseous discharge lamps than with incandescent lamps and filters, because in the latter method a great amount of energy is converted into invisible and visible light—then all but a certain band of visible wave-lengths is absorbed in the color filter.

Highway lighting with sodium vapor lamps is in the experimental stage. One such system employed sodium lamps of 4000-lumen capacity operating at 48 lumens per watt, which is to be compared to 18 lumens per watt for the 4000-lumen incandescent lamp. One disadvantage of the sodium light is its monochromatic

quality; but this is partially offset by the greater visual acuity afforded by monochromatic light. The soft, yellow illumination also seems to be free of glare.

Lamps for sterilization purposes are now made, using mercury vapor within corex glass. The ultra-violet radiation from the mercury vapor discharge is able to penetrate the corex glass quite readily. It seems that the direct rays from the lamp are not necessary for sterilization—air which has been sterilized by the lamp carries germicidal properties with it to other parts of the room.

This lamp may be used to preserve meats in display cases. It has been suggested that meat be aged more rapidly at a higher temperature under the protection of ultraviolet light, which retards the growth of mold and bacteria.

In summarizing the benefits to be derived from the use of vapor lamps we find the following: Our advertising is done better and more attractively with gaseous discharge tubes. Colored illumination is accomplished more economically with vapor lamps, which will permit more extensive installations that add to the beauty of our surroundings. It may soon be possible to install extensive highway lighting systems because of the more efficient vapor lamp. Night driving will then be safer. And the use of sterilizing lamps in the home, in food storage houses, in the operating room, or wherever harmful bacteria lurk, will improve man's health and add to the span of his life.

SOME CONFIGURATIONS OF POINTS AND LINES

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THE CONFIGURATION of Hesse, $(12_4, 16_3)$, has been studied,[1] and its properties established. Mathews[2] has given a method of projecting this configuration in the plane into the "Desmic" configuration of Stephanos[3] in such a way that the 12 points project into the 12 vertices of three tetrahedra having the property that any two tetrahedra are in perspective from each of the vertices of the third. Such a configuration determines a conjugate configuration, having the same properties, whose vertices are the points of intersection of the edges of one tetrahedron with those of another. The points may be arranged symmetrically on the edges of the tetrahedron of reference, thus:

$$
\begin{array}{llll}
A_{23}(0.\,1,\,1,\,0)_1 & B_{23}(0,\,1,\!-\!1,\,0)_1 & B_{14}(1,\,0,\,0,\!-\!1)_1 & A_{14}(1,\,0,\,0,\,1)_1 \\
A_{13}(1,\,0,\,1,\,0)_1 & B_{13}(1,\,0,\!-\!1,\,0)_1 & B_{24}(0,\,1,\,0,\!-\!1)_1 & A_{24}(0,\,1,\,0,\,1)_1 \\
B_{12}(1.\!-\!1,\,0,\,0)_1 & A_{12}(1,\,1,\,0,\,0)_1 & A_{34}(0,\,0,\,1,\,1)_1 & B_{34}(0,\,0,\,1,\!-\!1)_1
\end{array} \tag{1}
$$

that is, the positive and negative unit points on each edge of the reference figure. In this paper we shall consider the similar array of points in space of four dimensions.

$$
\begin{array}{l}
A_{12}:(1,1,0,0,0),\ A_{24}:(0,\,1,\,0,\,1,\,0),\ B_{12}:(1,\!-\!1,\,0,\,0,\,0),\ B_{24}:(0,1,0,\!-\!1,0), \\
A_{13}:(1,0,1,0,0),\ A_{25}:(0,\,1,\,0,\,0,\,1),\ B_{13}:(1,\,0,\!-\!1,\,0,\,0),\ B_{25}:(0,1,0,0,\!-\!1), \\
A_{14}:(1,0,0,1,0),\ A_{34}:(0,\,0,\,1,\,1,\,0),\ B_{14}:(1,\,0,\,0,\!-\!1,\,0),\ B_{34}:(0,0,1,\!-\!1,0), \\
A_{15}:(1,0,0,0,1),\ A_{35}:(0,\,0,\,1,\,0,\,1),\ B_{15}:(1,\,0,\,0,\,0,\!-\!1),\ B_{35}:(0,0,1,0,\!-\!1), \\
A_{23}:(0,1,1,0,0),\ A_{45}:(0,\,0,\,0,\,1,\,1),\ B_{23}:(0,1,\!-\!1,0,0),\ B_{45}:(0,0,0,1,\!-\!1),
\end{array} \tag{2}
$$

1. The Configuration $(20_6, 40_3)$.

Under a central projection from a point P of S_4 upon an arbitrary linear space of three dimensions (referred to in this paper as a 3-flat), collinear points are carried into collinear points, so that the table of alignment for points in S_4 in unchanged when the set of points in projected upon a 3-flat, i. e. upon ordinary space, or again projected by a central projection upon an arbitrary plane.

The points of the set (2) as well as those of the Desmic set (1) lie by threes on lines, the points of a collinear triple being, since $A_{ik}=A_{ki}$ and $B_{ik}=B_{ki}$:

$$
\begin{array}{llll}
A_{ik}=A_{ij}=B_{jk} & (i\neq k\neq j;\ i,k,j=1,2,3,4,5) \\
B_{ik} \quad B_{ij} \quad B_{jk} & (i\neq k\neq j;\ i,k,j=1,2,3,4,5)
\end{array} \tag{3}
$$

There are 40 such combinations of three points among the points of set (2), every point occurring in six such triples. Hence the points (2) constitute the points of a configuration of points and lines $(20_6\ 40_3)$.

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[1] Hesse, O., "Ueber Curven dritter Ordnung und die Kegelschnitte welche diese Curven in drei verschiedenen Punkten berühren", Journal für die reine und angewandte Mathematik, vol. 36 (1819), p. 153.

[2] Mathews,R. M., "Cubic Curves and Desmic Surfaces", Trans. Am. Math. Soc., vol. 28 (1926), pp. 502-522.

[3] Stephanos, Cyparissos, "Sur les systemes desmiques de trois tetraedres", Bull. des Sci. Math. et Astron., ser. 2, vol. 3 (1879), pp. 424-456.

If from among the 20 points, the eight which do not contain a given subscript are deleted, the remaining 12 points form a desmic set. There are five ways to delete eight points from the 20 so that the remaining 12 form the vertices of three tetrahedra in desmic position, the five sets of tetrahedra being

$$
\begin{array}{ll}
 & (A_{23}\ B_{23}\ B_{14}\ A_{14}),\ (A_{13}\ B_{13}\ B_{24}\ A_{24}),\ (B_{12}\ A_{12}\ A_{34}\ B_{34}) \\
 & (A_{23}\ B_{23}\ B_{15}\ A_{15}),\ (A_{13}\ B_{13}\ B_{25}\ A_{25}),\ (B_{12}\ A_{12}\ A_{35}\ B_{35}) \\
(4) & (A_{25}\ B_{25}\ B_{14}\ A_{14}),\ (A_{15}\ B_{15}\ B_{24}\ A_{24}),\ (B_{12}\ A_{12}\ A_{45}\ B_{45}) \\
 & (A_{35}\ B_{35}\ B_{14}\ A_{14}),\ (A_{13}\ B_{13}\ B_{45}\ A_{45}),\ (B_{15}\ A_{15}\ A_{34}\ B_{34}) \\
 & (A_{23}\ B_{23}\ B_{45}\ A_{45}),\ (A_{35}\ B_{35}\ B_{24}\ A_{24}),\ (B_{25}\ A_{25}\ A_{34}\ B_{34})
\end{array}
$$

2. Construction of the $(20_6\ 40_3)$.

The desmic configuration may be constructed by considering two complete quadrilaterals, with a line of vertices in common, lying in different planes. Let the vertices of one be a, b, c, a′, b′, c′ and the vertices of the other be a, b, c, a″, b″. c″, where the three points on a line have different letters. Then the lines a′b″ and a″b′ meet in a point C; a′c″ and a″c′ meet in a point B and finally b′c″ and b″c′ meet in a point A. An easy calculation shows the 12 points so located to be the vertices of three desmic tetrahedra, and the construction is equivalent to that given by Mathews. A similar construction may be used in the plane to construct the Hesse configuration, by taking the two complete quadrilaterals with a common line, and this construction is equivalent to that given by Schroeter.[4]

Let there be constructed two sets of desmic tetrahedra, lying in different linear 3-spaces, the two configurations having in common six points, the vertices of a complete quadrilateral, lying in the plane common to the two spaces. Then a tetrahedron of one desmic set will have two vertices in common with a tetrahedron of the other set. Let two such tetrahedra be A, B, C, D, and A, B, C′, D′. Then the lines CC′ and DD′ meet in a point, X, and the lines CD′ and C′D meet in a point, Y. Continue in this manner for the remaining vertices of the various tetrahedra, and 20 points are located. These 20 points are the points of the desired $(20_6, 40_3)$.

Using the previous notation, we can construct the desmic sets in the 3-flat $x_4=0$ and $x_5=0$ having in common the six points A_{12}, A_{13}, A_{23}, B_{12}, B_{23}, B_{13}, the two desmic sets being the first two of the sets (4). An easy calculation shows (3) to give the alignment.

3. Drawing the Projection on a Plane.

The construction given in Sec. 2, together with the remark of the first paragraph of No. 1, gives a convenient method of construction for the projection of the $(20_6, 40_3)$ upon a plane. First draw a complete quadrangle, naming the vertices according to the rule (3) and Sec. 2. Draw a second complete quadrangle having a line of vertices in common with the first and by rule (3) again name the three new points. Then three more points are quickly found by the same rule. Then draw a third quadrangle again having a line in common with the first, but no line in common with the second. Again refer to rule (3) and all 20 points and 40 lines are easily located. The figure below shows the configuration so drawn.

[4] Schroeter, Heinrich, "Die Hessesche Configuration $(12_4, 16_3)$". Journal für die reine and angewandte Mathematik, vol. 108 (1891), pp. 269-312.

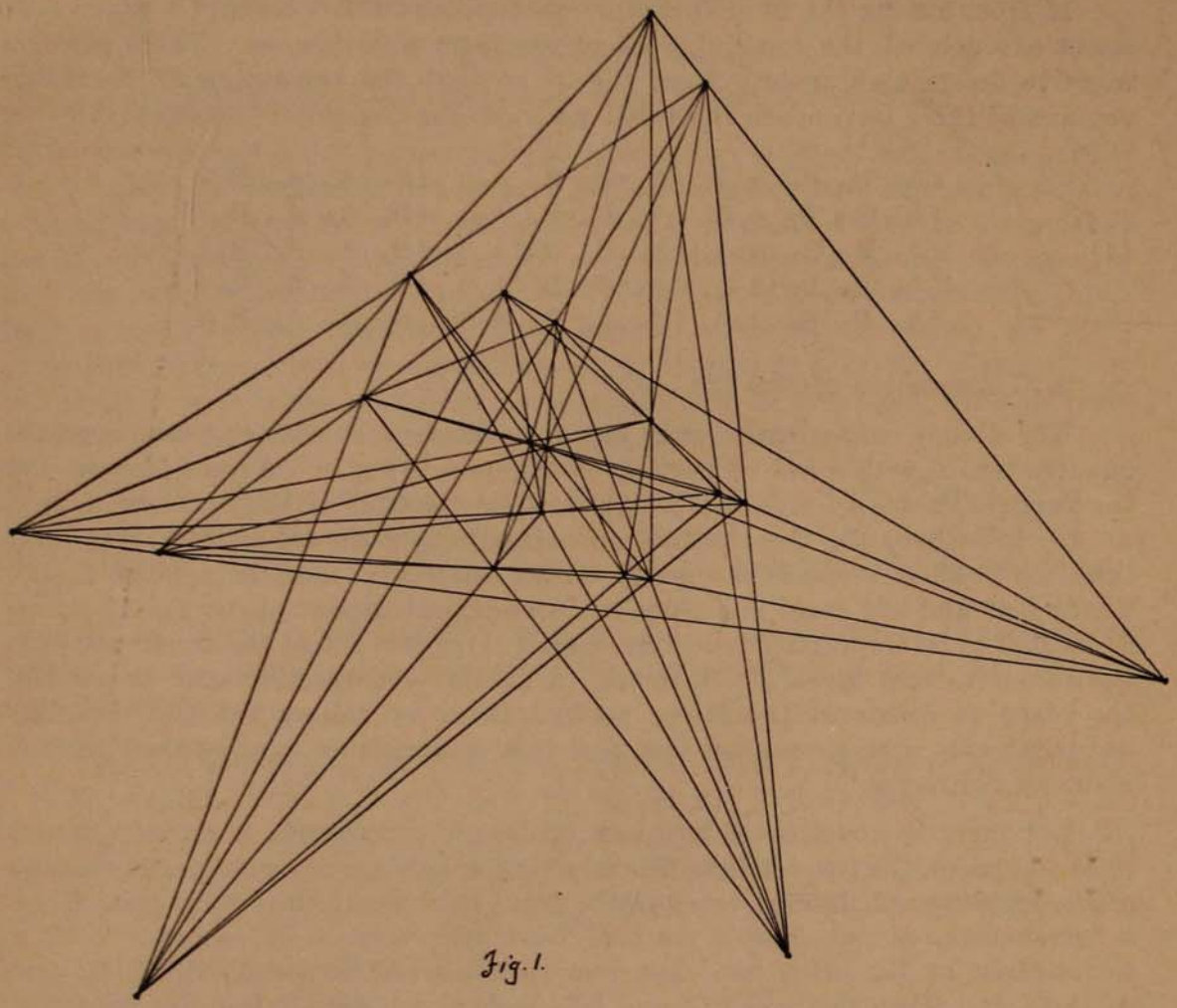

Fig. 1.

4. The Conjugate Desmic Points.

Every desmic configuration in ordinary space determines a conjugate configuration of the same kind. When a vertex of one tetrahedron is reflected harmonically with respect to the sets of opposite edges (or the vertices and opposite faces) of another, a vertex of the same tetrahedron is obtained. Thus the edges of the tetrahedra are concurrent at 12 points, these points forming again a configuration $(12_4, 16_3)$, said to be conjugate to the given configuration. Let us in this way determine the configurations conjugate to the five desmic sets (4). These five sets are

$$
\begin{array}{ll}
 & (C_1\ C_2\ C_3\ C_4)\ (D_{15}\ D_{25}\ D_{35}\ D_{45})\ (E_{15}\ E_{25}\ E_{35}\ E_{45}) \\
 & (C_1\ C_2\ C_3\ C_5)\ (D_{14}\ D_{24}\ D_{34}\ D_{44})\ (E_{14}\ E_{24}\ E_{34}\ E_{44}) \\
(5) & (C_1\ C_2\ C_4\ C_5)\ (D_{13}\ D_{23}\ D_{33}\ D_{43})\ (E_{13}\ E_{23}\ E_{33}\ E_{43}) \\
 & (C_1\ C_3\ C_4\ C_5)\ (D_{12}\ D_{22}\ D_{32}\ D_{42})\ (E_{12}\ E_{22}\ E_{32}\ E_{42}) \\
 & (C_2\ C_3\ C_4\ C_5)\ (D_{11}\ D_{21}\ D_{31}\ D_{41})\ (E_{11}\ E_{21}\ E_{31}\ E_{41})
\end{array}
$$

where

$C_1 = (1,0,0,0,0)$, $C_2 = (0,1,0,0,0)$, $C_3 = (0,0,1,0,0)$, $C_4 = (0,0,0,1,0)$,
$C_5 = (0,0,0,0,1)$, $D_{15} = (-1,1,1,1,0)$, $D_{14} = (-1,1,1,0,1)$, $D_{13} = (-1,1,0,1,1)$,
$D_{12} = (-1,0,1,1,1)$, $D_{11} = (0,-1,1,1,1)$, $D_{25} = (1,-1,1,1,0)$, $D_{24} = (1,-1,1,0,1)$,
$D_{23} = (1,-1,0,1,1)$, $D_{22} = (1,0,-1,1,1)$, $D_{21} = (0,1,-1,1,1)$, $D_{35} = (1,1,-1,1,0)$,

$D_{34}=(1,1,-1,0,1)$, $D_{33}=(1,1,0,-1,1)$, $D_{32}=(1,0,1-1,1)$, $D_{31}=(0,1,1,-1,1)$,
$D_{45}=(1,1,1,-1,0)$, $D_{44}=(1,1,1,0,-1)$, $D_{43}=(1,1,0,1,-1)$, $D_{42}=(1,0,1,1,-1)$,
$D_{41}=(0,1,1,1,-1)$, $E_{15}=(1,1,1,1,0)$, $E_{14}=(1,1,1,0,1)$, $E_{13}=(1,1,0,1,1)$,
$E_{12}=(1,0,1,1,1)$, $E_{11}=(0,1,1,1,1)$, $E_{25}=(1,1,-1,-1,0)$, $E_{24}=(1,1,-1,0,-1)$,
$E_{23}=(1,1,0,-1,-1)$, $E_{22}=(1,0,1,-1,-1)$, $E_{21}=(0,1,1,-1,-1)$, $E_{35}=(1,-1,1,-1,0)$,
$E_{34}=(1,-1,1,0,-1)$, $E_{33}=(1,-1,0,1,-1)$, $E_{32}=(1,0,-1,1,-1)$, $E_{31}=(0,1,-1,1,-1)$,
$E_{45}=(1,-1,-1,1,0)$, $E_{44}=(1,-1,-1,0,1)$, $E_{43}=(1,-1,0,-1,1)$, $E_{42}=(1,0,-1,-1,1)$,
$E_{41}=(0,1,-1,-1,1)$.

The points C_i D_{jk} D_{hs} do not in themselves form a configuration, although they represent five overlapping desmic sets in the five 3-flats of the reference simplex. But the points E_{ik} and the points of the set (2) are collinear as follows:

(6)

E_{14} E_{24} A_{12} A_{35} ; E_{15} E_{25} A_{13} A_{24} ; E_{32} E_{42} B_{13} B_{45} ;
E_{14} E_{34} A_{13} A_{25} ; E_{15} E_{45} A_{14} A_{23} ; E_{23} E_{33} B_{15} B_{24} ;
E_{14} E_{44} A_{15} A_{23} ; E_{11} E_{21} A_{23} A_{45} ; E_{23} E_{43} B_{14} B_{25} ;
E_{12} E_{22} A_{13} A_{45} ; E_{11} E_{31} A_{24} A_{35} ; E_{33} E_{43} B_{12} B_{45} ;
E_{12} E_{32} A_{14} A_{35} ; E_{11} E_{41} A_{25} A_{34} ; E_{24} E_{34} B_{15} B_{23} ;
E_{12} E_{42} A_{15} A_{34} ; E_{21} E_{31} B_{25} B_{34} ; E_{24} E_{44} B_{13} B_{25} ;
E_{13} E_{23} A_{12} A_{45} ; E_{21} E_{41} B_{24} B_{35} ; E_{34} E_{44} B_{12} B_{35} ;
E_{13} E_{33} A_{14} A_{25} ; E_{31} E_{41} B_{23} B_{45} ; E_{25} E_{35} B_{14} B_{23} ;
E_{13} E_{43} A_{15} A_{24} ; E_{22} E_{32} B_{15} B_{34} ; E_{25} E_{45} B_{13} B_{24} ;
E_{15} E_{25} A_{12} A_{34} ; E_{22} E_{42} B_{14} B_{35} ; E_{25} E_{45} B_{12} B_{34} ;

and thus constitute the points of a configuration $(40_3, 30_4)$.

Changing the third letter in each of the above sets of four collinear points from A_{ik} to B_{ik} or from B_{ik} to A_{ik} and substituting D_{ik} for E_{ik} throughout, the resulting table gives a second set of 40 points which lie by fours on 30 lines, three lines through each point: i. e., a second configuration $(40_3, 30_4)$.

The configuration $(40_3, 30_4)$ projected upon the plane can easily be drawn by the construction given for the $(20_6, 40_3)$. First locate the 20 points A_{ik}, B_{ik}, then by joining them in pairs according to table (6) the points E_{ik} can be located. Figure 2 shows this projection.

5. Some Known Configurations Included in the Set.

There are 10 lines joining the points C_i to the points A_{ik} B_{ik}, four points on each line. The rule of alignment is C_i C_k A_{ik} B_{ik}. If we delete from this set of 10 lines the four which do not contain a given subscript, and of each of the two above configurations $(40_3, 30_4)$ consider only the lines including the points E_{ij} D_{ij}, where j is the deleted subscript, the resulting set is a configuration.

Let $j=5$ and we have

(7)

E_{15} E_{25} A_{12} A_{34} ; D_{15} D_{25} A_{34} B_{12} ; C_1 C_2 A_{12} B_{12} ;
E_{15} E_{35} A_{13} A_{24} ; D_{15} D_{35} A_{24} B_{13} ; C_1 C_3 A_{13} B_{13} ;
E_{15} E_{45} A_{14} A_{23} ; D_{15} D_{45} A_{23} B_{14} ; C_1 C_4 A_{14} B_{14} ;
E_{25} E_{35} B_{14} B_{23} ; D_{25} D_{35} A_{14} B_{23} ; C_2 C_3 A_{23} B_{23} ;
E_{25} E_{45} B_{13} B_{24} ; D_{25} D_{45} A_{13} B_{24} ; C_2 C_4 A_{24} B_{24} ;
E_{35} E_{45} B_{12} B_{34} ; D_{35} D_{45} A_{12} B_{34} ; C_3 C_4 A_{34} B_{34} .

This is the configuration $(24_3, 18_4)$ pointed out by Schroeter[5] in his dis-

[5] Loc. cit. S 9, No. 2.

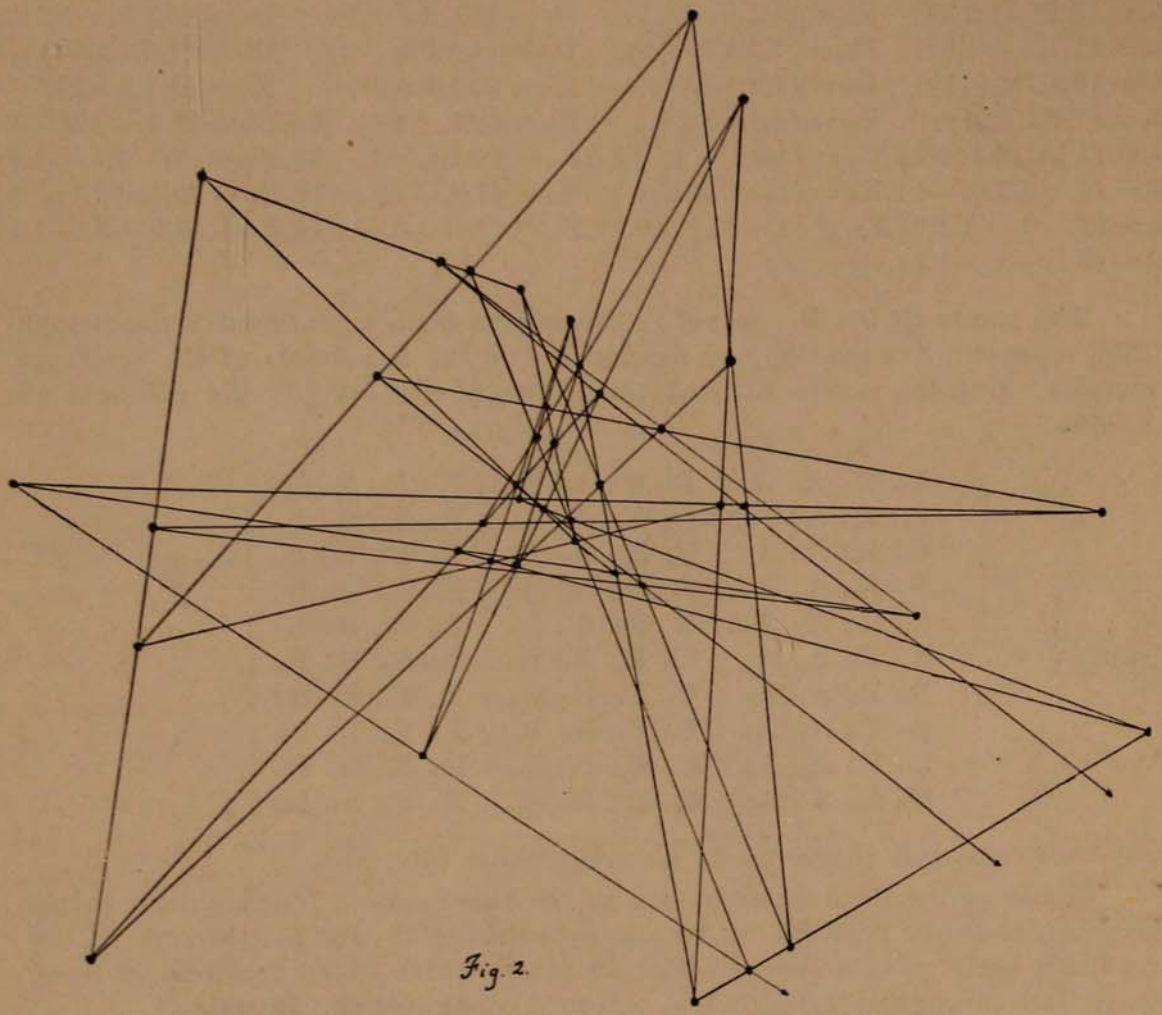

Fig. 2.

cussion of the plane configuration of Hesse. The above array (7) in the 3-flat $x_5=0$ is implied in the work of Mathews, which gives a method of transforming the Hesse configuration into the desmic set.

In the system (5) there are 80 lines, each containing three points. These collinear sets are of four types:

20 sets $C_i\ D_{ik}\ E_{ik}$ (i=1, 1, 3, 4; k=1, 2, 3, 4, 5)
15 sets $C_i\ D_{ik}\ E_{ik}$ (i=2, 3, 4; k=1, 2, 3, 4, 5)
15 sets $C_i\ D_{ik}\ E_{ik}$ (i=2, 3, 4; k=1, 2, 3, 4, 5)
30 sets $C_n\ D_{ik}\ E_{jk}$ ($i \neq j \neq n$; i, j, n=2, 3, 4; k=1, 2, 3, 4, 5)

Any of these sets of three points, together with the set of 12 from (4) from which that value of k is missing which occurs in the set, forms a set of 15 points which lie by threes on 20 lines, four lines through a point: i. e., a configuration in S_3 which projects into the Cayleyan configuration $(15_4, 20_3)$ in the plane. There are 80 ways to pick such a configuration from the 65 points.

The six points A_{ik} having a common subscript, together with the four points B_{ik} from which that subscript is missing form a set of 10 points which lie by threes on 10 lines, the well-known configuration 10_3. Since the 10 points B_{ik} satisfy this relation, there are six ways to pick the 10_3 configuration from the points of set (2).

6. Dual Configurations.

By the principle of duality, the existence of a configuration (P_q, R_s) in the plane implies the existence of a configuration (R_s, P_q). Thus without further comment we have demonstrated by the projections of the $(20_6, 40_3)$, $(40_3, 30_4)$ the configurations with the numbers interchanged. In space of three dimensions, a point-line configuration $(20_6, 40_3)$ implies the existence of a plane-line configuration $(20_6, 40_3)$, since the line is the self-dual element. In space of four dimensions, however, the $(20_6, 40_3)$ as well as the $(40_3, 30_4)$ are dual to plane-3-flat configurations with the same numbers reversed.

The 20 points of the set (2) lie by sixes on 50 planes, the coplanar arrangement being as follows:

$$\begin{array}{r} 10 \text{ planes } A_{ik}\ A_{ij}\ A_{jk}\ B_{ik}\ B_{ij}\ B_{jk} \\ 20 \text{ planes } A_{ik}\ A_{ij}\ A_{ip}\ B_{jk}\ B_{jp}\ B_{kp} \\ 15 \text{ planes } A_{ik}\ A_{jp}\ A_{ij}\ A_{kp}\ B_{ij}\ B_{kp} \\ 5 \text{ planes } B_{ik}\ B_{ij}\ B_{ip}\ B_{jk}\ B_{jp}\ B_{kp} \end{array} \tag{8}$$

It is noted at once that the points lie by 12's on the five 3-flats of the reference simplex. An easy calculation shows that they also lie by 10's on each of the 16 3-flats

$$x_1 \pm x_2 \pm x_3 \pm x_4 \pm x_5 = 0 \tag{9}$$

From the system of 50 planes (8) let us omit the first 10: i. e., those planes lying in the 3-flats of the reference figure, and the remaining 40 are found to lie by 5's on the 16 3-flats (9). Thus we have found a configuration of flats and planes $(16_5, 40_2)$ and by duality also a point-line configuration of the same numbers.

7. An Extension to Space of n Dimensions.

In general, let us consider the points of S_n whose coordinates are all zero except two, say x_i and x_k, and let $x_i = \pm x_k$. There are $n(n+1)$ such points. When $x_i = x_k$, let us denote the point by A_{ik} and when $x_i = -x_k$ let us denote the point by B_{ik}.

The line joining a point A_{ik} to a point A_{rs} does not meet another point of the set. This is true also of the line joining A_{ik} and B_{rs} as well as the line joining the points B_{ik} and B_{rs}. But the line joining A_{ik} to A_{ij} meets the point B_{jk}, and the line joining the point B_{ik} and B_{ij} also meets the point B_{jk}. The number of lines $B_{ik}\ B_{ij}\ B_{jk}$ is the number of combinations of $n+1$ elements taken three at a time, that is,

$$(n+1)\ n\ (n-1)/6$$

and there are three times as many lines of the type $A_{ik}\ A_{ij}\ B_{jk}$.

Thus the totality of lines meeting three of the $n(n+1)$ points is $2/3(n-1)n(n-1)$. Each of the points lies on $2(n-1)$ different lines. Hence we have the extended configuration

$$(n(n+1)_{2(n-1)},\ 2/3(n+1)n(n-1)_3)$$

In the plane this set of points is the set of six vertices of a complete quadrilateral, and the configuration is the $(6_2, 4_3)$.

VIBRATING PLATES AND MEMBRANES

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Department of Physics, West Virginia University

WHEN THIN METAL PLATES, symmetrical in shape, are clamped at the center and set into vibration with a violin bow, they give out a musical note. It is possible to make each plate vibrate in segments, and the lines between these segments, known as nodal lines, may be made visible by strewing sand upon the plate. The sand collects at the lines where no vibration takes place. This experiment was first performed by Chladni and the plates are named after him. Membranes stretched on a frame like a drumhead may also be set in vibration, and nodal lines will form. The standard plates or membranes are usually square or circular and about ten inches in diameter. The plates may be of any thickness but for high frequencies they should not be over 0.02 in.

With the advent of the vacuum tube oscillator it has been found that plates and membranes can be set in vibration at any desired frequency. A simple circuit is given in Fig. 1. Here A is the six-volt battery to heat the filament of the triode tube. B is the plate voltage. C is an audio transformer which by its feed-back action sets the tube in oscillation; the frequency of oscillation is determined by C and the variable condenser F. This oscillation passes through the audio transformer G and is very greatly magnified in the high-power amplifier. The output of this amplifier actuates the diaphragm of a loud speaker to which is attached a small rod. This rod may be applied to a membrane, or a Chladni plate H may rest upon the end of the rod as shown in the figure. With this apparatus it is possible to produce thousands of sand figures at different frequencies.

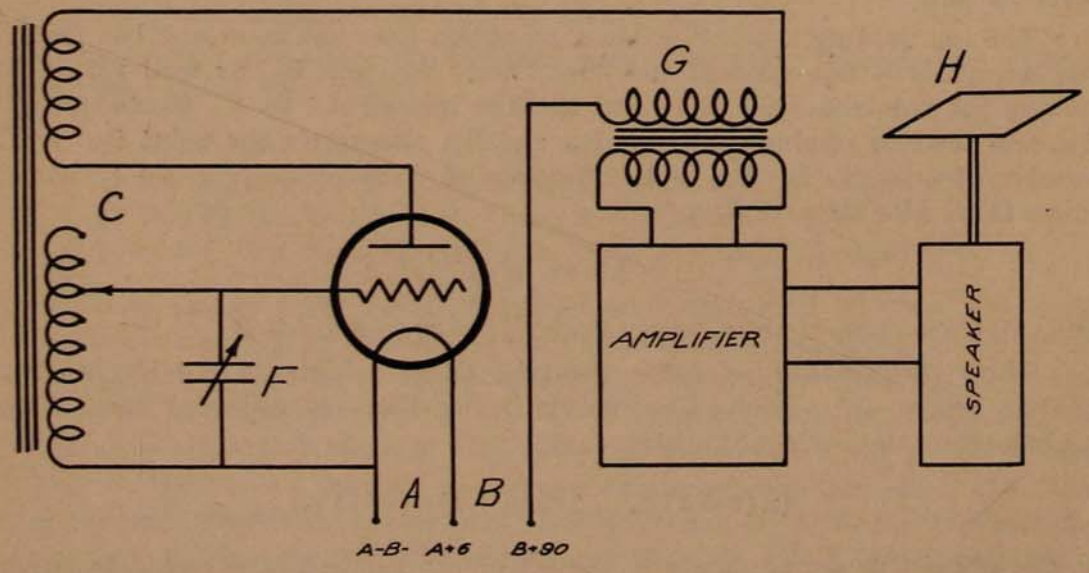

FIG. 1

Perhaps the best means for obtaining a continuously variable range of audible frequencies for vibrating plates and membranes is by the use of a beat frequency system. If two radio frequency oscillations are set up by separate oscillators so that the difference between their radio frequencies lies in the audible range, the two oscillations may be maxed so as to produce a heterodyne or a beat frequency which is audible.

A small percentage change of frequency produced in one oscillator will cause a relatively large variation in the beat frequency. By the use of two vacuum-tube oscillators, properly coupled, the beat note may be varied over the entire audio range by merely varying the capacitance of a small tuning condenser.

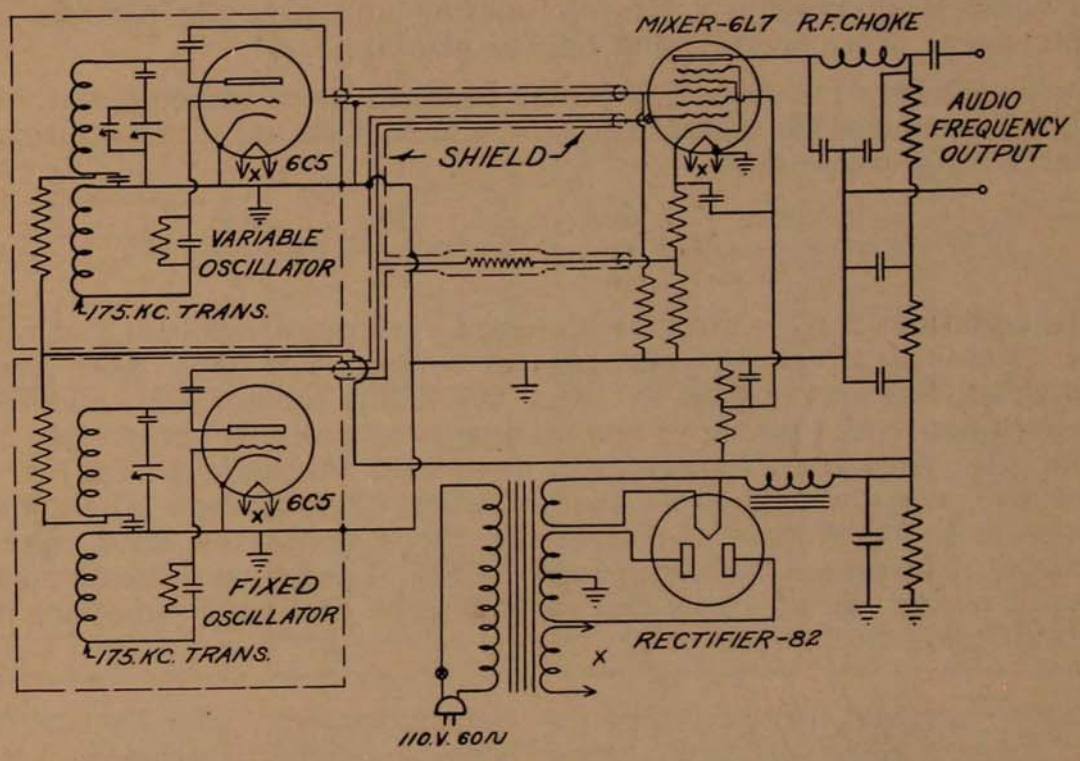

FIG. 2

Fig. 2 shows a practical circuit diagram of such a system. The circuit includes two carefully shielded triode oscillators operating at about 175 kc. The output signals from these are mixed electronically in a penta-grid mixer tube (type 6L7). This form of mixing was chosen in order to avoid interlocking between the two oscillators, since the electronic mixing eleminates nearly all capacitive coupling between the oscillators.

This device gives a frequency range of from 10 cycles per second to 12000 cycles per second, with an average output of about 20 volts A. C. This output must then be sent through a power amplifier to gain sufficient power to drive the plates.

The mathematical theory for the membranes is comparatively simple and gives for a square membrane side a the equation

$$W = A \sin \frac{m\pi x}{a} \sin \frac{n\pi y}{a} + B \sin \frac{n\pi x}{a} \sin \frac{m\pi y}{a} = 0 \qquad -(1)$$

If A and B are varied, the note remains the same and the number of lines remain the same but they are placed differently on the membrane for each value of A and B. Now m and n are always whole numbers but if they are changed, the note rises or falls and new patterns appear upon the membrane.

If the membrane is of circular cross section, it will give as the simplest figures a series of circles and diameters with the equations

$$J(kr) = 0 \qquad -(2) \qquad \text{and} \qquad \cos(n\theta - \alpha) = 0 \qquad -(3)$$

in which J represents a Bessel function and n is the number of diameters. More complicated figures also appear.

The theory for vibrating plates is much more difficult, but for high frequencies the nodal lines on a square plate are given approximately by the equation

$$W = A \cos \frac{m\pi x}{a} \cos \frac{n\pi y}{a} + B \cos \frac{n\pi x}{a} \cos \frac{m\pi y}{a} = 0 \qquad -(4)$$

The equations for the circular plate are even more involved and will be found in advanced treatises on sound. For very high frequencies, however, plates act very much like membranes, and the nodal lines reduce to circles and diameters as given by equations (2) and (3). Only the simplest cases have been worked out so far and there is here a wide field for mathematical investigation. The nodal lines in the first part of Fig. 3 are those appearing upon membranes. The others including those in Fig. 4 and 5 were made upon metal plates. In all cases the vacuum tube oscillator was part of the driving mechanism.

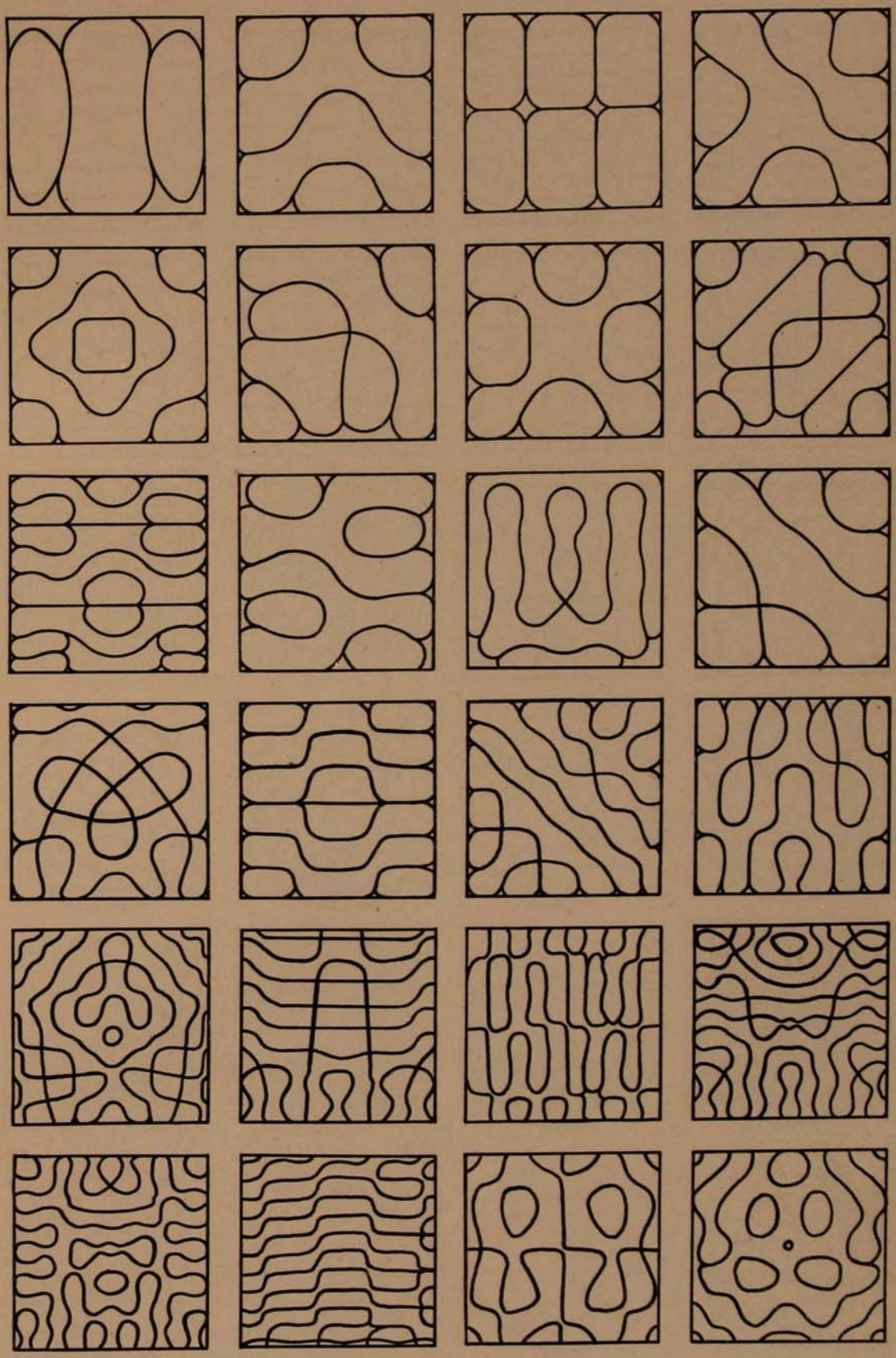

FIG. 3

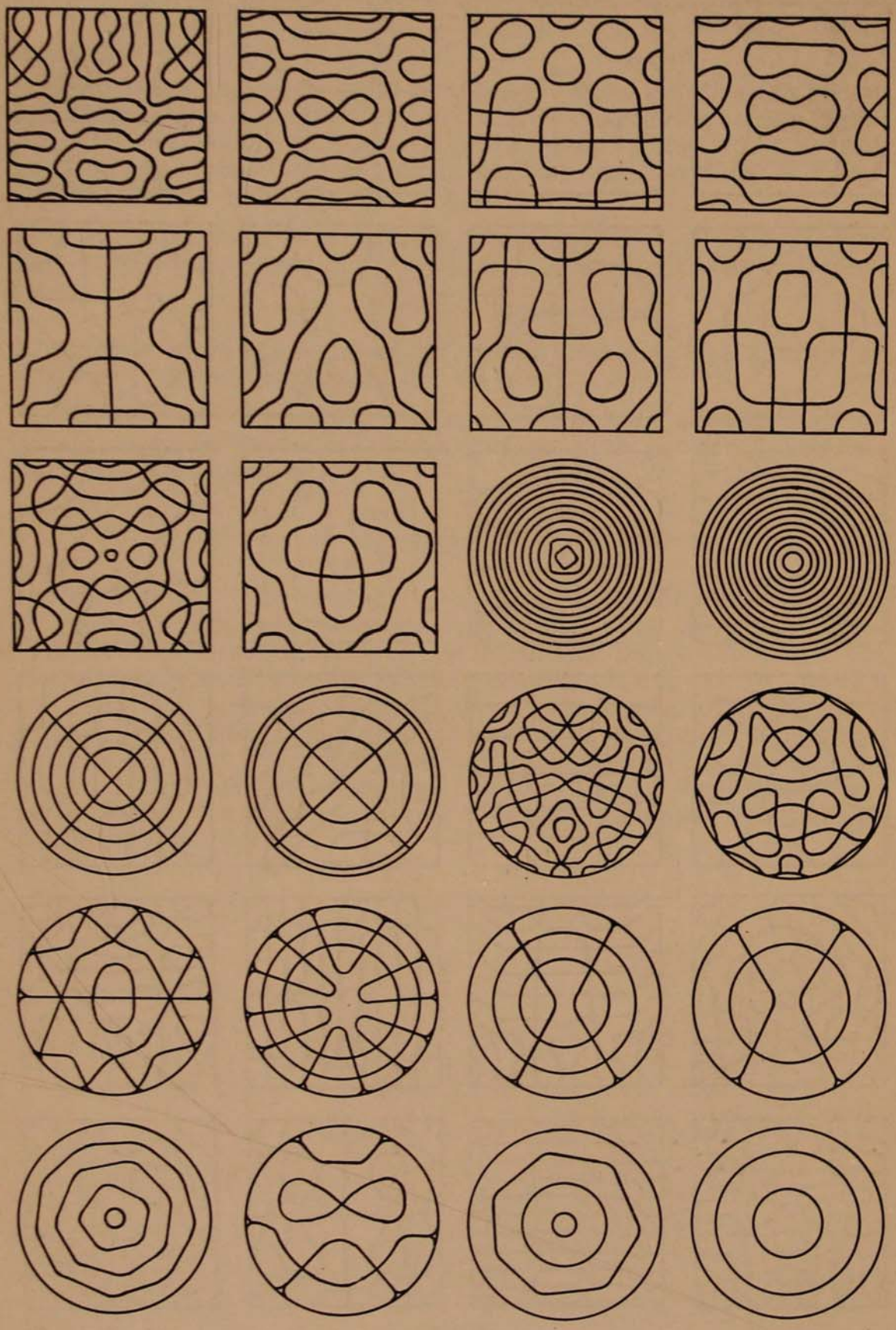

FIG. 4

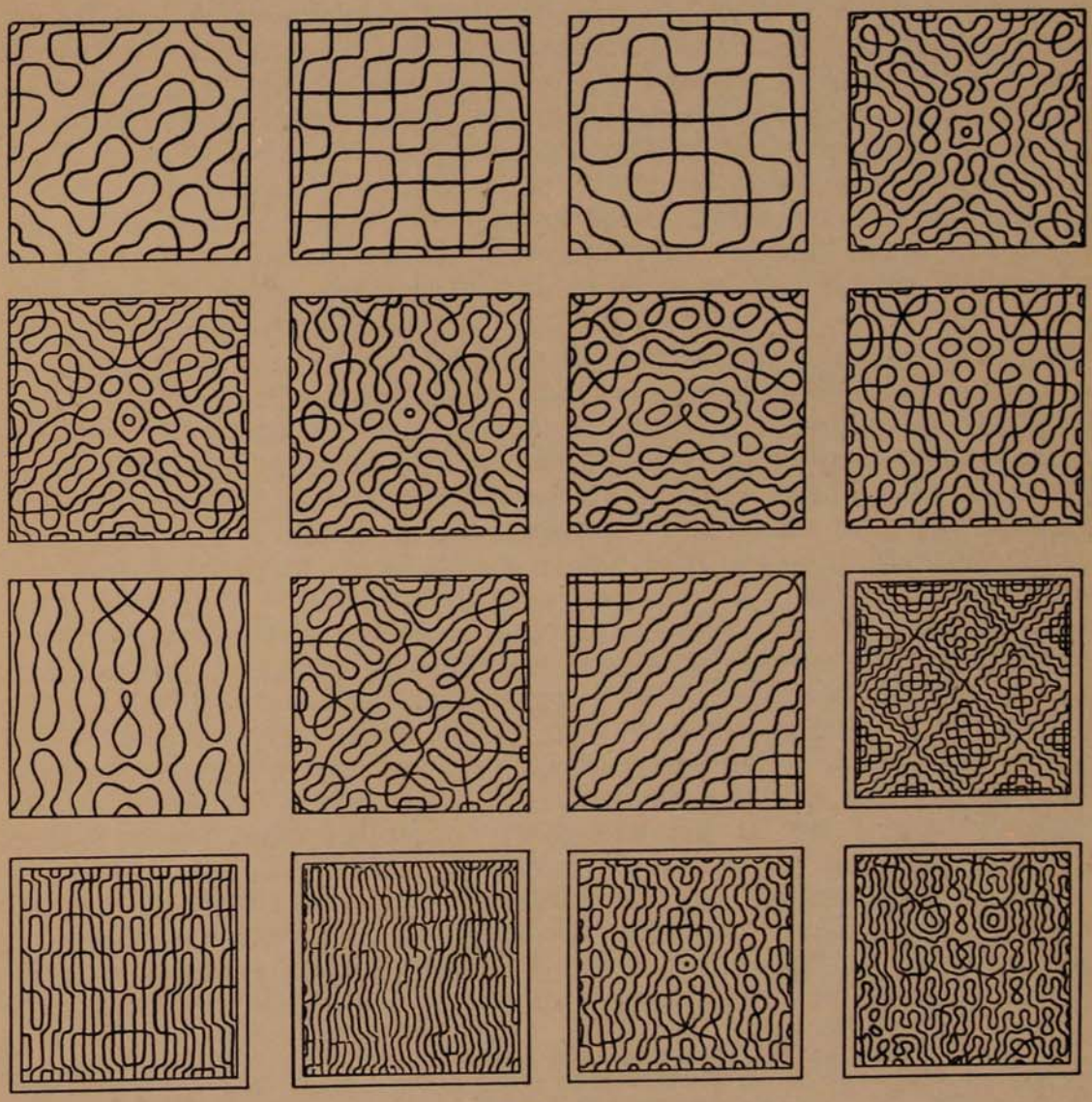

FIG. 5

The Social Sciences Section

Social Classes Among West Virginia Negroes

JAMES T. LAING
Kent State University, Kent, Ohio

One of the commonest popular fallacies in conventional white stereotypes of the Negroes is that of regarding them as belonging to a unified and homogeneous group. Negroes were differentiated even before the abolition of slavery into free Negro and slave elements.[1] Differentiation on various bases continued after emancipation so that the Negro group of the present is divided by many class schisms.[2] Membership in a particular social class in American white society is based chiefly on economic considerations. American Negroes, however, most of whom have occupied a definitely low economic position, have developed other criteria for social status in addition to that of wealth or occupation.[3] In this paper the main bases of status as defined by the culture of the Negro miners in West Virginia are discussed.

A common basis for the assignment of status to a person in contemporary American culture is his function in the economic organization.[4] Negroes perform various functions in the mining fields of West Virginia, some of which command larger wages than others. The relationship, however, between the position held by the Negroes and their social status is not striking. Preachers and teachers of course constitute the aristocracy of the mining town. Machine men, contractors, or night watchmen, as well as certain others who occupy positions denoting a particular trust in the men by the companies, are likely to occupy a somewhat higher status because of the fact; but the thrift, energy, and far-sightedness in saving and using money which these men usually exhibit affect their prestige more than the mere holding of responsible positions.[5] Some of these men have become small capitalists, cashing scrip at 25 percent discount and lending money for a consideration. The possession of money and the evidences of such position are highly respected by most of the miners, and especially by their wives and daughters. The style and quality of clothes worn by the women, like other kinds of "conspicuous consumption," have a great deal to do with the status the families hold in the mining town. The chief value of

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[1] See Woodson, C. G., **The Negro In Our History**, Associated Publishers, 1927 pp. 236, 246, 253; Woodson, C. G., **Free Negro Heads of Families in the U. S. in 1830**, Associated Publishers, 1925; Nelson, A. D., **People of Color in Louisiana**, Jour. of Negro History, vol. I, pp. 361-376; Dodge, D., **Free Negroes of North Carolina**, Atlantic Mo., vol. 47, Jan. 1886.

[2] See Frazier, E. F., **La Bourgeoisie Noire**, Modern Quarterly, vol. 5, no. 1; Frazier, E. F., **The Negro Family in Chicago**, ch. III; Dunford, F. M., **Conflicting Forces in Negro Progress**, Social Forces, vol. 3, p. 703; Park, R. E., **Bases of Race Prejudice**, Ann. Amer. Acad. of Pol. and Soc. Sci., vol. CXXXX, Nov. 1928, pp. 11-20; Miller, K., **Race Adjustment**, Neale, New York, 1909, pp. 181-187.

[3] Young, D., **American Minority Peoples**, Harpers, 1932, pp. 356ff.

[4] See North, C. C. **Social Differentiation**, pp. 21-23.

[5] In verifying and clarifying many of my ideas in this paper, interviews with Mr. U. H. Prunty, Principal of Elkhorn District Colored High School, McDowell County, were especially helpful.

certain social and public functions to many of the women is that such occasions afford the opportunity for exhibiting a new dress.[6] In the "dull times", as the "depression" was termed in the mining fields, the women sometimes greatly altered their routines because of their inability to continue on the same plane of consumption they formerly enjoyed.

As a rough index of the relation between the positions of the Negro miners and their social status a study was made of the occupations of the leaders in many mining towns visited. The identity of leaders was determined by interviews with Negro teachers and preachers as well as with employers. The occupations of 66 Negro leaders exclusive of preachers and teachers reveal the fact that leaders are drawn from all occupations. Usually the

Occupations of 66 Negro Leaders in West Virginia Mining Towns: 1932

Occupations	Number
Coal Loader	39
Track man	7
Machine man	3
Motorman	3
Boiler fireman	3
Janitor	2
Mechanic	2
Electrician	1
Brattice man	1
Pumper	1
Stable boss	1
Stone mason	1
Brakeman	1
Tipple man	1
Total	66

teachers or preachers are also considered as leaders. Sometimes, on the other hand, the Negro leader is one of the most illiterate members of the group. These leaders express their leadership in politics, civic matters, and in church and lodge affairs. The Negroes enjoy their full political rights in all parts of West Virginia. They may, it is true, vote at times as the operators wish them to,[7] but such voting does not seem to detract from the satisfaction of participating in political practices. The very fact that they have been able to elect members of their own race to office, and to gain concessions from the political parties in the form of appointments to various state and federal offices, gives the Negroes, especially those who come from states in which such achievement is not possible, a feeling of progress and protection. The Negroes have engaged strongly in these political activities in the mining fields, and the political leader, even though he may come to the company office to find out who are "our men," still maintains his prestige. Although the church leader has traditionally been a man of high standing

[6] Correspondence with Miss Laura Thornhill, Negro teacher in the mining fields of Logan county.

[7] See Spero and Harris, **The Black Worker**, Columbia Univ. Press, 1931, pp. 371-374.

among the Negroes, in some places he does not seem to exert the influence he once did.

The development of culture traits through which status is recognized in any group is determined in many cases by the vicissitudes of group history. A circumstance in the history of the Negroes in the mining fields has resulted in an attitude which has been incorporated into the mores of the upper stratum. Many years ago there was a large number of Negro criminals in certain places which constituted a considerable part of the Negro group. The "better element" among West Virginia Negroes, not only in the mining fields but throughout the state, feels that it has been done great harm by the presence of this early criminal class[8] and makes a decided distinction between this and other Negro groups. Said a Negro teacher concerning this situation: "In justice to those who have toiled upward and are striving for the good of their fellowman, do not judge the entire race by the class of criminals that belong to all races."[9] Some of the Negroes with whom the writer talked were hypersensitive on this subject of Negro criminality. The Director of the Bureau of Negro Welfare and Statistics requested the newspapers of the state not to use the racial adjective in reporting crime news.[10]

A very important reference point for differentiation is that based upon the place of origin of the Negro miners. The West Virginia- and the Virginia-born Negroes, who constituted about 62 percent of the group studied,[11] tend to look down upon Negroes from more southern state, particularly the Alabamans. A Negro in Fayette county almost hung his head when he admitted he was from Alabama. A Kanawha county Negro upon being asked whether he was from the south replied: "No, *suh!*" with evident pride in the fact that he was from Virginia. Many deny their far southern origin, while still others are inclined to be evasive, saying: "I've been here 20 years." While the Virginians and West Virginians in the mining fields show the greatest antagonism toward the Alabama migrant, they are by no means over-cordial to the Negroes from Mississippi, Georgia, South Carolina, and North Carolina. The North Carolinian, however, is much less disliked than the others.

A Negro woman to whom the writer mentioned the hesitancy of the Alabamans about telling their birthplace had an explanation: "They won't tell it. Many of them got in trouble down there and that is the reason they come up here. They think the West Virginia people are 'overbearin'.' So do the North Carolina people. I went down to North Carolina on a visit and stayed six months. I went to a house-party and there were three people killed. A man cut a woman's head clean off and people went by her laying there an didn't even so much as look at her. I told them we might be over-

[8] See W. Va. Bureau of Negro Welfare and Statistics, Report, 1921-22, pp. 13-14.
[9] Welch Daily News, Sept. 21, 1926.
[10] W. Va. Bureau of Negro Welfare and Statistics, Report, 1925-26, pp. 114-116.
[11] West Virginia and Virginia natives formed 14.0 and 47.8 percent respectively of the 600 Negro miners of whom a schedule study was made.

bearin' up here in West Virginia—but at least would glance at a dead person. I came out of there just about as quick as I could get."

While the schisms based on place of origin are not always apparent on the surface, and the casual observer may not notice any lack of fraternization, there is a decided differentiation due to a clash of mores. The Alabama Negroes and others of the South in many cases take pride in being "bad." This criterion of distinction is not respected by the Virginia and West Virginia Negroes, who are habituated to a degree of independence which has given them pride in order and self-respect rather than in the cruder standard of the southerner. They consider the southerners as "bullies" and "too loud" and tend to hold themselves apart from them. Said a Fayette county woman: "Some of these Alabama boys brag about how bad they is. One of them was bragging to me one day about how mean he was. I told him that Alabama people wasn't the only ones God gave a temper to. We don't like Alabama people any better than they like us." An old woman near by, overhearing the conversation, said:" I don't mess with these Alabama people. They'll kill you in a minute." As a result of this isolation of the southerners by the majority Negro group, the Virginians and West Virginians, the southern minority has been driven to seek the association of persons of like origin and therefore has been more closely cemented together.[12] West Virginians and Virginians whose attitudes have brought about this condition regard the southerners as "clannish."

A degree of personal disorganization in this situation is inevitable. Many of the southern Negroes strive all the harder for recognition by the development of extreme aggressiveness and by becoming even "meaner" than before.[13] Said one West Virginia woman: "The miners from Alabama and Georgia are not accepted by the West Virginians. In the church the southeners will join and take charge, putting the West Virginians in the rear. They believe in action, that is to say they are emotional and, of course, the West Virginians are not. Virginians do not have much to do with those from Alabama and Mississippi because most of them are mean and carry guns." The West Virginia and Virginia Negroes, then, feeling the difference between themselves and the cruder and more "emotional" southerners, are concerned because of the possible effect the migrants may have on the attitudes of whites toward the entire Negro group.[14] In self-defense they have isolated the far-southern minority, thus accentuating the traits they dislike.[15] It is not to be inferred here, of course, either that all southern Negroes take pride in their "meanness" or that all Virginians and West Virginians do not. The unfavorable stereotypes of the southern Negro and the deep South held by the latter groups do, however, play an

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[12] Cf. Park, R. E., and Miller, H. A., **Old World Traits Transplanted**, Society for Social Research, Univ. of Chicago, 1921, ch. III.

[13] Cf. Miller, H. A., **Races, Nations, and Classes**, Lippincott, 1924, ch. IV.

[14] Cf. the attitudes of Negroes in northern cities toward newcomers from the South. See Mark, M. L., **Negroes in Columbus**, The Ohio State Univ. Press, 1928, p. 10; Frazier, E. F., **Negro Family in Chicago**, ch. V.; Young, D., **American Minority Peoples**, p. 46.

[15] Cf. Park, R. E., **Behind Our Masks**, Survey, vol. 56, May 1926, p. 138.

important part in creating intra-group attitudes among the Negroes of the mining fields and produce a very real differentiation. Some of the southerners, as mentioned before, attempt to escape the effects of this discrimination by "passing" into the majority Negro group through a denial of their origin; others do so by living in towns in which Negroes from southern states have concentrated.

Another cleavage in the Negro mining population is between the "church people" and the non-church people, for the church group as a rule considers itself as of a somewhat higher order than the group which is indifferent to the institution. The Negro church has never been a purely religious institution. Social, economic, civic, and literary activities have always formed a part of its program,[16] and therefore membership in a church means more than the mere democratic attendance at religious services. The church members are likely to be the citizens active socially and economically, or in other words, the aristocracy of the town. In towns where exist more than one denomination, the social status of the individual is partly determined by the church to which he belongs. If, for example, both Methodist and Baptist churches are found in the same town the Methodists are likely to consider themselves somewhat superior to the Baptists, while the members of both of these larger denominations feel themselves pretty definitely separated from the adherents of the "Holy Rollers" or "Holiness" church. By far the largest number of towns, however, have only the Baptist denomination.

Before the recent "dull times" the Negro lodges were very active, "socials" and parades in brightly colored regalia being very common. Funerals were usually conducted by the lodges, for it was the exceptional Negro miner who did not belong to at least one of the various lodges. The Odd Fellows and Household of Ruth claimed the largest number of Negroes. They were followed, in order of their respective numbers, by the Knights of Pythias and Court of Calanthe, Order of Saint Luke, Golden Rule Endowment Association, Masons and Heroines of Jerico, Masons and Eastern Star, and the Elks of the World.[17] The depression, however, dealt the lodges an almost fatal blow. Consequently, although membership in these lodges signified a certain status, this basis of status is of historical rather than current importance.

In spite of these class differentiations, operators report that the Negroes show a great deal of group loyalty. In mining towns where the giving of relief has been necessary in recent years, Negroes have shown a decided tendency to share with others of their group whatever material aid is given them. Negro solidarity is often shown in any situation involving the Negro group as a whole. Even when difficulties arise among themselves, Negroes frequently show their preference for adjustment without recourse to members of the white group. An employer gives an example in the following conversation: "You would be surprised at the loyalty

[16] See W. Va. Bureau of Negro Welfare and Statistics, Report, 1927-28, pp. 65-67.
[17] W. Va. Bureau of Negro Welfare and Statistics, Report, 1925-26, p. 83.

the Negroes show toward each other. They gamble a good bit, but if they have a shooting or cutting scrape they are loathe to tell on the one who injured them. One night one of them came to the doctor with a stab wound in a dangerous place. It was a gash about two inches deep and it is a wonder it did not kill him. The doctor said: 'What's the matter, John?' He replied: 'I—I think I have been stabbed, suh!' The doctor answered: 'John, you know you have been stabbed. Where were you?' 'I was down to the lower end' (the Negro section of the town), he replied. 'Who stabbed you?' 'I just don't know, suh.' 'Now, John, you know who stabbed you. Who was it?' 'No, suh, you know all of a sudden the lights went out and I don't know who stabbed me.' "

An antagonistic attitude, on the other hand, is exhibited by some of the Negro miners toward Negroes successful in other fields than mining. The writer found this attitude to be quite prevalent, even, in some cases, to the detriment of the miners themselves. The following illustrates how this attitude of antagonism and suspicion may have stood in the way of their correcting an alleged wrong being done them. At a mine where relief was administered once a week by a county truck which left bags of food for the miners whose names had been turned in by the company as needing help, the Negroes, a disgruntled and protesting group, claimed that they had not been getting their share of relief as compared with the whites. The writer, knowing the name of the president of the nearest branch of the National Association For the Advancement of Colored People, suggested that they communicate their grievances to this man. The reply of the spokesman for the group was: "Mr. B.? What he care 'bout us? Why he's a rich man—he don't worry none about us people up here. He'll take our cases (the man was a lawyer) but he does it for the money in it. He don't care about us po' folks. That 'sociation won't do nuthin' for us." The rest of the group agreed that such was the case.

We have here an exhibition of the attitude that makes the part played by the Negro in positions of authority in industry a difficult one. Perhaps one of the reasons for this attitude is to be found in the fact that the successful Negro tends to be separated to a certain extent from the group as a whole. For instance, the Negro of means has striven to allow his family the advantage of a good neighborhood, and hence in many cases has moved into a white area.[18] This move is made not because of any desire to leave the Negroes, but because the better neighborhoods are to be found outside the Negro sections; but to the less fortunate Negroes the change of residence simply means that the members of this family feel themselves "too good" to live with their people any more. The National Association For the Advancement of Colored People is the object of some of this antagonism because it has often fought for the right of these Negroes to live in white neighborhoods. Many of the West Virginia Negro coal miners feel that the Association is

[18] See Frazier, E. F., The Negro Family in Chicago, p. 249.

interested in the upper groups rather than in the common man,[19] but, on the other hand, some staunch supporters of the Association are to be found within their ranks.

Mention has been omitted, up to this point, of one of the most common bases for class distinctions within the Negro group. This distinction upon color is discussed last not because of its absence but because, among West Virginia miners, its role is apparently less important than some of the others already stressed. The advantages which the "bright-skinned" person has over his darker brother within the Negro group are probably ubiquitous in the American culture pattern.[20] Inquiry revealed the fact that in the mining fields there is little difference in the number of Negro leaders of light and dark skin color. Among the women, however, the situation is different. In West Virginia as elsewhere a woman with a dark skin is at a tremendous disadvantage in the marriage mart. For the Negro man the possession of a light wife is a badge of distinction. She is for him an article of conspicuous consumption which reflects upon him a sort of artificial prestige. The wife of light color and, through her, her husband may enter economic and social areas which would be closed to persons of darker pigmentation.[21] To the young women, then, color is of most vital importance. Just which men may secure the more desirable women of light color, however, and from which women the most desirable men will select their wives are determined by other cultural factors already discussed.

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[19] Interview with the president of the N. A. A. C. P. branch, Bluefield, W. Va.
[20] See Herskovits, Melville J., **The American Negro**, Knopf, 1928, ch. IV.
[21] **Ibid.**, pp. 59-66.

THE PROBLEM OF A SHORTER WORK WEEK

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ONE OF THE OUTSTANDING RESULTS of the economic readjustment since 1929 is the nation-wide consideration of a shorter work week. A five-day week began to develop in some small plants about 1908; the Ford Motor Company announced its five-day week in 1926; and the American Federation of Labor included it in its program the same year.

Before 1929 labor organizations advocated the short work week on the grounds of justice to the workers and more time to enjoy life. After 1929 the appeal was to keep as many workers employed as possible, and plants began to adopt a five-day program and some even offered employees two or three days work each week. One must differentiate between emergency conditions existing since 1929 and normal conditions before that date.

The trend in America has been toward shorter working hours. In 1791 a twelve-hour day, or longer, was the rule. Some agitation sprang up spasmodically for shorter hours, but little was accomplished until 1835, when President Van Buren by executive order established a permanent policy of the ten-hour day in government work. In the decade of the 1840's the ten-hour day received state recognition. By 1870 the ten-hour day prevailed for factory workers generally, and the eight-hour day had been adopted for laborers employed in all Federal work.

The United States Census of Manufacturers showed that in 1919 about 50 percent of the persons employed in manufacturing worked 48 hours a week. By 1925 in a few plants a five-day week had been inaugurated. In 1930 the National Industrial Conference Board Report showed a general shift to the five-day week, more for the purpose of distributing employment to as many workers as possible, rather than favoring the shorter working period.

Very few companies were operating on the five-day basis before 1914, and most of the progress in the movement came about after 1923. Before the depression the five-day week was gaining ground in the non-continuous process type of industries; it was more prevalent in the small than the large establishments; and was largely confined to New York and New England. Before the depression when the five-day week came as a result of agreement with organized labor, the work week was usually set at 40 hours.

The five-day week will likely be judged by the effect it has upon production. The arguments seem to favor the shorter work week, and the employees have very generally favored the plan even though it brought some loss in wage earnings.

Probably the most important factor in retarding the movement for a shorter work week is the continuous industry. In order to bring any reduction an entire crew is needed. Many industries must

operate day and night without interruption, such as iron and steel industries, chemical plants, pulp and paper mills, and public utilities. A survey of the literature on the subject indicates that where employers expected, as a result of the union-enforced short week, reduced production, higher costs, and lessened efficiency, they have not been disappointed. Where the employers have tried the system, expecting it to prove satisfactory, it usually has done so. There are many instances where a five-day week has been found superior to any other system, and just as many where it has failed utterly. In most cases other factors have been called into play along with shorter hours. Change in organization, change in shifts, better supervision, or less waste of time may be credited to the shortened week.

The employee who has his work week reduced from 40 or 50 hours to 30 or 36 is sure to have more leisure time for such activities as recreation, opportunity to cultivate a garden, painting and repairing, travel and education. However, employers have objected to the employees demanding a five-day week and then finding other work on Saturdays. It is pointed out that growing gardens, if indulged in extensively, will reduce the demand for the products of the full-time gardener and thus tend to defeat the main purpose of the shorter week.

Employers in some establishments find it necessary to care for rush orders on Saturdays since customers demand services any day. With the adoption of the five-day week it will be found difficult to compete with companies having a full week schedule.

It seems reasonable to limit working hours and working days so as to maintain one's health and physical well-being; however, it has not been shown that there is much to be gained by adopting a five-day week from the standpoint of fatigue or better health. Eight hours a day for five days for work, and a like period for sleep, would still leave 72 hours per week, or more than 10 hours per day, for recreation and other activities. This should be sufficient time for anyone to spend his earnings and for most of us to enjoy life. Some careful studies of fatigue in industrial work have been made. The type of work varies so greatly, and conditions under which the work is performed vary so much that the studies of influence of long hours on fatigue are not of much consequence.

Organized labor has had for one of its objectives shorter hours and has reduced working hours from 12 downward. Now the demands in many industries are for five hours per day or 30 hours per week. One labor organization claims that if all laborers should work two hours per day at productive work there would be no necessity for anyone working more.

There is a growing demand for federal and state limitations on hours of work. If these demands are enacted into laws, and wages and profits are dealt with in the same way, which seem just as logical to many, there is danger of losing our democracy in its broadest sense. The state may not presume to have any more power

to determine hours of labor than it has to fix rates of wages, amount of profits, or any other terms of a labor contract. The establishment of an eight-hour day by law might be construed as an unwarranted infringement upon constitutional liberty of private contract. The same action would not apply to Sunday laws, since these are recognized as valid everywhere. Sunday legislation differs from shorter-work-day or shorter-work-week legislation in that it merely enforces customary standards.

A shorter work week has been favored because it promises relief to the unemployed. From a long-time point of view it seems likely that a 30-hour week will not relieve unemployment in the United States without the cooperation of other nations. If our cost of production increases with a shortened work week, we are likely to lose some of our foreign trade. There is but little possibility of cooperating with Japan and Germany in this regard.

A shorter work week will aid unemployment, it is claimed, because it will provide more leisure and in leisure time people will buy more goods; and if each worker does less work it will take more men to do the work. Unless the workers find new purchasing power they will buy less of some goods if they buy more of others. With less purchasing power they will purchase less of all goods. Shortening the work week does not imply a larger volume of production. Then the shorter work week means sharing wages and working time with others. This, of course, will help the other fellow. A series of double shifts could be inaugurated which would reduce the amount of capital required for a given volume of production. It would put labor in a better position relative to utilization of capital.

If a law limiting hours meets requirements under normal conditions, there is still a problem as to what can be done in slack seasons or in peak-load times, both of which are sure to come. A short work week will hardly apply to farmers, domestics, and workers in small factories. A large number of workers will not be affected by any reduction in hours.

The arguments advanced indicate that 40 hours per week is not too much for the best well-being of workers, except in a few industries of very heavy work, excessive heat, or other unusual conditions. If very much shorter time is worked it seems likely to result in higher priced products, fewer purchases, and in turn less work. There can be little doubt that there is a large field for labor reform among the great industrial classes.

So long as we have our present low standards of living among a large percentage of our working people, the additional earnings of 10 hours per week, the difference between 40 hours now worked and 30 demanded, might well be used to improve standards of living.

GREEK DIPLOMACY JUST BEFORE THE PELOPONNESIAN WAR

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THE FIRST CASE for diplomacy just before the Peloponnesian War arose with the quarrel between Corcyra and the mother colony, Corinth, over Epidamnus. This city was a Corinthian and partly a Corcyrean colony (I, 24, 2, 3).[1] When the common people[2] of Epidamnus needed help against the aristocracy and sent to Corcyra for aid, the Corcyreans paid no attention. When the Corinthians were asked to send them aid and they undertook to assist them, the Corcyreans began to resist the attempts of Corinth. This friction started an alliance of the Corinthians, Ampracians, Leucadians, Megarians, Cephallenians, Epidaureans, Troezenians, Thebans, Phliasians, and Elians. (I, 27). On the side of the Corcyreans were lined up the Illyreans (I, 26, 4), and later on, as we shall see, the Athenians and their Empire.

The aristocrats of Epidamnus were driven away by the Corinthians and came to Corcyra seeking help (I, 26, 3). The Corcyreans straightway invested Epidamnus. The Corinthians learned of it and were preparing an expedition. When the Corcyreans heard of it they sent ambassadors to Corinth together with ambassadors from Sikyonia. They begged the Corinthians to withdraw their protection from Epidamnus or otherwise to submit the matter to any city in Peloponnesus (I, 28, 2) for arbitration, the colony to remain with the party adjudged to by the arbitrators. The Corinthians answered that they would consider it only if the Corcyrean ships withdrew first (I, 28, 4).

The Corcyreans answered that they would withdraw from Epidamnus if the Corinthians would withdraw also. They were ready to submit their dispute to arbitration (28, 5), but the Corinthians rejected it. War having been declared on both sides, a naval battle was fought in which the Corcyreans won a victory. The Epidamnians capitulated and the Corinthians who were in Epidamnus were captured (29, 5). With this success the Corcyreans began to grow bolder, the Corinthians to smart and prepare for war in all haste (31, 1-2). Both parties sent envoys to Athens to win her alliance (31, 3). A diplomatic contest now started which was to fulminate over Greece. The Corcyreans spoke first before the Athenian Assembly, putting forth the following arguments: They did not harm any one; they were themselves harmed. They had a navy which might be used by the Athenians to their great advantage, since the Peloponnesians were already thinking of war against Athens and wanted to put Corcyra out of the way first (33, 1-3). Corcyra held the key to Italy and the West (34, 1; 35, 2, 5; 36, 2). The fact that they were colonists of Corinth should not prejudice

[1] Thucydides, Bk. I, 24, 2, 3. Hereafter, unless otherwise specified, references given without the name or work of the author or the book are to Thucydides, Bk. I.

[2] In practically every city of Greece, with the possible exception of Sparta, there were two parties, the aristocratic, or oligarchic party, and the democratic, or that of the common people.

their case. If Corinth wished to retain Corcyra she should act like a mother to her child and not like a master to his slave. Whatever state had not allied itself with another could certainly choose its own alliance. Besides, the Corinthians were the enemies of both Corcyra and Athens.

The Corinthians began to speak in their turn: "The Corcyreans," said they, "are covetous and unjust. Their isolation, preserved heretofore, was for having freedom of wantonness (37, 2, 4). They ask for arbitration now that they have committed an offense. Moreover, they are trying to embroil you, O Athenians, in their quarrel with us (39, 2). If you should conclude an alliance with them you will violate our treaty, since you will turn against us who are now your allies. For, although our treaty says that any neutral party may join either side, yet the Corcyreans can not do so because they are not neutral, seeing that they are fighting with us and are, therefore, our enemies (40, 2-3). We did not help the Samians when they revolted from you (Note 40, 4-5), and we have done you much good in various ways. The war of which the Corcyreans prophesy (cf. 33, 3 and page 105 above) may or may not come true. Don't be misled by it. Nay, in view of the lurking suspicion of the Megarian incident,[3] be the wiser. In fact, if you would only do us the favor of staying aloof from Corcyrean entanglements you will scatter all suspicions and clouds of war (41, 2; 42, 2-3). Do not therefore receive the Corcyreans as your allies against our will nor help them in their wrong-doing. By granting us our request you will do the proper thing toward us and at the same time you will have planned best for yourselves (43, 3-4)."

Such was the arguing, in the main. The Athenians after calling two assembly meetings cast their favor for the Corinthians, in the second meeting. But on the next day when their assembly met again they changed their minds and concluded a defensive alliance with Corcyra ('epimachian). Their reasons for this change were that Corcyra had a strong fleet and held the key to Italy. This last was a consideration of the "Policy of Pireus," as F. M. Cornford (*Thucydides Mythistoricus* p. 51) calls it. Plutarch says (*Pericles*, XXIXL) that Pericles influenced the Athenians in their choice and that it was he who persuaded them to send help to the Corcyreans because of the strength of the island. Be it as it may, the Athenians had a vague feeling that the Peloponnesian War was slowly but surely coming (44, 2) and wanted to have a strong navy as well as access to other parts of the world, principally to Italy and Sicily (44, 3). After this alliance was made, the Athenians sent ten ships to Corcyra with the injunction not to fight except in defense of Corcyra. This was like an open declaration of hostilities between the Athenians and Corinthians inasmuch as their fleet could hardly stand aloof when the Corcyrean and Corinthian navies had engaged in combat, as the events that followed proved.

Thus the ominous spark of the war was beginning to enliven, slowly yet surely, just as it did before the World War.

[3] The Megarian incident is explained below, p. 111 ff., and notes 10 and 11.

In the fight that ensued between the Corinthians and Corcyreans the Athenians were present, and when the Corcyreans were hard pressed they drew nearer, and the Corinthians were afraid (49, 4) to press too close on that quarter. The Athenian admirals however refrained from fighting as yet. But when the Corcyreans were defeated by the left wing of the Corinthians, the Athenians stepped in and the enemy engaged with them. Later on twenty more ships arrived (49, 7; 50, 5) and joined the Athenian fleet. After this incident the Corinthian ships began to fear lest the Athenians attack them. The Corinthians had the notion that the truce between Athens and Corinth was broken because they had actually come to blows. So they sent an informal embassy ('aney kerykeioy) * to the Athenian commanders saying: "O men of Athens, you are wronging us! By beginning the war you are breaking the truce." "Will you let us go freely, or will you use us as your enemies?" (53, 2). The Athenian generals replied that they did not break the truce, nor start a war; that the Corinthians were free to go anywhere else, except against Corcyra (53, 4).

Such was the beginning of the actual tangle of the web of long-drawn diplomatic negotiations which were to embroil the Greeks in the deadly struggle that followed.

Another stroke of diplomacy on the part of the Athenians, perhaps bad, consisted in the measures taken by them against Potedaea, a colony of Corinth (56, 2). They ordered the Potedaeans to demolish the Pallenian Wall, give hostages to Athenians, send away the Epidemiourgi (who were probably Doric officers), and receive no Corinthians in their town, for fear that the Potedaeans might revolt on being instigated by the Corinthians as well as by Perdicas the King of Macedonia. In fact Perdicas had already sent ambassadors to Lacedaemon to incite war between the Peloponnesians and the Athenians (57, 4-5).

The Athenians sent to Potedaea thirty ships. The Potedaeans sent ambassadors to persuade the Athenians not to change their former policy of goodwill toward them (me sphon peri neoterizein meden). In case their plea failed, at the suggestion of the Corinthians, the ambassadors were to go to Peloponnesus and ask help (58, 1).

The Potedaean ambassadors failed to accomplish their purpose at Athens, but at Sparta they obtained a promise that if the Athenians would make war against them the Spartans would invade Attica. This promise was given about July 432 B. C. (Olymp. 87, 1). Accordingly the Potedaeans revolted together with the Chalcideans and Botteaeans, after making common cause among them by oath (xynomosantes, 58, 1).

Meanwhile the Corinthians, fearing for Potedaea, sent there volunteer troops including some of their own citizens (60, 1).

After that time war loomed more clear and probable.

In the battle that followed at Potedaea about three hundred of the Potedaeans and their allies were killed (63, 3), and the first

* Throughout this article the greek letter "Ypsilon" is transliterated to "y."

allied blood was spilled. The sleuth-hounds of war and fury began their feast. The Athenians complained that the allies broke their oath in having fought on the side of the Potedaeans, while the Corinthians charged that the Athenians besieged their colony, Potedaea, in which Corinthians and other Peloponnesians were at that time (66, 1). Complaints began to be rife. The Corinthians succeeded in calling together a congress of Pelloponnesians in Sparta and vehemently accused the Athenians of having broken the treaty (kateboon). The Aeginitans also were present, secretly fomenting ill will against the treaty by saying that according to the truce they had lost their independence. Others, too—among them the Megarians—came forward and poured out their grievances against the Athenians. But last and most vehement were the Corinthians who took the platform. After scolding the Lacedaemonians for allowing the Athenians to grow great since the Persian Wars, by neglecting to stop the building of their Walls (cf. 90-92; 107, 1) they proceeded to accuse the Athenians of high-handedness toward their allies (69, 1-3). They charged that the Athenians were revolutionizers (neoteropoioi) and adventurous; that their hopes were as good as their possessions; that they gained with each rebound. In short, they declared, one might say, that the Athenians were born to let neither themselves nor others be quiet (70, 1-9). Finally they urged the Peloponnesians to put a limit to their dilatoriness and help the Potedaeans quickly by invading Attica (cf. 58, 1); not to betray (proesthai) their relatives, nor to make the rest of them turn toward another alliance (perhaps that of Argos) from having lost faith ('athymia) in their protection (71, 4).

The Athenians, who happened to be present on other business, spoke briefly before this meeting. They reviewed the services Athens had done to Greece in the Persian Wars (74, 4) and tried to advise the Peloponnesians not to act rashly (72, 5). Said they: "We had the hegemony thrust upon us, as it were, and incurred the hatred of our allies because they revolted and we put them down (73, 3-4). If you were in our place you would become just as unpopular as we"[4] (76, 5). "We have used our power," they continued, "with moderation (76, 3) and dealt with our allies on equal basis; yet when frustrated in petty things they began to be disappointed (77, 3). Should you get the hegemony you would find it not so easy. Take counsel slowly, therefore, before you enter upon a war which may prove long drawn out. Let our differences be adjusted by court (dike) according to our treaty. If you do not listen to reason and start a war, by the Gods, we will strike back on you in like manner (78, 2-4)."

After this long speech the Lacedaemonians withdrew for private consultation. Their opinion was that the Athenians were the offenders and that war should be declared against them as quickly as possible (79, 2). But Archidamas, king of the Lacedaemonians,

[4] A very true prophecy indeed in the light of what actually happened after the Peloponnesian War and had even happened just after the Persian Wars (cf. 95).

a man of good judgment and descretion ('aner xynetos dokon 'einai kai sophron) made a speech against war.

"How," said he, "can we fight an enemy away from here without ships and money? We can not fight so well far away as we can fight here in Peloponnesus. The Athenians have wealth, ships, horses, weapons, and many allies as their subjects (symmachoys phoroy 'ypoteleis 'echoysi, 80). Shall we waste their land? They have other large territories. Shall we instigate their allies to revolt? But we need ships! Unless we can check their resources or destroy their fleet we shall rue it more than they. For I fear that this war will last even for our children (81). I do not mean that we should lie supine. But first let us try by negotiations without either threatening war or suggesting inactivity. Meanwhile we can prepare (82). For the war *will be* ('estin 'o polemos) not so much a matter of arms as of expense.[5] Let us get money, then, before we lose our heads by listening to the arguments of our allies (83). Let us not be ashamed because they call us slow and dilatory. Nor let us underestimate the ability of the Athenians."

But Sthenelaidas, the Ephor, was displeased at these words and made a short but vigorous speech for war saying bluntly that he did not see what the Athenian speech had to do with redress of grievances. He urged the Lacedaemonians not to abandon their allies, saying: "Let us avenge our allies (timoretea) as quickly as possible so that others may think hard before wronging us or our allies." His concluding remarks are significant: "Vote, therefore, O Lacedaemonians, for a war worthy of Sparta and do not allow the Athenians to grow greater. Let us not betray downright (me kataprodomen) our allies; but by the help of the Gods let's punish the wrongdoers (86)."

The Lacedaemonian vote was almost equally divided, but Sthenelaidas slyly made those wishing war stand apart from the others, thus taking advantage of their sense of prowess and feeling of shame. When this was done, a majority of them declared (gnome) that the Athenians were the offenders ('adikein) and voted that the truce[6] had been broken (87).

After this vote the Lacedaemonians sent to Delphi to consult the God whether it would be better for them to fight. The Oracle

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[5] Refer to the World War and the debts contracted by the warring parties.

[6] This happened in 432 B. C., fourteen years after the Thirty Years Truce had been made (87). Thucydides tells us that the Lacedaemonians voted thus not so much from being persuaded by the arguments of the allies as from fear of the Athenians lest they become greater ('oson phoboymenoi toys 'Athenaioys me 'epi meizon dynethosin) (88). Perhaps this fear and jealousy began from the very time the Athenians had become leaders of Greece, shortly after the Persian Wars. We have seen how the Spartans made attempts to stop the building of the Athenian walls and how they were frustrated by Themistocles (90-93; 107, 4). In another chapter (118, 2) Thucydides says that the Lacedaemonians, seeing the progress of the Athenians, did not try to impede them except to a slight degree ('epi brachy). But when the Athenians clearly grew beyond question (saphos 'ereto), and began to annoy ('eptonto) their allies, "then the Lacedaemonians thought that they should bear it no longer but try to bring down the Athenian power if they could (118, 2)." Although this fear and hatred began as soon as the Athenians had obtained the hegemony, yet it did not take such dimensions before some of her allies revolted and were reduced to dependencies. This aroused the suspicion of many states that had not been unfavorably disposed toward Athens up to that time (cf. 114-115).

said that if they should fight with all their might they would win. Even the God himself would help them.[7]

Be it as it may. After consulting the oracle the Lacedaemonians called a meeting of their allies and asked them to vote as to whether they thought it necessary to fight. In this conference each state having any complaints came forth boldly and expressed them ('eipon 'a 'eboylonto). Most of the states blamed the Athenians and insisted on war. The Corinthians canvassed first each state privately to vote for the war, fearing lest Potedaea capitulate before the war was declared (me prodiaphthare). Then coming forward they spoke again before the congress (119).

They asked their allies now to vote for the war since the Lacedaemonians had voted for it, complimenting the latter for the care they took of their allies; whereas in their first speech the same Corinthians accused them of indifference, slowness, and inaction.[8]

They took up this war because they had been wronged. When they had punished the Athenians ('amynometha), they would bring it to an end. There were many reasons why they should conquer. They had greater numbers and better fighting skill and discipline. As to the fleet, though the Athenians surpassed them, they could build one from the money at Delphi and Olympia, and hire the Athenian mercenary sailors for themselves: "The power of Athens," said they, "is procured for the most part by money. We can take Athens in one sea-fight! If not, we can become their equals by study (meletesomen); for, what they have learned, we, too, can learn; but what nature gave us, they can not acquire by learning. As for the lack of money (121, 1-4) well, we have other ways of fighting them; for example, by instigating a revolt of their allies from whom they derive their means. We could besiege their city and do other things which one could hardly foresee at present. War finds its own ways and means. Let us remember that they are stronger in regard to concentrated power and much stronger than each of us singly, and therefore we must offer them a united front. Separately and individually they will beat us."

Then they discussed the policy of the allies and encouraged them for the fray (121). It was hereditary with them to enjoy the fruits of virtue with labor. Besides, the God himself promised them help. Then, too, the rest of Greece would come to their side, some from fear, lest they too be subjected, and others from desire of winning their freedom. "Do not fear," they said, "lest you are breaking the truce first; for not those who defend themselves are guilty of such a thing but those who attack first (123; cf. 144, 2). So, since everything is all right with us, let us help the Potedaeans, who are Dorians and who are besieged by Ionians. Vote then, dear allies, for the war, without fear! Free the enslaved Greeks, make the world safe for Democracy! and live for the rest of your lives in peace!

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[7] This goes to show clearly that nearly all Greece was against Athens (cf. page 108 of this article); unless we take the oracle as ambiguous and as meaning simply "to any one city fighting with all her might the victory would go, etc. (118, 3)."

[8] Cf. 69, 5, 70, 1; 71, 1-4, etc.

From war comes assured peace. We urge you to it from common interest (koine), yea, in the interest of all, since the surest pledge for states and individuals is the same interest (tauta) which binds them (124)."

Thus did the Corinthians end their speech. The allies both small and great voted for the war, but thought it would be hard to start hostilities at once because of their unpreparedness. Nearly a year elapsed before they took up arms openly and invaded Attica. Meanwhile they were trying to gain time by diplomacy with the Athenians, charging them with offences in order that they might have the strongest possible excuse for fighting if the Athenians should not comply with their demands (126).

First the Lacedaemonians sent ambassadors to Athens ordering them to drive out the "curse," meaning thereby Pericles, since his family, on his mother's side, was connected with the Alcmaeonids, who had taken part in the murder of Cylon (126); though of course they did not mention Pericles[9] at all. But the Athenians in turn ordered the Lacedaemonians to drive out their own "curse" that came from Taenaron, meaning by it the disgraceful execution of Pausanias, whom they forced to die in the Brazen Temple of Athena.

The Lacedaemonians, though failing in their first embassy, came back again and demanded that the Athenians raise the siege of Potedaea (apanistasthai) and let Aegina be free. But they placed even more emphasis on the Megarian Decree[10] (cf. 42 and 67), making it very clear ('endelotata) that if the Athenians should rescind it, war would not take place. But the Athenians, just as they had paid no heed to their other demands, so now they did not abolish the Megarian Decree, charging the Megarians with infringing upon the "no man's land" of the holy ground and of cultivating it. They also charged the Megarians with receiving their runaway slaves who went there, evidently knowing that they would become free.[11]

Then a third and last embassy came to Athens from Lacedaemon, consisting of Ramphius, Melisippus, and Agesander. These men did not repeat their former demands, but brought on new grounds[12] for complaint, namely, that the Lacedaemonians wished to have peace and that there would be peace if the Athenians would let the Greeks become independent ('aytonomoys).

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[9] They perhaps did not hope that the Athenians would actually drive Pericles out but they hoped that this would weaken his position and hold on the people, or would split the unity of the Athenians, by instilling in them the belief that the war would be partly due to Pericles himself (127).

[10] F. M. Cornford (**Thucydides Mythistoricus**, p. 51) speaks of three decrees, the last of which declared "a truceless war with Megara" (April, 431).

[11] Plutarch says in his **Life of Pericles** (30, 3; cf. also 395) that the decree was passed against the Megareans because the latter had killed one of their heralds who had gone to Megara for negotiations. Thuc., who speaks of the Athenian invasion to Megara (II, 31; I, IV, 661), does not mention the herald's death, but Pausanias (I, 36, 3) mentions even his name, it being Anthemocritus. See H. A. Holden's ed of **Pericles** (London, Macmillan, 1894), 1-181 **ad locum.**

[12] The reader will doubtless recall the familiar myth of Aesope, "The Wolf and the Lamb."

The Athenians called an assembly to deliberate the matter through once for all ('edokei 'apax peri 'apanton boyleysamenoys), and to reach a conclusion. Different men expressed their opinions, some for and some against the Lacedaemonian proposals. Some suggested that Athens should rescind the Megarian Decree if it stood in the way of peace. But Pericles came forward and spoke (139).

"The Lacedaemonians," he said, "are clearly plotting against us now as they did before. For though it is written in the treaty that our differences should be adjusted by arbitration (dikas men ton diaphoron 'allelois didonai kai dechesthai), yet they never asked for arbitration (dikas). Nor do they now accept it when we offer it, but they want to settle our so-called "offences" ('egklemata) by war rather than by parley and understanding (logois). Even now they are here ordering us, not expostulating with us. They ordered us to raise the siege of Potedaea, to let Aegina be autonomous, and to abolish the Megarian Decree. Now these last have come here telling us to let (all) the Greeks become free! Let no one think that we would fight for a trifle (peri bracheos). There will be war even if we should abolish the Megarian Decree, on which they especially harp (proychontai) by alleging that if we were to abolish it there would be no war.

"If you shall yield to this now, straightway they will order you to do some bigger thing. They will think that you will obey this, too, from fear. But if you strongly reject this proposal you will make it clear to them, once for all, that they should treat you as their equals (prospheresthai). Let us then decide to fight and not to yield (140)."

Then Pericles went on to tell the Athenians of the advantage they had over the Peloponnesians, if war should come.[13]

He continued: "The Peloponnesians are farmers and poor at that; unused to the sea, and can not fill many ships, or make many expeditions. In case of absence from their land they eat their property. War is won by resources rather than force of arms.[14] The Peloponnesians are strong enough for a pitched battle but can not endure a long-drawn war, at least against superior resistance, since they have not one command. They have equal vote and yet are not of the same race. Some pull one way and some another. It takes them a long time to come together; and when they do come together they consider the common good only for a short time, looking for the most part for their private duties, while each trusts that others will take care of the common affairs (141).

"They will be hindered most of all in respect to money. War does not wait. We shall not fear their navy. Nor should we fear their encircling us by a chain of forts ('epiteichisma). Even if they should get hold of a fort, they can not invest us entirely, whereas we can go with our ships and retaliate. We have more experience

[13] This is almost diametrically opposed to the remarks made by the Corinthians (cf. 121-122) in the Second Congress, but is very much like the speech of Archidamas (cf. 80ff.).

[14] Cf. to the World War.

on the land from our navy than they have on the sea from their experience on land. Besides we shall not give them time to practice (142). If they should take the money from Olympia and Delphi and try to win our mercenaries, the metics and we would be more than match for them (143, 1), since most of our citizens serve in the ships, and all the pilots are Athenians. Our men would not bear to lose their country for the paltry extra salary the Peloponnesians might offer them.

"The enemy will come to our land. We shall go to theirs. We have more land than they. Moreover, let us not consider our property, but our lives, for men make money but money can make no men (143).

"Everything will come out well if we do not add any self-chosen dangers. I fear more our own faults than the cunning (dianoias) of our enemies. But of that some other time. At present let us answer the ambassadors that we will allow the Megarians to use our markets and our harbors if the Lacedaemonians will cease to drive us and our allies from their land and markets. One is just as strong reason as the other. As to the states that are subjected to us, we will let them be independent if they were so when we made the Truce; and, if the Spartans give their states independence not according to the Lacedaemonian taste, but as each state desires. Thirdly, we are ready to submit our dispute to arbitration according to the treaty and will not start war. But we will ward off the invaders (cf. 123). Let us then undertake the war with eagerness, since fight we must. Our Fathers, with fewer means than we, fought and made our state what we have found it, even though the Medes were more numerous. We, too, must not fall below them (144)."

Such was the eloquent speech of Pericles who contested nothing smaller than "the principle" of the thing.[15]

The Athenians accepted his counsel. They answered the Lacedaemonians according to his advice, point by point. In summing, they said they were ready to arbitrate for the settlement of the Corinthean grievances but on equal terms ('epi 'ise kai 'omoia). The Lacedaemonians, having heard this answer, returned home and came no more with official embassies (145). Such was the outcome of the long-drawn diplomacy. It failed utterly.

Recriminations soon took place and parties came and went to Athens but without any formalities ('akeryktos) and always with suspicion.[16]

A weak and final effort toward conciliation was made later on by King Archidamas, the same person who had made the only speech

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[15] Cf. 140-141, and page 112 of this paper and note 11.

[16] Plutarch in the **Life of Pericles** (33, 1), on the authority of Theophrastus says that before the Truce was concluded Pericles used to send to Sparta ten talents each year to delay the war. It is hardly conceivable that Pericles gave that money to Sparta as a direct bribe, if Theophrastus is to be trusted; perhaps the money was spent "for general diplomatic purposes." See H. A. Holden's ed. of Pericles, ad locum (p. 159); A. Holm, Geschichte Griechenlands II, p. 238, Anmerkung 7; G. Busolt, Griechische Geschichte II, p. 550, Anmerkung 1.

in the Spartan Assembly, trying to dissuade the Lacedaemonians from voting for war (cf. 80-85, and page 109 of this article). Evidently from his own initiative he sent Melissippus,[17] the Spartan, to Athens to see if perchance the Athenians would yield now, inasmuch as the Peloponnesians were on their way to Attica to lay it waste. But the Athenians received him not, nor brought him to the assembly ('epi to koinon); for, as Thucydides says, the advice of Pericles had from the first (proteron) prevailed that the Athenians should receive no herald and no embassy from the Lacedaemonians if they had actually led their army into Attica ('exestrateumenon). So without giving him a hearing they sent him back on the same day and told him that if the Lacedaemonians returned home with their army they might send ambassadors about whatever matters they wished; otherwise they would not treat with them. The Athenians even escorted Melisippus that he might not talk and influence any one of the Athenians about peace, or cause division among the Athenians by his offer of peace.

Thucydides gives a touching account of the moment when Melisippus was about to part from his escorts. On taking leave he said pathetically, "This day will be the beginning of great evils to Greece." (Bk. II, 14).

Thus ended the long-drawn negotiations and diplomatic endeavors of the Peloponnesians and the Athenians, which had started with the Corcyrean affair. These negotiations the reader may not find unlike the ones that took place before the World War of 1914. There are in fact many points of similarity between these two wars,[18] since human nature is not much different now from what it was then, as Thucydides in his foresight claimed that "the future according to human nature will be something like the past." ('osoi de boylesontai ton te genomenon toioyton kai paraplesion esesthai).

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[17] Melissippus was one of the former ambassadors sent to Athens by the Lacedaemonians.

[18] The reader who wishes to pursue these analogies may further read Gilbert Muray's book, **Our Great War and the "Great War of the Ancient Greeks."** (N. Y. Thos. Seltzer, 1920), and W. Deonna, "L' Eternel Present" in Revue des Etudes (Grecques) XXXV (1922) pp. 1-62, 113-179.

HUMAN-WELFARE LIGHTS AND SHADOWS IN THE BRITISH ISLES*

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WITH THE ABANDONMENT of the gold standard in the fall of 1931, Great Britian began her economic and social recovery from the world depression. Thus she was the first of the large countries definitely and consciously to enter upon new governmental and business policies which, on the whole, have had favorable results upon human welfare. The total picture is not a bright one; indeed, in the minds of some students and commentators, the basic policies are highly experimental and based upon temporary and shifting principles rather than upon sound, permanent, and fundamental changes in the British economic and political systems. In the judgment of the writer this honest difference of opinion as to how temporary or permanent may be the present trends in Britian is, for the present, largely an academic and not a practical question.

In the light of this situation, therefore, it is of interest to sketch roughly a few of the more significant trends and achievements, also some of the failures to achieve, as suggested by actual present conditions. This approach to an analysis of British conditions seems all the more justified because Britian, more than any other large nation in modern times, has shown a strong tendency to experiment rather freely with political, economic, and social problems and processes and not to be unduly fearful of supposedly derogatory terms and phrases. "Socialism", "Fascism", "Communism", are not only *words* in England, but they represent the ideas of substantial groups of citizens and voters. While the Conservative or National party has been in control of the government, by a large majority, since the fall of 1931, the Labor or Socialist "Opposition" has constantly mustered 100 to 150 members of the House of Commons. There is now also a Communist member, representing a London constituency. The Fascist organizations are rather numerous.

The term "muddle through" is not a descriptive phrase of which the English people are especially proud; and the muddling process *may*, in the uncertain future, turn out to be disastrous. Up to the present time, however, this experimental, tentative, sometimes inconsistent, procedure of the Britons has brought some positive results during the last quarter of a century. It is to a brief analysis of these results, favorable and unfavorable, that the balance of this paper is devoted.

1. Favorable or Positive or Constructive Results.

A. *Government aid to agriculture.* During the world war the German submarine campaign came dangerously near to shutting off England's food supply and winning the war for Germany. The people and the government have not forgotten this experience and they have resolved more fully to develop potential food-production

* This paper is based partially on the personal observations and inquiries of the writer in Great Britian in the summer of 1936.

capacities. It is not intended to make the country self-sufficing as are the United States, Russia, Canada; but it *is* believed that, by means of public subsidies for certain crops and products and by the encouragement of more scientific and intensive agriculture, great steps *toward* a more adequate food supply can be taken. The grain farmer has, *relatively*, passed from the picture, but live stock production for meat and dairy products is having a high degree of prosperity. The writer visited the weekly cattle market in Dorchester, the heart of southwest agricultural England. The number and quality of animals on sale and the prices paid give evidence of a flourishing live stock industry.

In certain limited sections excellent wheat and hay are grown too, and a liberal subsidy is allowed the producer of wheat. There are yet many unrealized agricultural possibilities in England; and the public policy has in recent years definitely shifted from a deliberate neglect of agriculture to a policy of fostering and encouraging better quality and greater quantity of farm products. The great Rothamstead Experiment Station is perhaps the oldest and one of the most efficient agricultural experiment stations in the world and its activities have been greatly stimulated by the new public attitude toward the agricultural industry. While the farm laborers and tenants and their families still have rather low living standards, the average is better than the average for the United States and the tendency is distinctly upward.

B. *The Housing Problem and What Is Being Done About It.* Even the destructive calamities of modern bloody wars sometimes leave unexpected but desirable by-products. Perhaps this is the sociological version of the statement in biblical literature that "God maketh even the wrath of man to praise Him." Anyway the putting into action of England's thorough-going housing reforms grew directly out of the facts brought to light in London and other large cities by the operation of the universal military conscription law in the early part of the world war. It was found that large sections of the slum population of East London yielded hardly any men fit for military service. The few men that were accepted, when the physical examination standards were necessarily lowered as the war dragged on, had to be conditioned in training camps for a year or more before they were ready for military duty.

These sadly disillusioning experiences of the British government in having to reject as physically unfit thousands of men from the crowded city regions roused the government to action. Soon after the war closed, well thought-out plans were put into effect for tearing down ramshackle dwellings that harbored vermin, filth, and disease and replacing them with adequate, modern dwellings, not luxurious, but sanitary and with many modern conveniences. The various housing acts passed by Parliament in the years immediately following the world war have been administered efficiently and economically. The work of reconstruction of the living quarters of the English wage-earning population is still going forward. While many German cities before the war, and Vienna, Austria,

after the war, pioneered along these lines, providing large numbers of adequate workers' homes, in the last 10 years England has probably led the world in this field. Even the casual visitor to London cannot escape observing the vast amount of new and attractive housing projects that dot the landscapes for miles as one approaches the city of London from the West, South, or North. To be sure, some of these projects, the more expensive ones, have been built by private capital, but the vast majority have been constructed under government auspices. About half a million people in greater London have already been moved into these new homes. The official representative of the London County Council Housing Authority, under whose auspices this housing program is carried on, guided a group of men and women from the International Conference on Social Work, as they visited the new housing and also the old slum sections. This man made the positive and deliberate statement that "all these slum dwellings are coming down—we don't know how long it will take, but the job will be done."

There are two distinct types of housing projects. One type is that of the four-story apartment building, housing about 150 families. These homes are well within the city limits but are built on tracts of land with space enough for play and some outdoor life. A clubhouse is near by. This type is for the lowest wage-earning group of unskilled or semi-skilled workers. The rent varies from about three pounds to five pounds ($15 to $25) a month, depending upon number of rooms in the apartment. Public utilities, including electric laundry, are furnished at very low rates. A trained man or woman, of good business and human judgment, is in charge of each group of apartments, collects rents, sees that regulations are carried out, and is the official representative or manager for the Housing Authority. Some of these apartments have been operating for five years or more and practically no difficulty is encountered in the collection of rents or in general behavior of the tenants.

The other type of low-cost housing is usually on the outskirts of the city. The residents have somewhat higher incomes and travel greater distances to their work. The writer and his companions thoroughly inspected one of these typical homes, an attractive two-story, six-room bungalow, with vegetable and flower garden in the rear, grass lawn in front. The head of the family of five was a bus driver with a salary of about thirteen pounds ($65) a month.

Inasmuch as the British housing program has, justifiably, attracted international attention and, barring unexpected difficulties, is on the way to a relatively complete solution of England's housing problem, it may be worth while to specify some of the characteristics of this program that seem to be the bases of its success.

1. The land or site aspect of the program is simply, promptly, and efficiently handled. When a suitable site has been selected by the housing authority, the land is appraised and if the private owner is not willing to sell at the appraised value, condemnation

proceedings in a very short time give the housing authorities full right to possession; construction is started immediately. Long-drawn-out technicalities or disagreements among different governmental authorities are not tolerated. Our American efforts along these lines should profit by the English example.

2. The Public-Health Authorities Have a Large Share in the Planning and Promotion of the Program. Whenever they report a dwelling or group of dwellings unsanitary, or dangerous fire hazards, or generally unfit for human habitation, the community in which the dwellings are located is eligible for a government loan for a substantial part of the needed new housing project. This law prevails not only all over England, but in Scotland, Northern Ireland, Wales, and the Irish Free State. Perhaps the United States could increase the progress in construction of low-cost housing if the slum situation were recognized distinctly as a health problem.

3. A Government Low-Cost Loan, to the extent of 20% or more of the total cost, and amortized over periods of 20 to 40 years, and with government supervision of construction and operation of new housing, is a significant factor in the whole set up. England's civil-service system, of long-recognized standing, probably justifies this thorough-going government control more than would be the case in the United States with politics (both local and partisan) playing a large part, so far at least, in our attempts to provide housing for low-income groups.

4. Another factor making for the success of England's low-cost housing is the willingness of both organized labor and employing contractors to keep costs down to a reasonable point. The same principle applies also to costs of building materials.

C. The third aspect of the English sociological situation that is distinctly favorable to human welfare is the *broad system of social insurance*, parts of which have been in operation for a quarter of a century. There are three main features of this program which we shall briefly sketch:

(1) Old-Age Assistance, while modest in amount, is dependable, is operated efficiently and economically, and certainly saves many aged men and women from a pauper's existence in their declining years. The delegates to the London International Conference on Social Work were given opportunity by the London County Council Housing Authority to visit some of these aged couples in their homes. For the equivalent of about $50 a month a couple lived in security and self respect, being free even to exercise the cherished British prerogative of complaining about the government's penuriousness in not giving them a more generous dole. The lot of the aged poor in England is also made more tolerable by the fact that all old-age pensioners are entitled to free medical and health service.

(2) Health Insurance in England is working remarkably well. It covers practically all persons having incomes under $2000. Those covered make regular weekly and monthly payments into the fund,

and only the administrative costs are paid by the national government. A district inspector supervises the program in the local communities, and all doctors who so desire and qualify may serve on the "panel". Each doctor has from 100 to 200 families on his roll and receives about $3000 a year for his services. All ordinary diseases and accidents are cared for; even a *part* of the costs of obstetrical care and dental treatment are provided. A very important fact in the system is the local advisory committee, consisting of representatives of the insured persons, the doctors, and the government representatives. The trade-unions and other dependable local groups are often the agents of the government in administering health-insurance benefits. This committee hears complaints of any insured persons who feel they have been neglected and also makes any recommendations they think appropriate for the improvement of the service. On the whole the health insurance plan is working remarkably well.

(3) The third important aspect of English social insurance is the Unemployment Benefits. Even though the actuarial insurance feature broke down during the severest part of the depression period, necessitating borrowing about 100 million pounds from the national treasury, the system as a whole seems to be a settled and accepted fact from one end of England to the other, also in Scotland, Wales, and northern Ireland. The government officer in charge of one of the large Glasgow "employment exchanges" told the writer that the unemployment insurance policy, from the British viewpoint, is not only justice to the worker but a relatively inexpensive preventive of revolution. He also said that the unemployment service is not only now self-sustaining, but is in process of paying back its loan from the government. He resented strongly the idea of many Americans that the British "dole" is pauperizing to the recipient and will bankrupt the government. The men receiving unemployment benefits are required to report regularly and frequently at the employment exchange with which they are registered and are required to accept any reasonable job offered them. These employment exchanges in Great Britian serve the double purpose of connecting men and jobs and of administering the unemployment insurance funds.

When we turn to the sociological shadows in the British picture there are tragedy and suffering to be portrayed; for, like America, England's revived prosperity is sadly spotted. Important sections of the population are still under the blights of stranded industry and unemployment, running back for 10 years or more. It is true, as an offset, that the one-third of England's population that live and work in the London area are more than ordinarily prosperous. In addition to the constant factors of financial, industrial, and governmental activities which center in London, the great new industries of automobile manufacture and related operations have seen fit to locate in this area. Thus there is steady employment at good wages, enormous wholesale and retail trade domestic and foreign, and vast new housing projects already referred to in this

paper. The recently stimulated war industries are also chiefly in the London area.

But when the interested observer travels, in a few hours from London, to Newcastle-on-Tyne, to Glasgow, Scotland, to South Wales, or to certain other sections, evidences of poverty and long-continued unemployment are found on every hand. The British government and the public generally have invented a new phrase for these unfortunate sections; they are called "the distressed areas"—a very suitable term. Long and earnest debates in Parliament and in the leading newspapers, as to what measures could or should be taken to relieve the economic and social suffering of these populations, have so far brought little substantial relief. We now turn to specific, brief comment on each one of the five "distressed areas".

1. Newcastle-on-Tyne, in northeastern England, with an excellent harbor for trade and shipbuilding, in pre-war days was busy and prosperous with the making and launching of both commercial and wartime craft of various sorts. With the tremendous set-back to British world trade caused by the war, Newcastle-on-Tyne sank back into a "ghost town". When the writer visited this port on his way to Norway in 1926, the harbor was lined with idle boats, large and small. Thousands of stranded seamen and their families picked up precarious livelihoods by odd jobs and eked out their living by government doles. The situation in 1936 was little better.

2. Glasgow, Scotland, the second largest city in Great Britian, and still one of the two or three largest ship-building centers in the world, is in much the same plight as Newcastle-on-Tyne, and for substantially the same reason. The miles and miles of dry-docks, of huge derricks for loading and unloading cargo and of idly floating boats with their smokeless funnels, told us the story as we rode on the train down the banks of the Clyde into Glasgow in July, 1936. To be sure, the building of the trans-Atlantic liner Queen Mary and the promised building of a companion ship have greatly cheered the downcast shipbuilding companies and their workmen, but there are still tens of thousands of able-bodied workmen idle, with their families on public charity. The drastic decline in foreign trade since the world war has naturally dealt a severe blow to the employers and employees in the country that *was* not only the outstanding nation in that trade, but also built more of the ships to carry that trade than any other nation.

3. Liverpool and Merseyside, in western England, have been hard hit not only in their shipbuilding industries but by heavy losses in actual trade and shipping as well; both passenger and freight traffic having shifted heavily from Liverpool to Southhampton and London in recent years. As London is more and more the final point of destination of both passengers and freight entering England, the aim is to route that traffic by the quickest and most direct lines, which are via Plymouth or Southampton or up the Thames river, an all-water route direct from New York to London.

Much traffic from India and Mediterranean ports also goes to the London docks direct. All these shifts of maritime business, which was once the glory of Liverpool, have left her in the lurch, so to speak. Evidences of various kinds are visible that she has seen better days. In a short 15-minute walk in the middle-class residence and shopping section the writer noticed 10 "for sale" or "to let" signs on rather large and no doubt once profitable buildings and apartments.

4. Only a short distance from Liverpool is Manchester, the center of the largest cotton textile manufacturing business in the British Empire. While the Manchester district is still a large producing center for cotton goods, the growth of textile mills in India and the keen competition of Japan for former profitable British markets, as well as the great expansion of cotton manufacturing in the United States, have combined to pull down England's cotton-goods industry from its former high state. Desperate efforts are being made to revive the industry by "rationalization" and by government subsidies of various kinds. "Rationalization" refers to improvement of technical processes and also to financial corporation organization and administration, more or less on the American model. These efforts have not been altogether fruitless, but Manchester strongly bears the marks of a city which is in economic distress. In July 1936 one of its leading newspapers was carrying on a vigorous campaign, both in its news columns and on its editorial pages, to secure more government loans and subsidies. The tone and method of argument used in this campaign reminded the writer strongly of the urgent requests which many of our American states and cities have sent to Washington for P. W. A. and W. P. A. projects. The tendency for a local community to look to its national government for the financial support of its declining resources seems not to be limited to any one country.

5. When we come to South Wales, we are in the midst of the most truly "distressed area" to be found in all Britian. Due to the drastic decline in the demand for British coal since the world war, more than 100,000 Welsh miners and their families are almost entirely on government charity, the dole. The continued mechanization of mining processes forecasts more rather than fewer unemployed miners in South Wales. Also Poland, Germany, and other cheap-coal-producing countries have stolen away, by cut-throat competition, some of the best foreign markets for British coal.

Many sturdy, grown-up men, 30 years old, have *never* had a real job in South Wales. Naturally, under these conditions, housing and all other living conditions have vastly deteriorated. Many remedial proposals have been made, but none put into effect that has any appreciable influence in bettering conditions. The government offered free transportation to the Dominions, but the Welsh coal miners said No. The development of self-sufficing agriculture has been suggested, but soil conditions in South Wales are not encouraging. It has been proposed that about half the population be transported bodily to some other part of Great Britian, but no

other section wants such a group, and the people themselves do not want to leave their life-time homes. It was in this desolate region of South Wales that King Edward VIII visited a short time before his abdication. He was in the homes (or "hovels" as he called them), he talked personally with the people and observed their wretched conditions. He told them that "something must be done and something would be done" for them. Some of the most authoritative commentators on Edward's abdication have said that these remarks of the king, more than his love affair with Mrs. Simpson, forced his abdication. The cabinet and the ruling classes in England did not like the idea of their King (who is not the responsible government) making such promises or irresponsible remarks. However this may be, it certainly is one of Britain's human tragedies that one of her formerly prosperous communities has been reduced to the point where 80 percent of her able-bodied working population are without jobs to earn their daily bread.

As we conclude this analysis of the sociological lights and shadows of present-day Britian, we can not quantitatively or statistically balance the lights against the shadows. Perhaps it is another case of the inextricable mixture of the wholesome and the unwholesome, the desirable and the undesirable, that make up so much of the warp and woof of human life. At least, as socially minded persons, interested in the welfare of our fellowmen, we may be allowed to hope that ways may be found, in the British Isles, to *increase* the positive and constructive factors in the social organization and to *decrease* the destructive and negative factors.

HUEY LONG'S FIRST SESSION IN THE UNITED STATES SENATE (January 25 to July 16, 1932)

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HUEY PIERCE LONG has been characterized as the ablest politician of the South since the Civil War.[1] He has also been rated as a demagogue[2] and as a left-wing Democrat whose position within the ranks of this party is similar to that held by the LaFollettes among the Republicans.[3] Born in 1893 of a poor farm family in Winnfield, of northern, rural Louisiana,[1] he became the champion of the Southern dirt farmer, who has been steadily losing control in an area becoming industrialized.[3] As he claimed, during his early childhood he saw the advantages enjoyed by the weak over the strong, with the result that he early developed a sympathy for the handicapped and the underprivileged.[4] In his native Winn Parish, an area strongly pro-Union in Civil War days,[1] he saw a strong neighborly spirit of helping one another, with nobody in need if any one of the community "had things beyond his own immediate requirements."[4] His progress through school and his year and a half of legal studies (six months in the University of Oklahoma and one year in Tulane) were interspersed with the varied activities of a salesman in more than one line of goods, all of which culminated with his admission to the bar in Louisiana on May 15, 1915, at the age of 21.[5] As a lawyer he championed "the small man—the under dog",[6] until after 1924, when, for the next four years, he took the cases of some millionaires and corporations who were fighting millionaires and corporations more powerful than they; and, with the large fees he received, he was able to build a $40,000 house in Shreveport, Louisiana.[7]

In his days as a practising attorney he became a stockholder in some independent oil companies; and the attempts of the Standard Oil to choke out the smaller competitors in Louisiana, including his own companies, made him a bitter foe of the oil trust.[8] In the remaining years of his life he claimed to see this powerful combination back of all forces that opposed him.[9] In fact, it was the arch-villain of the great melodrama of which he was the hero, the holders of large fortunes the dupes, and the common man the fair maiden in distress.

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[1] Statement of George M. Reynolds, State Director of Resettlement in Mississippi, before a session of the American Historical Association, Chattanooga, Dec. 30, 1935. Mr. Reynolds, a native of Louisiana, was a life-long acquaintance of the late Senator Long.

[2] Brooks, Robert C. **Demagogues, Past and Present.** (Paper read before a joint session of the American Historical Association and American Political Science Association, Chattanooga, Dec. 30, 1935).

[3] Robison, Daniel M. **Southern Political Leaders—Tillman to Long.** (Paper read before a session of the American Historical Association, Chattanooga, Dec. 27, 1935).

[4] Long, Huey Pierce: Every Man a King (New Orleans, 1933), 2.

[5] **Ibid.,** 7-18.

[6] **Ibid.,** 37.

[7] **Ibid.,** 87.

[8] **Ibid.,** 25-50 ff.

[9] Daniell, F. Raymond. **The Gentleman from Louisiana** (article in **Current History,** Nov. 1934, 172-178).

As governor of Louisiana from 1928 to 1932, his administration has several constructive achievements to its credit. It increased the severance tax on oil and abolished the poll tax as well as the state levy against small homes and farms. It reduced public-utility rates, built a first-class highway and bridge system, reorganized, enlarged, and rebuilt the State University, gave Louisiana free text-books, school busses, night schools for adults, and traveling libraries; and it accomplished all these progressive changes with no excessive tax rates or driving of capital from the State.[3]

In his own words he sought election to the United States Senate for three reasons:

First, as a vindication, or endorsement of his record as governor, by the voters of Louisiana.[10]

Second, because the Standard Oil had frozen him out of the oil business, thus forcing him to go into law and into politics.[11]

Third, and, as he claimed, his only project, "by every means of action and persuasion," to "do something to spread the wealth of the land among all of the people."[12]

This last-mentioned item seems to be the central keynote of his policies while in his first session in the United States Senate. It influenced his stand upon nearly all the questions he discussed. According to his own statements, his attention was first called to maldistribution of wealth when a lad of eight. He saw a farmer's goods sold at public auction for debt; and the purchaser was a man who had no use for the goods he bought.[13] In March, 1918, at the age of 24, he wrote a letter to the New Orleans *Item,* in which he claimed that 65% of the wealth was then owned by only 2% of the people; and that only 2% of the wealth was owned by 68% of the people; and that the masses were owning less in 1910 than they did in 1890.[6] He claimed that the Standard Oil and other vested interests were back of the move to impeach him as governor in 1928, and as evidence mentioned, among several items, the fact that the New Orleans *Times-Picayune,* which led in the fight against him, was controlled by a railway, telegraph, and power attorney, president of the Board of Administrators of Tulane University, "on which sat others affiliated with such interests," and that Tulane itself "was largely supported by the Rockefeller Foundation."[14] He won his race for the Senate by claiming that his opponent, Senator Ransdell, was backed by Sam Zemurray, the multi-millionaire head of the United Fruit Company, a man who had caused the United States Government to keep troops in Central America.[15]

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[10] Long, Huey P., **op. cit.,** 211.

[11] **Congressional Record** (Washington, 1932), **72d Congress, 1st Session,** 10551. All other references to the **Congressional Record** will be limited to the volumes for this particular session and Congress, therefore, will be cited only by the page number.

[12] Long, Huey P., **op. cit.,** 290.

[13] **Ibid.,** 3-4, and Lee, Rose. **Senator Long at Home** (article in **The New Republic,** May 30, 1934, 67-68).

[14] Long, Huey P., **op. cit.,** 181. The writer, a Tulane graduate, frankly believes this attempt to connect Tulane with any attempt to impeach Governor Long rather an extreme and unwarranted exaggeration.

[15] **Ibid.,** 213-219.

Long held that the uneven distribution of wealth was the true cause of the depression. He assumed that the amount of land, houses, food, and clothing in the world was constant; yet enough and more than enough for the whole human race if all people were reasonable. He argued that if any individual took more than his share, the others would be crowded out of theirs; just as, in the hypothetical case of 100 people with 100 houses before them, one man were to take over, as his own, 99 of the houses and leave the other 99 men to do what they could with the one remaining house. He did not need the extra 98 houses; and he caused suffering and hardship to at least 98 of his fellow-men by his act. Likewise when one percent of the people own 99% of the wealth, the remaining 99% of the people would have no money with which to buy anything.[16]

A careful examination of the pages of the *Congressional Record* fails to show that he made any remarks about "bloated fortunes" or "share-the-wealth" until he had been in the Senate nearly two months. He took his seat on January 25, 1932; and on March 21[17] he made his first statements upon this subject when answering an attack made upon him in a *Washington Post* editorial of March 19. After denying charges of dictatorship in Louisiana, he showed that the report of the Industrial Relations Committee, appointed by President Wilson to study the economic distress then creeping upon the country, revealed that the wealth of the United States had been concentrated to a degree hard to realize; that, for example, two thirds of the people, in 1916, owned less than five percent of the wealth. He also quoted an editorial from a 1916 number of the *Saturday Evening Post*, showing America "a bloated aristocracy," lording it over the starving hordes, "with a margin of merely well-to-do in between." He also quoted from a pamphlet by Charles G. Ross, entitled *Our Country's Plight*, showing that one percent of the population owned 59% of the wealth. He held that concentrated wealth had caused the closing of many banks and the absorption of others; and the large commercial interests had taken over some stores and closed others, thus gradually converting American business into "one vast chain enterprise." He also admitted the general statement that America was drifting into communism. He quoted from the writings of the Jewish historian Josephus, to show the danger of great wealth in ancient times. He held that it was such a gigantic concentration of wealth in the hands of a few that prevented the people from having any money with which to buy anything or to pay their taxes; and he held that the only way to remedy this distressing situation of the masses, as well as to balance the budget, was to tax the inheritances of large fortunes that double every 25 years, and thus gradually to break up such large holdings and eventually bring about a more nearly equal distribution of wealth. Such a plan would also bring in plenty of money with which to balance the government budget. His purpose

[16] Ibid., 290-292.

[17] Congressional Record, 72d Congress, 1st Session, between the dates of January 25 and March 21, 1932.

was not to impoverish the multimillionaire or to deprive him of any of his luxuries, but simply to take from him all excess holdings that were not adding to his needs or to his luxuries. To support his contentions against so-called "bloated fortunes" he quoted scriptural passages showing how ancient Mosaic law ordered a periodic 50-year redistribution of land and of all other wealth. By heeding these warnings and inaugurating such a reform, Long insisted that the Democratic party could render the nation a real service of lasting value. He also quoted President Hoover's Indianapolis speech of 1931, and remarks of the late Senator Underwood of Alabama, wherein admissions were made that the present maldistribution of wealth had caused the present depression.[18]

On April 1 he made a lengthy speech, in which he again attacked large fortunes. Here he insisted again that a redistribution of wealth would give the common man a chance to live and that it would also balance the budget; that such a move was not to "soak the rich", but to save the rich from dangers of a social upheaval. He insisted that millionaires like Morgan, Rockefeller, and Baruch were fighting large inheritance taxes, large income taxes, and an oil tariff; and thus we of America have simply exchanged a tyrant George III for a handful of slave-owning landlords; and facing them are the poverty and starvation of the ever-increasing masses. He claimed that the 1929 figures showed that the total net earnings of 504 "supermillionaires" were $1,185,000,000—a sum large enough to have bought the entire wheat and cotton crops of 1930, produced by 2,232,000 American farmers. He also showed that the 1929 net income of the 85 largest income taxpayers was a total of $538,664,187, a sum large enough to pay the wages of the nation's 421,000 garment industry workers and leave a surplus of $100,000,000. He quoted from other writers, such as John Dewey and Dean Wallace B. Donham of the Harvard School of Business Administration, in support of his views, and he concluded his address with the parable of the foolish rich man.[19] He also tried to draw Senator Pittman of Nevada[20] and Senator Harrison of Mississippi[21] into a discussion of these ideas, but they refused.

On April 29 he introduced a resolution asking the Senate to instruct the Finance Committee to revise the revenue bill then under consideration, by taking away in taxes all surplus annual income in excess of $1,000,000, and all surplus inheritances above $5,000,000.[22] The refusal of the Democratic floor leader, Senator Joseph T. Robinson of Arkansas, to support such a resolution, led to a break between him and Long and to the latter's resignation from the committee appointments which Senator Robinson had secured for him. He also denounced Robinson as unfit for the post of Democratic floor leader and reiterated his contentions against large fortunes.[23] He also claimed his resolution would supply cash

[18] Ibid., 6540-6544.
[19] Ibid., 7372-7377.
[20] Ibid., 7767.
[21] Ibid., 7378.
[22] Ibid., 8556.
[23] Ibid., 9212-9218.

for the Treasury debentures, as well as aid for the farmers; and he lamented the fact that it had no chance of adoption by the Senate.[24] He continued his attack upon Senator Robinson of Arkansas on May 3 by inserting in the *Congressional Record* the write-up of the latter's law firm in Little Rock, together with a list of its clients;[25] and on May 12, after outliving a filibuster, he secured the floor and re-read this list, showing from it that the famous Arkansas Senator was an attorney for a Standard Oil subsidiary corporation, the Texas Company, and for some chain banks. He also called Robinson a "lost leader." He also claimed that his share-the-wealth plan was in accord with the preamble of the Declaration of Independence, and in accord with the principles held by Jefferson, Jackson, and Bryan, while Senator Robinson, by virtue of his frequent trips to the White House for consultation with the President, was following the dictates of Hoover, of Baruch, of Rockefeller, and of Ogden Mills.[26] He also quoted Lord Bacon, also some lines from Daniel Webster's oration on the commemoration of the first settlement of New England, wherein statements were made concerning the "curse of great wealth." He also claimed that he sought not to destroy, but to save the wealth of America.[27] He made his last plea for wealth-limitation during this session of the Senate, by quoting part of the Papal encyclical of May 18, 1932, and having the whole of this document inserted in the *Record*.[28]

This same hostility toward large fortunes guided Long in his stand upon taxes. He opposed extra taxes upon the small wage-earner, already hard hit by the depression.[29] He upheld the proposed tax on stock-exchange transactions because it would affect men who, according to his own words, had "lived for years out of the miseries and the slim profits that might have meant some convenience and comfort to the people of this country."[30] As we have seen, he stood for high income and inheritance taxes. When Senator Couzens of Michigan proposed an amendment to the revenue bill, reviving the old war-time income tax rates, Long held that such rates should not compare to what they should now be, because in 1932 a smaller percentage of the population held a larger percentage of the wealth than was the case in 1918.[31] He fought for this same Couzens amendment, because of the high rates it revived;[32] and when it failed to secure passage, he backed the Connally amendment, which was of a similar nature;[33] and he voted for it.[34] When this also failed to pass the Senate, he introduced an income-tax amendment of his own with high rates on incomes above the $10,000

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[24] Ibid., 9281.
[25] Ibid., 9482-9483.
[26] Ibid., 10060-10068.
[27] Ibid., 10395.
[28] Ibid., 10614.
[29] Ibid., 6543.
[30] Ibid., 7372.
[31] Ibid., 7376.
[32] Ibid., 10107-8, and 10276.
[33] Ibid., 10294-5.
[34] Ibid., 10388.

figure;[35] but it was likewise killed on the Senate floor.[36] He supported the Trammell amendment, which sought to reduce the tax on incomes below $6,000.[37] His absence from the Senate during the latter part of May prevented his voting upon the revenue bill when it was finally passed on May 31. He was reported to be in favor of it,[38] but upon his return to the floor on June 20, he frankly showed that he did not approve of much that was in the act as finally passed.[39]

He also opposed any pay cuts for federal employees, upon the ground that such an act would only save money for the big income taxpayers and give no measure of relief for the masses.[40] When he learned that the Kansas City Southern Railway was lobbying for pay cuts for federal employees, he criticized such conduct as bad form for a railway living on a government loan financed by the taxpayers of the nation.[41] He also held that cutting the salaries of Congressmen would simply make a rich man's club out of the Senate, because of the heavy campaign expenses.[42]

He was friendly to the tax-exempt securities. He held that such an arrangement afforded a low-interest charge, which thus enabled states, counties, cities, and towns to raise money with which to prosecute public-works programs, thus affording employment to more people.[43] He and Senator Couzens both agreed that most of these securities were held not by large payers of income taxes, but by estates and widows.[43]

He also opposed a federal sales tax because he believed it meant that the average man with five or six children would be paying as much tax as the man with the large income.[44] He condemned the so-called luxury taxes on moving-picture theater tickets, automobiles, radios, and the like, as a camouflaged means of shifting the tax burden from the earners of large incomes to those of small wages. He also condemned the whole scale of luxury taxes as a thing too complicated for an ordinary man to understand.[45]

In his efforts to shift the tax burden to the shoulders of the wealthy he recalled his experiences with the Standard Oil while governor of Louisiana. Recalling how the Standard Oil and other large oil interests had choked out the small oil man in Louisiana, he pleaded, on May 18, for a tariff on oil. He held that the proposed tariff rate of 21 cents a barrel was too low, for the oil of Mexico and of Venezuela could be produced $1.03 more cheaply per barrel than could that of the United States. The Standard Oil, he claimed, thus brought in cheap foreign oil, upon a river kept navigable by the taxpayers of a now bankrupt Louisiana, and undersold the small

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[35] Ibid., 10390-1.
[36] Ibid., 10400.
[37] Ibid., 10273-5.
[38] Ibid., 11166.
[39] Ibid., 13445.
[40] Ibid., 7536.
[41] Ibid., 8671-3.
[42] Ibid., 10117-8.
[43] Ibid., 10194.
[44] Ibid., 10188.
[45] Ibid., 10299-10301.

Louisiana producer; and this same Standard Oil was shipping Louisiana oil to Europe. He kept up this fight during the remainder of the days of his attendance in this session of the Senate. He fought for the tariff on oil to protect the small oil man;[46] and he opposed deleting any tariff items from the bill, as was suggested by some Senators who wished to facilitate the passage of the revenue bill.[47] He pleaded with others to back him and he showed how other Democrats had voted for certain tariffs that were of benefit to their respective home areas. To win support of his Senatorial colleagues, he expressed himself as willing to support any tariff measure that any member believed beneficial to his own local area.[48]

He also backed tariff measures for other items. He called for one upon lumber to protect the home sawmills against foreign competition encouraged by the large lumber interests.[49] He voted against the proposal to reduce the tariff rates upon aluminum, also upon various chemicals containing aluminum;[50] and he voted for the tariff on copper ores.[51]

As part of his desire to limit and control the large industrial concerns, he supported a proposal to forbid any industry recipient of an R. F. C. loan from paying any salary higher than that received by the Vice-President of the United States;[52] and when that failed of adoption, he supported a similar proposal with a $100,000 salary limit.[54] He also supported a measure seeking to authorize the R. F. C. to call in any loan made to a borrower who had reduced the wages of employees earning less than $2000 a year.[53] He also supported the spirit of the proposed anti-injunction measure, but feared it would need revision within two years, because lawyers would find loopholes. He felt that the use of the jury in injunction cases was not effective; and that some federal judges had abused their advantages on the bench when handling such cases.[55]

For the same reason, he opposed certain appointments. He fought the confirmation of Ernest A. Burguieres of Louisiana, whom President Hoover had nominated as commissioner of immigration at the port of New Orleans, on the ground that the man was personally obnoxious to him and to the laboring people of Louisiana.[56] He also opposed confirming the nomination of Marcel Garsaud as power commissioner and called his appointment "a crime against the country," because the man was in somewhat questionable dealings with a power company.[57] He also went so far as to charge the

[46] Ibid., 10549-10557.
[47] Ibid., 10767.
[48] Ibid., 10808-9.
[49] Ibid., 10810.
[50] Ibid., 10931.
[51] Ibid., 10945.
[52] Ibid., 2642.
[53] Ibid., 2643.
[54] Ibid., 2644-45.
[55] Ibid., 4682-4779.
[56] Ibid., 13443.
[57] Ibid., 13445 and 13446.

Power Trust with trying to control the Democratic National Convention of 1932 by backing Owen D. Young for the Presidential nomination.[58]

His hostility to the power of large industrial establishments also caused him to oppose the chain stores as well as all types of chain business interests. He claimed that these chain interests had absorbed banks, grocery stores, dry-goods stores, and drug stores, thus forcing the small and the independent establishments out of business at the rate of 435 a day; that they were contributing to the evil of concentrating the wealth of the nation into the hands of a small group of people; and that they were depriving young people of a chance to go into business.[58]

Long was friendly to relief measures. He backed the various amendments proposed to the La Follette-Costigan bill, all of which sought the quickest way of getting relief.[59] He supported the bill to relieve storm sufferers in the South, claiming that such an act was logical as long as the federal government was lending money to railroads to enable them to pay debts to Morgan, Kuhn, Loeb & Co., and others.[60]

He had but little if any confidence in the R. F. C. or even in the Department of Commerce. He once facetiously remarked that the only way a farmer could get an R. F. C. loan with which to pay interest on his debts, or to pay his taxes, would be to buy a railroad.[61] He also called for an openly public investigation of the activities of the R. F. C., as well as a complete revelation of its real chieftains.[62] He wanted to cut the appropriations of the Department of Commerce back to the figures of 1925, because he was convinced that the more money it received, the less real service it performed.[63]

Long claimed he had never voted against prohibition; but he held that its enforcement had been uneven, discriminatory and inefficient.[64] When an attempt was made to levy a tax upon beer wort, or any other material used exclusively for the making of beer, he insisted that the Senate might as well legalize beer while they were at it.[65] He supported the Tydings beer amendment, believing that the re-legalization of this beverage would make more effective the prohibition against the sales of stronger ones, such as whiskey or gin; and he held a beer bill constitutional even with the Eighteenth Amendment still in force. He also held that a beer tax would be another means of revenue for the Treasury. He dodged the question as to whether beer was intoxicating by claiming the word "intoxicant" had never been satisfactorily defined.[66] On July 11, he sought to remedy this supposed shortcoming by inserting

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[58] Ibid., 15330.
[59] Ibid., 3313, 3322, 3939.
[60] Ibid., 7660 and 7665.
[61] Ibid., 7196.
[62] Ibid., 14648-14650, 14767, and 14987-8.
[63] Ibid., 6628-9.
[64] Ibid., 6636-7.
[65] Ibid., 10426-7 and 10510.
[66] Ibid., 10116-19.

in the *Record* a definition of "intoxication", taken from Mordecai's *Law Lectures,* which read as follows:—

> "Not drunk is he who from the floor
> Can rise again or drink once more;
> But drunk is he who prostrate lies
> And can not either drink or rise!"[67]

Finally, though absent on the day of the vote, he was reported to favor a proposed amendment to the Constitution, repealing the Eighteenth Amendment but outlawing the saloon.[67]

During his first session in the Senate, Huey P. Long was present 56 days and absent 81 days, or over half the time he was a member of this body. He introduced one resolution, as we have seen, and four bills, one for a pension,[70] and three for bridges across navigable streams (two across the Sabine,[71] and one across the Pearl).[72] He showed himself an able debater, ready of humor and wit, and on the side of the small fellow or the "underdog." He did not show as much interest in the Negro, however, because he opposed measures seeking to increase the appropriations for Howard University,[73] unless the Federal Government would also grant Louisiana some money with which to educate her own Negroes as well.[74]

A reputable scholar has recently defined a demagogue as "a leader of the people; that is, of the masses of poor and underprivileged people. As such he and his followers are arrayed against the privileged class. Since, in general, members of the privileged class are possessed of education and are also in control of press and radio, it was inevitable that the demagogue should become the butt of unlimited criticism and ridicule". Does Huey P. Long measure up to this standard?[2]

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[67] Ibid., 15651-2.
[68] Ibid., 6542.
[69] Ibid., 14981.
[70] Ibid., 7166.
[71] Ibid., 10048.
[72] Ibid., 10384.
[73] Ibid., 8040, 8121, 8124.
[74] Ibid., 5987 and 5991-5992.

ALBERT GALLATIN IN WESTERN VIRGINIA, 1785

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ANYONE TRAVELING down the valley of the James on March 31, 1785, might have met a solitary horseman riding west. Evening found him a scant 24 miles from Richmond after an all-day ride. The following morning he continued on his way, covering before nightfall some 30 more miles of his long trip to the frontier. Although the third day brought rain, ice, and snow, it also saw him fall in with another pair of travellers westward bound, a Mr. Porter of Washington county and an Irishman. So far the roads had been none too good; the spring floods had washed out bridges, forced ferries to suspend, and created troublesome detours.[1] Yet, one who had important business could not wait for the season to improve.

The trio must have amused persons at the inns along the road. For, to the Virginian English of Mr. Porter and the brogue of the Irishman, the third companion contributed a French accent, which he retained during an American residence of 70 years.[2] He was a young Swiss, named Albert Gallatin, who had deserted his native Geneva five years before to seek his fortune in a land where he imagined men to be free, and where he hoped to find the opportunity to follow the precepts of Rosseau by living close to nature. His early years in this country had been so unprosperous that, at one time, he was reduced to supporting himself by tutoring Harvard students in French.[3] Such was Gallatin's situation when he encountered Savary de Valcoulon, a native of Lyons, whom business had brought to America and who urgently needed an interpreter.[4] The two immediately made an arrangement based partly on their mutual requirements and partly on a compatibality of ideas. In Philadelphia during the autumn of 1783 the two foreigners, of whom Savary was the senior by about ten years, became interested in frontier land on which to realize their dreams of a simple life in the wilderness. Finally, because an exceptional opportunity offered, they entered into a speculative partnership involving 120,000 acres for which Savary supplied the funds and Gallatin the necessary knowledge of American law and customs and the skill to survey the various tracts.[5] The arrangements completed as far as they might be without visiting the frontier, the partners went to Richmond, Virginia, where Savary's business detained them during the winter.

It was not until February 1784, that either of them could leave to inspect the purchase. Gallatin at that date journeyed to Philadelphia, where he made preparations for a summer in the Ohio Valley. April found him at Fort Pitt ready for the task of locating the most favorable properties, making surveys, and smoothing the

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[1] Gallatin Diary, March 31-April 2, 1785.
[2] Stevens, J. A., **Albert Gallatin**, 14.
[3] For Gallatin's early life see Adams, H., **Life of Albert Gallatin**, ch. I.
[4] Savary Letters.
[5] Gallatin to Badollet, Oct. 1, 1783, a postscript added Nov. 12, 1783, quoted by Adams H., **op. cit.**, 47.

way for the future settlers who were to make his and Savary's fortunes. Although we know little of his summer's activity, the smoothness and certainty with which he directed the following year's expedition testify to exhaustive labor on the first occasion. In September he was at George Creek on the Monongahela just north of the Pennsylvania line, undoubtedly studying possible routes from the seaboard to the Ohio Valley.[6]

Gallatin and Savary, reunited again, passed another winter in Richmond attending to the latter's affairs.[7] The waning months of 1784 and the first quarter of 1785 provided the partners with leisure to plan their enterprise. Gallatin reported with enthusiasm what he had seen during the summer. A native of Switzerland, he found the West Virginia hills to his liking; accustomed to the intensive methods of European agriculture, he visioned cattle grazing on the slopes and grain ripening in the narrow valleys below.[8] Yet, as they both realized, the future development of the region depended upon adequate transportation facilities. To meet this need Savary and Gallatin proposed to create two stations on the route from the seaboard to the west. To obtain a base east of the mountains, some of their frontier holdings were exchanged for a plantation near Alexandria. Secondly, as they expected to ship goods up the Potomac and across the divide to the Monongahela, they determined to erect a store and ware-houses at the mouth of George Creek, which for some reason seemed to them more favorably located than Point Marion on the Cheat. In time, they hoped to have goods and products flowing both ways in such quantities as to render them wealthy.[9] It was a well-considered plan to meet a problem whose solution, although they did not know it, waited upon the invention of the railroad.

Such in brief was the situation when Gallatin left Richmond in the spring of 1785. To understand why he planned to visit Lewisburg on his way west, one must take cognizance of the Virginia land law. In the early days the speculator or settler acquired not the land itself but a warrant giving him a claim upon a certain number of acres within a specified area. The state government had early adopted a policy of rewarding services, especially those of soldiers, or of paying creditors, by warrants for land on the frontier. It would also sell similar warrants to any who wished to purchase them for £40 (Virginia currency) per 100 acres. The second step toward the acquisition was to have the documents registered with the surveyor of the county in which the holder wished to acquire property, specifying the tracts which he desired. It then became the duty of the surveyor to lay off such land as was unappropriated, giving to the warrantee a certificate, which upon presentation at the land office entitled him to a formal grant of title to the specified property. As, in the western counties, an official surveyor was not

[6] Ibid., 54-56.
[7] He was the agent of a French company to which the state of Virginia owed money.
[8] Gallatin to Badollet, March 30, 1785, quoted by Adams, H., op. cit., 60. He even instructed Badollet, a Genevan friend, to join him in America at the first opportunity.
[9] Savary Letters.

always available, any legal surveyor recommended by the county court and approved by the governor and council might be substituted.[10] It was undoubtedly under this last provision that Gallatin obtained the right to make surveys. From a partial list of the warrants given in Gallatin's diary and the records remaining in the Greenbrier county courthouse, it is possible to state that the speculators had acquired both treasury warrants and preemption warrants, purchased at the land office for £40 a hundred acres.[11] These rights to land the partners had bought in Philadelphia, where they circulated as speculative paper. Many persons, as the result of military service or otherwise, came into possession of warrants for which they had no use, and as a result, turned them into cash for whatever they would bring. These warrants passed from purchaser to purchaser until they fell into the hands of someone who decided to settle in the west. It was for the purpose of visiting the surveyor of Greenbrier county in which many of their claims lay that Albert Gallatin jogged westward along mud roads and across swollen streams in April 1785.

Mr. Porter of Washington county accompanied the young Swiss for four days. This we know from a diary which Gallatin kept faithfully, if somewhat sketchily, during the trip. In the margin he entered his expenses, perhaps to charge them up against the common enterprise, or perhaps solely because he was methodical. The brief document of 30 pages, written in French and in execrable handwriting, is now among the Gallatin papers in the New York Historical Society, with whose permission and that of Mr. Gallatin's decendants I have been permitted to examine it.[12] Alone, the diary, while possessing considerable value, is on many points silent or unsatisfactory in its briefness. Fortunately, however, Savary, the other partner in the speculation, also left records behind him in the form of letters written during 1785 and 1786 to friends in France and published them in an obscure provincial paper, the *Journal de Lyon*, in the latter year.[13] Ignorance of this correspondence prevented Henry Adams, in his monumental life of Gallatin, from making adequate use of the diary or of dealing more fully with the western adventure of his subject.[14] With the material furnished by both partners, the student may form a more complete and sympathetic picture of the journey to the Ohio Valley in 1785.

On the fourth day the travellers experienced better going and a happier ending to their wearisome jaunt. After luncheon at a

[10] Hening, W. W., **The Statutes at Large, being a Collection of the Laws of Virginia, 1664-1792,** X, 50-66; XI, 159-160; 352-359; XII, 100-101. Acts of Assembly of May 1779, ch. 13; October 1787, ch. 33; October 1783, ch. 32, and 1785, ch. 42.

[11] Gallatin Diary, April 29, 1785. Greenbrier County Court, Surveyor's Record No. I, 465, 470, 471, 472, 473. For these last records I am indebted to Mr. Paul C. Hogsett, Clerk of the Greenbrier County Court.

[12] I am under special obligation to Mr. Alexander J. Wall, librarian of the society, who made all the necessary arrangements for the use and eventual publication of the diary.

[13] **Journal de Lyon,** March 29; April 12; April 27; August 30; September 13; and Sept. 27, 1786. For aid in obtaining photostatic copies of these letters and other help I am heavily indebted to M. Jean Vermorel, former archivist of the city, and M. G. Magnien, conservateur-adjoint at the municipal library in the same city, where one of the rare files of the **Journal de Lyon** may be found.

[14] Adams, H., **Life of Albert Gallatin,** New York, 1879. There is even less on this particular episode in Stevens, J. A., **Albert Gallatin** (in the American Statesman Series), Boston and New York, 1883.

"babbling and curious spot on the Rockfish River," they pushed on to Colonel Meredith's, where, as a relief from the inns along the road, they passed the night. The Colonel's wife was a sister of Governor Patrick Henry, who had given Gallatin a letter requesting that he "meet with particular attention and respect . . . . because his character, as well as his present designs, entitle him to the most cordial regards."[15] His host's pretty daughter, whom he singled out for special mention, also helped the young Swiss to forget the hardships of several days on horseback.[16] So the trip continued with stops at country houses along the way, where the youthful adventurer conversed and danced, even though the daughters of the house were in his eyes homely.[17] The James was left behind, when the trio cut southwestward toward the Roanoke; the peaks of Otter emerged from the distance and were skirted, as the Blue Ridge came out the horizon to meet them. There Gallatin took leave of Mr. Porter, who rode off toward Washington county.[18] The spring rain soon began to fall over the Virginia countryside with sufficient vehemence to justify two days halt at "Mr. Madison's stone house."[19] Evidently young Gallatin received a welcome in the homes of the hospitable Virginians and, in return, entered fully into the life of the plantations. Such ready acceptance by the important already bespoke the future politician.

His business, however, called him toward the west. Saying farewell to Madison, Gallatin journeyed onward and picked up the Roanoke somewhere near the city of the same name. Following the river and its North Fork into Montgomery county, the traveller then turned aside across the mountains to a place which he called Preston and which is not identifiable from any map that I have seen. There Gallatin remained for several days, engaged in investigating some land that he and Savary had acquired in the vicinity.[20]

After finishing his business at Preston, Gallatin's next objective was Lewisburg. Entering what is now West Virginia at Peters Mountain, he proceeded by way of Second Creek to the Greenbrier River, which he crossed near Ronceverte. At Lewisburg, where he arrived on April 16, he made arrangements for surveying large holdings in the Kanawha and Elk Valleys, which at the period were included in Greenbrier county, and visited the brothers Clendenin, at least one of whom he knew before beginning his journey.[21] This was a very important step on the trip west, because Gallatin could not only fulfill some of the legal requirements for

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[15] Letter of introduction given Gallatin by Governor Henry, March 25, 1785, quoted by Adams, H., op. cit., 59.

[16] Gallatin Diary, April 3, 1785. Colonel Meredith and his son, both of whom were campaigning for office at the time introduced their guest to some of the mysteries and intrigues of Virginia politics.

[17] Ibid., April, 4, 1785.

[18] Ibid., April 5, 1785.

[19] Ibid., April 6, 1785.

[20] Ibid. April 8 and 9, 1785. The exact location of the land in Montgomery county occupied Gallatin's mind during the summer, and on August 18 he wrote to a certain Welsh to change some of the plots that he had chosen earlier.

[21] Ibid. April 15-21, 1785.

completing title to his land, but also might obtain advice and information about the region which he proposed to develop. George Clendenin, with whom he visited several days, moved in 1787 to the present site of Charleston,[22] and there is every reason to believe that he had already become interested in that area.

Not the least important items in Gallatin's diary on the trip from Richmond to George Creek, where he planned to rejoin Savary, were those that indicate how much his lodging cost. As he approached the frontier, the price dropped from five or six shillings a night in the tidewater to one shilling six pence, which is what he generally paid in the Greenbrier and Tygarts Valleys. As this figure included not only a place to sleep but also the evening meal, it was not excessive even for those times. When he stayed at country houses, the only expense consisted of tips to servants, including Negro slaves. Occasionally he encountered foreigners as well as hospitable natives along the way. In the Blue Ridge he came across a party of French, at least one of whom had recently arrived from Paris, and, near Roanoke he met another person of the same nationality at a stop on the road. It is always surprising to find these Europeans at remote spots in eighteenth-century America. Finally, Gallatin occasionally commented upon the condition of roads or the quality of the soil. Greenbrier county, he noted, appeared fertile and prosperous. The student can only regret that he failed to record his observation except at rare intervals and then only in the briefest fashion.[23]

The route which he took north from Lewisburg, to the Monongahela, followed the rivers. The Greenbrier accompanied him through Renick to Clover Lick, where Gallatin deserted it to cut across the hills and descend into Tygarts Valley. Forty miles along the latter stream brought him to a point below the present town of Elkins, from which the road again mounted the heights toward Buckhannon. On April 27 West Fork, where Clarksburg now stands, received the lonely traveller. Two days' easy ride down the Monongahela then took him to George Creek in Pennsylvania, 14 miles beyond Morgantown.[24] At last, after more than a week on the road, Gallatin might rest while he awaited the arrival of Savary, who intended to accompany him down the Ohio. The second stage of the journey had lacked the pleasures and amenities of the first. There were no hospitable homes with pretty daughters, or even homely ones, where a lonely foreigner could enjoy a brief respite from the tedium of the road.

The days of waiting at George Creek passed quickly in organizing the expedition to the interior. Savary's arrival on May 17 reunited the partners, who promptly arranged with Thomas Clare to lease the property necessary for establishing the store and warehouses contemplated in their earlier conversations. In his enthusiasm Savary even considered purchasing enough land to found

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[22] Ambler, C. H., A History of West Virginia, 167.
[23] Gallatin Diary, March 31-April 29, 1785.
[24] Ibid., April 21-29, 1785.

a city, which should be called New Lyon after his birthplace.[25] Six days elapsed at these pleasant tasks before the huntsmen and surveyors arrived ready for a long summer in the woods.

On May 25, 1785, the expedition got under way. With new clothes and equipment purchased at the store against their future wages, 15 frontiersmen embarked by boat for Fort Pitt. This was no ordinary pioneer family driven to seek a new start in the wilderness, but a pair of landed proprietors with their men setting out to exploit a vast domain. Such a project required elaborate preparations and a large personnel, both of which Gallatin had efficiently organized. The partners lingered a day at George Creek before setting out on horseback in pursuit of their rapidly disappearing employees. The journey cannot, however, be said really to have begun until Fort Pitt, where last-minute supplies were purchased, had been left behind. Gallatin and Savary boarded the boat, trading places with five of the men who led overland the horses necessary for reducing to farmland the timbered slopes of West Virginia. Progress down-stream was extraordinarily slow. For eleven days the proprietors watched the river banks slip past, an average of only a little more than 20 miles a day on the 240-mile journey from Fort Pitt to their destination in the big bend of the Ohio. Each evening the party tied up to the shore, pitched tents, and prepared food provided by the huntsmen, quite a contrast, as Savary remarked, to the majority of pioneers, who travelled without tents or provision other than their rifles.

On the whole it was a leisurely trip. Those on the river saw their friends leading the horses at Wheeling, and some of them even changed places. From time to time they passed groups of settlers, intent on carving out new homes in the wilderness. On June 3 Gallatin pointed out the first of their locations and immediately disembarked, below Pond Creek, to begin surveying. Four days later the boat docked at the point chosen for the first settlement, promptly christened Friend's Landing by Savary.[26] Although the exact location cannot be determined, the scanty evidence in existence indicates a spot a little downstream from Sandy and upstream from Mill Creek. As the settlement failed, despite the hopes of its promoters, to become permanent, the question retains little importance for us. Suffice it to say that neither Friend's Landing nor the names of Savary and Gallatin have left any trace along the river. No one whom I have interviewed could recall such a place or any such names between Letart on the one side and Belleville on the other.[27]

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[25] Savary Letters. Adams, H., op cit., 62. As the actual lease was not signed until the following November, Thomas Clare ran the store for some time in his own name. Savary never did found the city, although both he and Gallatin purchased land in the vicinity.

[26] The chronology of the trip may be found in the Gallatin Diary, May 25-June 8, 1785, and most of the details in the Savary Letters, where they are recorded brilliantly. The settlement closest to Friend's Landing was on the site of Belleville, West Virginia, which was commenced that very year (1785). Ambler, C. H., op. cit., 167.

[27] Gallatin recorded passing Sandy Creek some time before arriving at Friend's Landing, and in a later entry of passing Mill Creek on his way to Point Pleasant. (Gallatin Diary, June 4, July 1, 1785.) Savary confined himself to the statement that the spot chosen was in the center of their properties. (Savary Letters.) On the strength of Gallatin's evidence I am inclined to doubt the accuracy of Adams, who placed Friend's Landing at the mouth of Sandy Creek. (Adams, H., op. cit., 61.)

No matter where the exact location, they had at last reached their goal. Without delay the serious work, that had brought them so many weary miles from the comforts of civilization to the hardships of pioneer life, began. While one or two of the men departed on short surveying trips, the remainder cleared the forests. Axes rang merrily against the trees; bells on the horses tinkled as the animals strained to haul away the cuttings. A cabin of rough-hewn logs with detached cook-house took shape; and simple furniture appeared miraculously from the timbers of the boat that had been dragged on shore and broken up. Even the elegant Savary lent a hand in creating a habitation where nothing had existed but the woods stretching away endlessly across the hills. So rapidly did the work progress that Savary indulged himself in the luxury of having the trees, which obstructed a view of the opposite bank, cut from before the cabin.[28] In the eighteenth century, nature often required a bit of alteration to make her fit the ideas of her devotees.

Within less than a month Gallatin, seeing Friend's Landing so far advanced, departed to survey some land a considerable distance from the river. On July 1 he chose eight men, six of whom were to go directly to the valley of the Elk, while he and two others went around by way of Point Pleasant. After drifting downstream all night, they arrived before daybreak at the Point, where Gallatin passed the week-end hiring three additional guides, two for himself and a third for Savary, who remained at Friend's Landing to finish the work there. On Monday began the trip up the great Kanawha to meet the men coming overland to the Elk. As the paddling was against the current all the way, it required five days to reach the rendezvous near the confluent of the two streams. Even then the men coming overland did not all arrive for ten days more or until three weeks after their departure from Friend's Landing, so that the actual surveying was not commenced until July 23.

In the performance of the work it was necessary to proceed with the greatest care. The Virginia land law of the period easily opened the way for numerous law suits over the exact extent and limits of claims. As litigation would delay the disposal of their lands, Savary and Gallatin proposed to comply with the law so completely and to make their surveys so accurately that no doubt could ever arise over the validity of their titles.[29]

With these considerations in mind, Gallatin and his party plunged into the woods. Should one today follow their route along Big Sandy Creek from its confluent with the Elk, one would find that it ended in a series of ridges that divided its headwaters from those of the Pocatalico and Little Kanawha rivers. The region is rough and even now lightly inhabited; then it was virgin forest, as the quantity of buffalo, elk, deer, and other animals observed by Gallatin testifies. Across this area the surveyors tramped and retramped, laid out chains, and hunted landmarks, the last an especially difficult task because our forefathers often indicated boundaries

[28] Savary Letters.
[29] Ibid

by such mortal monuments as an oak, a poplar, or a maple. Where all was woods, the identification of individual trees often presented difficulties. Nevertheless, with such persistence was the work carried through that natives in the region still refer to the limits of their farms as Gallatin lines.[30] Something in young Albert's Bourgeois ancestry impelled him to perform all his appointed tasks with thoroughness and efficiency, whether the matter at hand was great or small, personal problem or affair of state.

One wonders how a young foreigner nurtured in the tradition of Geneva enjoyed the frontier. Between the lines of Gallatin's diary the attentive reader will discover a real love for the outdoors. Only once does he mention the fatigue resulting from long, strenuous days spent in the open. Carefully he noted the animals which he encountered in great numbers throughout the region. The pleasure at a sudden unexpected view of the hills rolling away in the distance, the thrill of following streams to their end or of discovering a new route across the forest to a familiar goal, in brief, all those things which delight the true lover of nature shine through that bare notations that he set down. Jean Jacques Rousseau never inspired a purer or keener appreciation for things natural than in the heart of his compatriot, Albert Gallatin. It was not only the wilderness but also the frontiersmen themselves that he learned to appreciate. Regularly he refers to them by their first names—Uriah, Jesse, Bill, Nigil, David, as American a set of fellows as one could find. Although unrecognized by him at the time, Gallatin was learning to know his adopted land as few foreigners have ever done, and preparing himself in a way without parallel for his coming career in politics. During those days in the woods he acquired an understanding, which would serve him in good stead, of the forces and the men who were building the United States.

Under Gallatin's skilled guidance the work gradually approached its end and on August 12 he entered in his diary plans for the conclusion of his activities in the woods. The men were to be dispersed on various missions which required attention, while he thought to leave directly for Lewisburg on business and not to rejoin Savary until they met at George Creek some time in the autumn. Before any of these plans were put into execution, word arrived that Indian raids had driven Savary to abandon Friend's Landing for the comparative safety of Point Pleasant. On Tuesday, August 16, Gallatin and four men—the others were still scattered through the woods—hastened down the great Kanawha toward the place of refuge, where they arrived on Thursday morning. After more than six weeks the partners were reunited.[31] It was rather a breath-taking adventure for two foreigners to find themselves in the midst of an Indian uprising.

The partners decided to halt their activities for the season. As their men were scattered through the forest, it took some time

[30] For this information I am indebted to Mr. E. R. Lester, clerk of the Roane county court.

[31] Gallatin Diary, July 1-Aug. 18, 1785. Savary recounts in one of his letters the details of the raid which forced him to leave Friend's Landing.

to warn them of the danger and to assemble them all for the return. The flour, of which they had brought a sufficient quantity for a long stay in the woods, was sold to Colonel Lewis, commandant at the Point, whose small garrison, suddenly increased by the influx of persons seeking protection, faced starvation.[32]. The summer that had begun with such high hopes ended amid sounds of tumult. For Gallatin and Savary it only remained to go home and wait for the crisis to pass.

On September 3 they left Point Pleasant for George Creek. Not daring to follow the river, where an encounter with the redskins was to be feared, Gallatin and Savary led their party inland across the woods, guided only by the water courses and, when these failed, by the compass. Because the game, recently so plentiful, had vanished, they lived on half-rations of bread and water. Still the men had much for which to be thankful when they all stumbled safe and sound into George Creek, especially as the other surveying parties limped back east with men dead or dying and horses crippled. Their only casualties were the purely nominal ones of a unfounded rumor spread abroad and difficult to check that Savary and Gallatin had fallen before Indian arrows.[33] The return, while not so enjoyable as the leisurely trip out, still had its little air of triumph for two foreigners who succeeded in extricating themselves and 15 men from a forest well-filled with angry Indians.

That autumn the partners regarded as only temporary the check to the realization of their plans. While lingering at George Creek to draw up a lease with Thomas Clare for five acres and a house on which to establish a store, Gallatin slipped away to Morgantown, where he applied for Virginia citizenship.[34] Together these two events demonstrate better than anything else the intention of Gallatin and Savary to continue their western experiment and eventually to live in the Ohio Valley. After all, nothing had occurred except a few Indian raids which, although they might delay, could not permanently halt the development of the frontier holdings. Little did either partner realize that he would never visit Friend's Landing again. Nine long years elapsed before Anthony Wayne administered an overdue lesson to the Indians at Fallen Timbers. During the interval Gallatin and Savary, although they remained life-long friends, dissolved the partnership.

From the beginning, even without the Indian raids, the speculation had been doomed to failure. The nature of the lands which they had purchased prevented them from being developed in the way the partners had planned. Lacking in minerals and too rugged for farming, the property was unsuitable for either mining or agriculture. Gallatin, many years later in a letter to his son, recognized his youthful mistake when he wrote, "I could not have invested my

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[32] Gallatin Diary, Aug. 18, 1785. Savary Letters.

[33] Savary Letters. This rumor even reached Gallatin's friends and relatives in Geneva, who applied for information to Thomas Jefferson, then American minister to Paris. This was the first time that Jefferson heard the name of his future friend and colleague. Stevens, J. A., **Albert Gallatin, 28.**

[34] **Adams, H., op. cit., 62. Stevens, J. A., op. cit., 25.**

patrimony in a more unprofitable manner . . . . "[35] Since any gain that may have resulted from the western adventure was not economic, we must look for it among intangible things. Savary, who had independent means, obtained little more than an exciting season spent in the wilderness and the chastening of his spirit that came from the collapse of his dreams. The younger partner, because he entered politics, might have reckoned as profit the knowledge of frontier ways and ambitions that he acquired in the Ohio Valley. It made him understand many important things of which he might otherwise have remained ignorant. As a preparation for a political career, the western journey of 1785 proved of abiding worth to one of the participants.

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[35] Albert Gallatin to James Gallatin, Jan. 13, 1827, quoted by Adams, H., op. cit., 621.

THE EFFECT OF RESTRICTED ENTRANCE TO FRESHMEN ON THE INTELLECTUAL CALIBER OF A COLLEGE STUDENT BODY

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AT THE PRESENT TIME, in order to be admitted to the freshman class of Bethany College without restricted enrollment, the student must, along with other requirements, stand in the upper half of his high-school graduating class. Since the adoption of this standard by the college, there have been admitted each year on probation a limited number of students (approximately ten percent of the freshman class) who stood in the lower half of their high-school classes. Hereafter these students will be designated as the probation group, while those admitted without restriction will be designated as the non-probation group.

The question arises, What would be the effect on the intellectual status of the Bethany College student body, had admission been refused to these probation students, or, in other words, had only those individuals who met the full entrance requirements been admitted? The present investigation is an attempt to find data bearing on this problem along three related lines: first, by comparing the intellectual standing of the whole class, as rated by freshman intelligence tests, with its standing when the probation students have been excluded; second, by comparing the Bethany College groups, including and not including the probation students, with the intelligence rating of other institutions which used the same tests; third, by comparing the academic success of the non-probation groups with that of the probation groups, assuming that academic success is to some degree a criterion of intellectual capacity.

METHOD AND RESULTS

The freshman classes entering Bethany College in September, 1935 and 1936, were made the basis of the following investigation, partly because these classes were the first to which the present standard of admission applied, partly because they were given highly comparable freshman intelligence tests, and also because the tests administered to them were widely used in other colleges, thereby giving a basis of comparison with other institutions.

The class entering in 1935 was given the American Council on Education Psychological Examination, 1935 edition, and the Ohio State University Intelligence Test, form 18. The freshmen in 1936 were given the 1936 edition of the American Council test and form 19 of the Ohio State University test. These two types of tests will hereafter be symbolized as Am. C. and O. S. U. respectively.

On any particular test the raw scores were arranged in rank order and grouped into deciles and quartiles. Percentiles were also computed from the norms furnished with the Am. C. and

O. S. U. tests. Each student had therefore for each of the two tests, in addition to his raw scores, a percentile, a decile, and a quartile rating—six ratings in all.

From the data thus available a comparison was made of the distribution of the raw scores of the whole freshman class with the distribution of the raw scores of the non-probation groups, that is, with the class as it would have been had the probation group not been admitted. This was done for both the Am. C. and O. S. U. scores for both years. The following tables indicate the changes in the class effected by the exclusion of the probation students.

TABLE 1—*The range and median of the raw scores of the Bethany College freshman class, September 1935, in the Am. C. and O. S. U. tests for that year, including and excluding students admitted on probation (1935).*

Am. C.		O. S. U.	
Including probation students	Excluding probation students	Including probation students	Excluding probation students
Range: 53—330	92—330	35—130	40—130
Median: 183	195	80	85
Number: 110	87	107	84

Table 1 indicates that, had the probation group been excluded, the low extreme of the class would have been raised 39 points on the Am. C. scores and 5 points on the O. S. U. scores, the upper extremes remaining the same in both cases. The median of the class would have been raised 12 points on the Am. C. scores and 5 points on the O. S. U. scores.

TABLE 2—*The range and median of the raw scores of the Bethany College freshman class, September 1936, on the Am. C. and O. S. U. tests for that year, including and excluding students admitted on probation (1936)*

Am. C.		O. S. U.	
Including probation students	Excluding probation students	Including probation students	Excluding probation students
Range: 45—338	67—338	29—135	35—135
Median: 188	194	84	88
Number: 154	136	150	132

Table 2 indicates that, had the probation group been excluded, the low extreme would have been raised 22 points on the Am. C. scores and 6 points on the O. S. U. scores, the upper extremes remaining the same in both cases. The median of the class would have been raised 6 points on the Am. C. scores and 4 points on the O. S. U. scores.

The median score of 65,737 freshmen in 304 colleges on the Am. C. test, 1936 edition, was 177. Comparing with this standard the Bethany 1936 median, we find the latter 11 points above the Am. C. norm, whereas it would have been 17 points superior with the probation students excluded. To what extent this would have raised Bethany College's percentile rating among the 304 colleges in the group tested, above its present rating in the upper half, we do not have data to compute. It obviously would have raised her standing to some extent.

In order to determine where the probation students ranked in each class as compared with the ranking of the non-probation students, the number in each of these groups in each quartile was counted. This was done for both tests for both years. Percentages were then computed. For example, in 1936 on the Am. C. test 31 students stood in the lowest quartile. Of these, 20, or 65% of the total 31 in the quartile, were non-probation students, while 11, or 35%, were probation students. Table 3 summarizes these results for both tests for both years.

TABLE 3.—*For the Bethany College Freshman classes of 1935 and 1936, ranked according to raw scores on the Am. C. and the O. S. U. tests for these years, the percentage of each quartile composed of non-probation and of probation students.*

Year 1935

	Am. C. Test		O. S. U. Test	
	% non-probation	% probation	% non-probation	% probation
4th quartile	100%	0%	96%	4%
3rd quartile	82	18	81	19
2nd quartile	73	27	80	20
1st quartile	61	39	57	43

Year 1936

	Am. C. Test		O. S. U. Test	
	% non-probation	% probation	% non-probation	% probation
4th quartile	100%	0%	100%	0%
3rd quartile	92	8	97	3
2nd quartile	91	9	92	8
1st quartile	65	35	69	31

From the data in this table we note that practically no probation students are found in the highest quartile, whereas from 31 to 43% of the lowest quartile is composed of these students. Or, the ratio of probation to non-probation students in the highest quartile is only 1:99, whereas their ratio in the lowest quartile is 37:63, somewhat more than 1:2.

This tendency for the probation students to fall in the lowest rank in the class is also indicated by the data in Table 4, which gives the percentage of the total probation group found in the various quartiles of the class. For example, in 1936, 18 students were admitted on probation. Of these 18, on the Am. C. test eleven students, or 61% of the entire probation group, were rated in the lowest quartile.

TABLE 4.—*For the Bethany College freshman classes of 1935 and 1936, ranked according to raw scores on the Am. C. and O. S. U. tests for those years, the percentage of probation students rated in the various quartiles of each test*

	1935		1936	
	Am. C. test	O. S. U. test	Am. C. test	O. S. U. test
4th quartile	0%	4%	0%	0%
3rd quartile	22	22	17	6
2nd quartile	30	22	22	19
1st quartile	48	52	61	75

This table shows, for 1936, only 6 to 17% of the probation students rated in the upper half of the class, whereas 83 to 94% are rated in the lowest half, 61 to 75% of them being in the lowest quartile

The data in Tables 3 and 4 together indicate a marked tendency for the probation group to fall toward the low extreme of the class distribution on the tests. In so far as the results of the freshman intelligence tests are a criterion of capacity for college work, this means that the probation students are on the whole inferior college material. This means, in turn, that the intellectual quality of the freshman classes as a whole, and in time of the entire student body, would be definitely improved by excluding from admission the probation groups. On the other hand, a policy of this sort would debar from Bethany College a limited number of students who apparently have the capacity to do good college work. In 1935, on the Am. C. test, 5 out of 23 probation students were rated in the third quartile, while in 1936, on the same test, 3 out of 18 were so rated. On the O. S. U. test in 1935, 6 out of 23 were rated in the upper half of the class. This would suggest that a conservative policy of admission, which would safeguard the interests of the college and at the same time not jeopardize the future of a worthy student, would combine the results of both high-school standing and freshman intelligence tests. For example, Bethany College might admit students from the upper half of their high-school classes who met all other entrance requirements, and also a selected group of probation students who met all entrance requirements except that they stood in the lower half of their high-school classes, provided these probation students stood above the median in the freshman intelligence tests. On this basis the data in Table 4 show that at least 75% of the probation group would have been excluded. Data already given and more to follow indicate that a policy of this sort would give Bethany College a student body of higher intellectual caliber and at the same time eliminate a good many academic problems.

A related interest of the college is its relative standing among other comparable institutions. Since the percentile of each student was computed not from local norms but from those furnished by the Am. C. and the O. S. U. tests, information was obtained on this point by counting the number of Bethany College students having percentiles within the limits 1-10, 11-20, 21-30, etc., for the entire range, also within the limits 1-25, 26-50, 51-75, and 76-100. This was done for both tests for both classes, including the probation students. Percentages were then computed to find the proportion of a class falling within each group; for example, the percentage of the 1935 class having percentiles within the limits 1-10, 11-20, etc., and within the limits 1-25, 26-50, etc. This was done for all the sub-groups on both tests for both entire classes. The probation students were then excluded and the percentages computed once more for all the sub-groups for both tests for both years. The percentages for the entire classes show the standing of the Bethany College classes as admitted, when compared with freshmen in 304

institutions. The percentages for the non-probation students show what the standing of Bethany College's classes would have been had the probation students been excluded. These data are summarized in Table 5.

TABLE 5.—*For the Bethany College freshman classes of 1935 and 1936, rated according to their percentiles on the Am. C. and the O. S. U. tests for those years, the percentages of the classes, including and excluding the probation students, falling in the upper and the lower half of the class ranked according to percentiles*

1935

	Am. C. Test		O. S. U. Test	
	Including probation students	Excluding probation students	Including probation students	Excluding probation students
Percentiles				
51—100	52%	61%	62%	70%
1— 50	48%	39%	38%	30%

1936

	Am. C. Test		O. S. U. Test	
	Including probation students	Excluding probation students	Including probation students	Excluding probation students
Percentiles				
51—100	55%	59%	67%	74%
1— 50	45%	41%	33%	26%

In order to interpret the data in this table it must be borne in mind that if the Bethany College groups are exactly equal to those of the other colleges, as indicated by the norms, 50% of the class will have percentiles 1-50, and 50% percentiles 51-100. Furthermore, above the fiftieth percentile any percentages more than 50 indicate superiority, while below this point any percentages more than 50 indicate inferiority. Likewise, above the median, percentages less than 50 mean inferiority, while below the median, percentages less than 50 mean superiority.

Examining the data of Table 5 in the light of these statements, we find that in every case the Bethany College groups show test ratings superior to those of the colleges as a whole. This is especially true for the O. S. U. results for both years. When the probation students are excluded, the superiority is increased considerably. For both years on the Am. C. tests, approximately 60% of the Bethany College non-probation groups stand above the general college median as against 40% below. Again the superiority is especially noticeable for the O. S. U. results. For both years on this test, an average of 72% of the Bethany College non-probation students are above the general college median as against an average of 28% below. This comparison with other colleges indicates that the exclusion of the probation students from admission would not only raise the intellectual caliber of the Bethany group itself but would also definitely enhance its relative rating with other colleges.

In the third place, the college is also interested in the academic success of the students admitted. Data are not yet available to make

a complete study of the difference between the non-probation and the probation students in their college academic standing and work, nor of the change in the academic standing of the class that would be effected by excluding the probation students. Some preliminary data, however, indicate that here also definite improvement would be made in class-room work. For example, for the 1935 freshmen, the quality-point average for the academic year 1935-36 was twice as high for the non-probation students as for the probation students. On the basis of three quality points for each semester hour of A credit earned, two for B, one for C, and none for D or lower, each student's average quality-point rating was computed by dividing the total number of quality points he earned in the year by the total number of academic semester hours' credit earned in the same time. The average quality-point rating for the whole non-probation group was then computed by finding the average of the ratings of all the students in this group. The same was done for the probation group. On this basis the quality-point average for non-probation students was 1.418 as against 0.78 for the probation students. Furthermore, the percentages of the group either continued on probation for another semester, or dropped from college altogether because of extremely poor academic work, was much greater for the probation group than for the regular students. Very few admitted on probation succeed in rising above this status. Complete data for statistical treatment of this point will not be available until the end of the present academic year. On the other hand, an occasional student admitted on probation was removed from this standing at the end of his first semester and continued to do very creditable college work. In this case, Bethany College would have excluded a good college student had the entrance requirement been rigidly enforced.

SUMMARY. From the data above we conclude that debarring from Bethany College students now admitted on probation because of falling in the lower half of their high-school classes would definitely raise the intellectual caliber of the student body. It would eliminate, on the whole, students who fall toward the low end of the distribution scale on the freshman intelligence tests, and thus it would raise the median score of the group. At the same time it would raise the relative standing of the college among similar institutions. This policy would also tend to enroll a student body who would do a higher grade of academic work and show a lower student mortality rate. On the other hand, such a policy would debar from admission an occasional student who would prove to be good college material.

A STUDY OF THE EXPERIENTIAL FACTOR IN OBJECTIVE TEST SCORES

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IT HAS BEEN FAIRLY WELL ESTABLISHED that the freshman psychological examination is an important factor in the appraisement of the student's capacity to do college work, but with mass education in the colleges and universities, together with the enormous increase in the number of students enrolled in recent years, there have arisen many problems both in the administration of these tests and in the evaluation of the scores. One of these problems is whether or not previous experience in taking objective tests affects subsequent scores.

This study was undertaken for the purpose of ascertaining the answer to this question. It is based upon the scores of 489 freshmen who took the regular psychological examination at Marshall College in September, 1935, and 373 who took it in September, 1936,—a total of 862 test scores. The Carnegie Mental Ability Test, Form A, was used in both years. Each student was asked to state on the "Answer Booklet" the number of objective tests from one to ten he had taken previously to this one, either in junior or senior high school or any other place.

The Carnegie Mental Ability Tests comprise a series of eight tests, as follows:

Test 1—Jumbled true-false-incomplete sentences, that is, jumbled sentences that were to be rearranged in the right order, then designated as true, false, or incomplete.
Tests 2, 3—Word-relationship tests.
Test 4—Number relationship in a series.
Tests 5, 6—Arithmetical problems.
Tests , 8—General informational tests.

The maximum score that could be made was 325.

The results of these 862 tests are shown in Table 1.

TABLE 1.—*Median scores according to the number of previous tests taken*

Number of previous tests taken	Median score	Number of cases	Percentile rank on table of norms
0	116.46	372	45.46
1	121.88	319	50.88
2	125.65	123	54.65
3	127.60	48	57.60

In so far as these 862 freshmen at Marshall College can be considered an adequate sampling we may conclude:

1. The scores made by students are affected by their previous experience with objective tests.
2. This experiential factor rapidly decreases after the first few tests have been taken.

3. This influence is sufficient to affect noticeably the rank of the students. In the cases studied the median ranged from 116.46 for those having no previous experience to 127.60 for those who had taken three such tests. This was equivalent to raising the student 11.14 positions on a percentile scale. This difference was sufficient to raise a student from the *E* level to the *D* level or from the *B* level to the *A* level, and to affect similarly all the borderline cases in most grading schemes.
4. Students who come from high schools in which the new type tests are unknown probably should be given a practice test prior to the one from which the record is kept.

It is also thought desirable to ascertain the effects of a retest, using the same test. Therefore 40 students who had signified on their previous test that they had never taken a standardized test before were given the same test again, with the results given in Table 2.

TABLE 2.—*Students without previous experience retested in the same form of the Carnegie tests*

	First Test	Retest	Difference
Number	40	40	0
Median Score	134	152	18

This table shows that the median score increased from 134 on the first test to 152 on the retest, thus giving a rise of 18 points in the student's score and a difference of 17 points in percentile rank. This rise is somewhat greater than the difference between those who had experience and those who had no experience prior to the first test. This greater difference may probably be accounted for in part by the fact that there is usually a slight "carry-over" other than experience from a former test.

After showing the consistency of the trend of the effects of experience we also wished to know what effects this experiential factor had on the students' subsequent work in college. A sampling of 253 students was chosen such that 126 had stated they had had no previous experience with such tests and 127 reported one such previous test. Recourse was made to the mid-semester and final first-semester grades made at Marshall College under classroom conditions with varied instructors. At Marshall the grading system is such that, when reduced to quality points, A=3; B=2; C=1; D=0. This afforded a convenient method for evaluating this factor of experience.

Table 3 indicates these effects.

TABLE 3

	No Experience	One Experience
Number students	126	127
Number credit hours, mid-semester	1959	1973
Number quality points, mid-semester	1985	2357
Average points per credit hour, mid-semester	1.013	1.194
Number credit hours, final	1946	1958
Number quality points, final	2257	2517
Average quality points per credit hour, final	1.159	1.285
Increase quality points per credit hour, from mid-semester to final	0.146	0.091
Median score	123.03	126.25

Summarizing the data from this table we find that:

1. The median score for this sampling was 123.03 for the no-experience group and 126.25 for the experienced group.

2. The "one experience" group carried 1973 credit hours and made 2357 quality points during the first half-semester. This was raised to 2517 quality points for 1958 hours of work completed at the end of the semester, which represents an increase per credit hour from 1.194 points at mid-semester to 1.285 at the end of the semester. The average point increase per credit hour in this case was 0.091.

4. The "no experience" group made 1.604 times as much improvement between these two sets of grades as the "one experience" group. This is approximately equal to an average improvement of one grade letter.

5. The practice of some instructors in grading more severely the first nine weeks as an inducement for better work may or may not be defensible but is probably more or less common. We may safely assume in the absence of data to the contrary that this tendency would be fairly evenly spread over the entire group of students studied. One can hardly doubt then that this experiential factor largely explains the discrepency between achievement and expectancy as indicated by scores made on freshman intelligence tests and subsequent work in college. After an initial period of "floundering" those who were penalized by lack of experience with such tests "found" themselves, and the effect diminishes as it did in relation to scores, as shown in Table 1.

Judging from these results it seems that a rather serious factor arises in the evaluation of test scores. It is quite possible that this factor of previous experience may account, in part at least, for the disparity between the percentile rank and the quality of achievement grades received. In general there seem to be more students having a rather low percentile rank who are doing average or superior work than there are students of high percentile rank doing a poor grade of work.

Further investigation may show that either a differential should be worked out, or that, as suggested above, a practice test perhaps should be given, prior to the one from which the record is kept, to those who never have taken objective tests. As shown by Table 1, the difference between the experienced and non-experienced student averages approximately thirteen points in his percentile rank. This means, of course, that it makes a much greater difference with some, and this difference may, and is likely to be, such as materially to affect classification for administrative purposes.

THE UNEMPLOYED SCHOOL TEACHERS OF WEST VIRGINIA

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DURING THE FIRST SEMESTER OF 1936-37 a short questionnaire, prepared by David Kirby, secretary of the State Board of Education, was sent to the 55 county superintendents of the state to ascertain certain facts concerning the unemployed school teachers in West Virginia. Data concerning the specific teaching positions or fields, home counties, certificates, and degrees were ascertained. Much of the information was obtained by the superintendents from applications for positions in their counties. The superintendents were requested to list only the residents of their own counties, this being done in order to avoid duplicates in the state report. The results of the questionnaire were tabulated by NYA workers.

HIGH-SCHOOL TEACHERS

The number and percentage of unemployed high-school teachers have been tabulated in Table 1. Obviously the larger counties with few exceptions have more unemployed high-school teachers than the smaller units. Cabell county led the list with 189. At the county seat is located the second largest college in the state, so one naturally expects many residents thereof to be prepared for teaching. Kanawha, the largest county in population in the state, was second with 145; Marion, third with 114; Ohio, fourth with 81; Mercer, fifth with 55; Fayette, sixth with 51; and Wood, seventh with 48 unemployed. All of these counties are considerably larger than the average. At the other extreme eight counties; namely, Boone, Calhoun, Clay, Hampshire, Logan, Pendleton, Pocahontas, and Wirt, reported no unemployed high-school teachers. Eighteen counties, Berkeley, Brooke, Doddridge, Gilmer, Grant, Hancock, Hardy, Lincoln, Mason, Mineral, Mingo, Monroe, Morgan, Pleasants, Putnam, Tyler, Webster, and Wyoming, reported one to five teachers inclusive unemployed.

The percentage of teachers unemployed is more significant than the gross numbers just cited, for such indexes are influenced by the number of positions available. Viewed from this method of approach, Taylor county reported proportionally more unemployed teachers than any county in the state, the percentage being 45.9, almost every other teacher available in the county. Cabell was second with 41.4 percent, followed by Marion with 37.6; Jefferson, 32.6; Ohio, 29.3; Ritchie, 26.4; Wood, 25.2; Upshur, 24.4; and Kanawha, 23.1; seven counties in the state having more than 25 percent of their available teachers unemployed. Other counties having more unemployment than the state at large were Fayette, 23 percent; Mercer, 22.2; Randolph, 20.3; Jackson, 19.4; Barbour, 19.0; and Monroe, 18.5. It is significant that colleges are located in ten of these fifteen counties which have the major part of the state's unemployment problem within their borders.

TABLE 1.—*Unemployed high-school teachers in West Virginia, 1936-37*

Counties	TEACHERS		Grand Total	Percent Unemployment
	Unemployed	Employed		
Barbour	8	34	42	19.0
Berkeley	4	51	55	7.3
Boone	0	57	57	0
Braxton	6	38	44	13.6
Brooke	1	86	87	1.1
Cabell	189	267	456	41.4
Calhoun	0	17	17	0
Clay	0	23	23	0
Doddridge	3	22	25	12.0
Fayette	51	169	220	23.0
Gilmer	5	36	41	12.2
Grant	1	12	13	7.7
Greenbrier	15	98	113	14.2
Hampshire	0	19	19	0
Hancock	1	82	83	1.2
Hardy	2	17	19	10.5
Harrison	20	257	277	7.2
Jackson	7	29	36	19.4
Jefferson	14	29	43	32.6
Kanawha	145	482	627	23.1
Lewis	9	47	56	16.0
Lincoln	1	27	928	3.6
Logan	0	120	120	0
Marion	114	189	303	37.6
Marshall	17	99	116	14.6
Mason	1	34	35	2.9
Mercer	55	192	247	22.2
Mineral	5	55	60	8.3
Mingo	2	110	112	1.8
Monongalia	22	149	171	12.9
Monroe	5	22	27	18.5
Morgan	2	23	25	8.0
McDowell	16	275	291	5.5
Nicholas	6	46	52	11.5
Ohio	81	195	276	29.3
Pendleton	0	15	15	0
Pleasants	3	17	20	15.0
Pocahontas	0	26	26	0
Preston	6	77	83	7.2
Putnam	2	30	32	6.3
Raleigh	11	178	189	5.8
Randolph	16	63	79	20.3
Ritchie	18	50	68	26.4
Roane	6	33	39	15.3
Summers	8	46	54	14.8
Taylor	34	40	74	45.9
Tucker	9	40	49	18.3
Tyler	4	28	32	12.5
Upshur	12	37	49	24.4
Wayne (No report)	—	—	—	—
Webster	3	26	29	10.3
Wetzel	6	69	75	8.0
Wirt	0	9	9	0
Wood	48	142	190	25.2
Wyoming	1	65	66	1.5
Total	995	4,399	5,394	18.4

In the state at large, about eighteen out of every 100 high-school teachers available were unemployed. Thirty-nine counties reported a lower percentage than the state tendency just cited. In addition to the counties which have already been mentioned as having no unemployed teachers, the following counties ranked low in unemployment, reporting fewer than five percent: Brooke, Hancock, Wyoming, Mingo, Mason, and Lincoln. The following counties reported unemployment ranging from five to eleven percent: Berkeley,

Grant, Harrison, Mineral, Morgan, McDowell, Preston, Putnam, Raleigh, and Wetzel.

Table 2 shows the first teaching subjects of the 727 unemployed teachers whose qualifications were reported. It is not surprising to find English leading with 218 cases, while social studies follow with 100 and mathematics with 84, these four subjects being the first teaching fields of 43 percent of the unemployed. The implication is rather strong that a considerable part of this unemployment could have been avoided if student choices of teaching fields were guided by a continuing survey of the demand instead of fortuitous circumstances. A telic program for teacher education should be developed and followed by the state.

TABLE 2.—*Unemployed high-school teachers by subjects (state-wide)*

Agriculture	2
Art	12
Biology	34
Commerce	21
English	218
French	25
General science	3
Home economics	64
Industrial arts	3
Latin	27
Mathematics	84
Music	19
Physical education	31
Physical science	20
Social studies	100
Spanish	2
Chemistry	5
Domestic arts	1
Economics	4
Education	4
History	21
High school by examination	1
Journalism	1
Library	4
Political science	1
Public speaking	4
Science	15
Speech	1
Total	727

All except one of these 727 teachers are college graduates holding first class high-school certificates, or equivalents. At the present time about 200 of the employed high-school teachers of the state hold only a standard normal or a lower grade certificate. It is now possible to replace all of these individuals with college graduates possessing first class high-school certificates. The only "fly in the ointment" is a firmly entrenched idea held by many employing boards to the effect that the schools exist to furnish jobs for local residents. It has already been shown that the major unemployment problem exists in about fifteen of the 54 counties studied. Obviously high-school teachers will always have to be recruited from counties in which colleges are located. County prejudices and short sightedness should be broken down. In recent years excellent progress has been made by local boards of education in raising the qualifications of employed teachers, because well-qualified local residents were available. But in the near future about 40 counties will have

exhausted their possibilities as far as this specific method of leavening their teaching corps is concerned. Local employing authorities must realize the truth of the well-known statement that the schools exist for the benefit of the children, and that efficient teachers must be employed without regard to the location of their homes.

TABLE 3.—*The certification of unemployed elementary-school teachers by counties (1936-37)*

Counties	Collegiate elementary	Standard normal	Short course	First grade	Second grade	Total unemployed	Total employed	Grand total	Percent unemployed
Barbour	2	48	13	28	2	93	154	247	37.7
Berkeley	1	5	0	0	0	6	157	163	3.7
Boone	0	0	0	0	0	0	216	216	0.0
Braxton	0	45	10	18	3	76	191	267	28.4
Brooke	0	6	0	0	0	6	119	125	4.8
Cabell	43	127	13	18	3	204	422	626	32.5
Calhoun	1	3	2	10	4	20	110	130	15.3
Clay	0	2	7	2	0	11	118	129	8.5
Doddridge	0	19	4	16	3	42	115	157	26.7
Fayette	14	60	41	29	1	145	477	622	23.3
Gilmer	4	55	4	18	0	81	94	175	46.3
Grant	0	6	4	8	0	18	80	98	18.4
Greenbrier	2	42	23	20	0	87	268	355	24.5
Hampshire	0	6	4	16	1	27	110	137	20.0
Hancock	0	3	0	1	0	4	123	127	3.1
Hardy	0	9	0	12	1	22	94	116	18.9
Harrison	0	49	0	0	0	49	419	468	10.5
Jackson	1	2	6	15	6	30	135	165	18.2
Jefferson	1	29	0	4	0	34	88	122	27.8
Kanawha	11	92	28	39	0	170	891	1061	16.0
Lewis	0	26	2	11	0	39	166	205	19.0
Lincoln	1	4	0	3	1	9	187	196	4.6
Logan	1	10	14	18	1	44	370	414	10.6
Marion	3	91	0	0	0	94	358	452	20.7
Marshall	2	49	0	9	0	60	219	279	21.5
Mason	0	2	7	13	5	27	180	207	13.0
Mercer	9	78	0	6	1	94	341	435	21.6
Mineral	0	3	3	2	0	8	95	103	7.7
Mingo	0	7	7	8	0	22	323	345	6.3
Monongalia[1]	0	0	0	0	0	0	0	0	0.0
Monroe	0	17	11	8	0	36	115	151	23.8
Morgan	0	9	1	2	0	12	69	81	14.8
McDowell	2	45	2	8	0	57	520	577	9.8
Nicholas	1	10	14	26	0	51	186	237	21.5
Ohio	3	52	1	4	1	61	259	320	19.0
Pendleton	1	5	2	6	2	16	121	137	11.6
Pleasants	0	6	1	3	0	10	51	61	16.3
Pocahontas	0	0	1	0	0	1	131	132	0.8
Preston	2	26	11	9	2	50	223	273	18.3
Putnam	0	0	1	6	0	7	149	156	4.5
Raleigh	5	40	23	18	6	92	494	586	15.7
Randolph	1	20	11	29	2	63	248	311	20.2
Ritchie	0	15	7	4	0	26	135	161	16.1
Roane	0	7	8	41	13	69	163	232	29.7
Summers	1	21	5	14	1	42	172	214	19.6
Taylor	3	36	3	5	3	50	111	161	31.0
Tucker	2	7	4	4	1	18	111	129	13.9
Tyler	1	8	0	11	1	21	98	119	17.6
Upshur	2	22	4	19	1	48	150	198	24.2
Wayne[1]	0	0	0	0	0	0	0	0	0.0
Webster	0	8	5	5	0	18	172	190	9.5
Wetzel	0	18	1	3	0	22	167	189	11.6
Wirt	0	0	1	0	1	2	65	67	2.9
Wood	1	27	13	22	2	65	267	332	19.6
Wyoming	0	2	2	7	0	11	218	229	4.8
Total	121	1279	324	578	68	2370	11015	13385	17.7

[1] No report from Monongalia and Wayne counties.

ELEMENTARY-SCHOOL TEACHERS

Table 3 depicts the certification and the percentage of the unemployed elementary-school teachers of the state. For the latter unit a total of 2,370, or 17.7 percent, were reported unemployed.

Twenty-eight of the counties have proportionally fewer unemployed than the state average. The range was from zero in Boone county to 46.3 percent in Gilmer county. Thirteen counties reported fewer than ten percent unemployed: Berkeley, Brooke, Clay, Hancock, Lincoln, Mineral, Mingo, McDowell, Pocahontas, Putnam, Webster, Wirt, and Wyoming counties. Counties with one-fourth or more of their teachers unemployed were as follows: Gilmer, 46.3 percent; Barbour, 37.7; Cabell, 32.5; Taylor, 31.0; Roane, 29.7; Braxton, 28.4; Jefferson, 27.8; and Doddridge, 26.7.

Cabell county has many exceedingly well-qualified unemployed teachers. Fayette, Marion, Kanawha, and Mercer, also have well-qualified unemployed elementary-school teachers. Ordinarily one finds such conditions existing in any county in which a teachers' college is located. The issuance of all certificates ranking below the standard normal could be stopped right now, without causing a deficiency in the supply of well-qualified teachers. The policy of issuing more low-grade certificates will only add to the number of unemployed, or give competition to the better-qualified members of the occupation.

Fourteen hundred, or 59 percent of the 2,370 unemployed elementary-school teachers hold standard normal or collegiate elementary certificates. The certificates of the remainder of the group were classified as follows: short course, 324, or 13.7 percent; first grade, 578, or 24.4 percent; second grade, 68, or 2.9 percent. The non-employment of the 970 teachers who possess either the short-course or the lower-grade certificates may be explained solely on the basis of their credentials. However, the important consideration in this connection is the fact that the median unemployed elementary-school teacher possesses a standard normal certificate. If a person (or a board of education) selected one of these teachers by chance instead of intention, he would choose the holder of a standard normal or collegiate elementary certificate about 59 percent of the time.

The qualifications of the employed elementary-school teachers of the state are higher than those of the unemployed, for 70.3 percent of the former possess standard normal certificates or higher qualifications. Thirteen percent of the employed are college graduates, while only five percent of the unemployed possess collegiate elementary certificates. Evidently employing boards have been exercising some discretion in this matter. Annually Superintendent Trent has urged such a course, and his efforts have borne some fruit. On April 1, 1937, he wrote the following to presidents of the county boards of education:

"We urge in your employing teachers without experience that you employ only those who are well prepared. A minimum may

well be graduation from a two years' course in a teachers' college where instruction has been given in principles of teaching and where practice has been given in putting these principles into operation. We hope the time may soon arrive when we shall permit to enter into the teaching profession only those who have completed four years of college preparation."

Since the inception of the county unit system, excellent progress has been made in raising teacher qualifications. In 1932-33, the last year of the district unit, 44.2 percent of the employed elementary-school teachers in the state possessed a standard normal certificate or higher qualifications. This figure advanced to 49 percent in 1933-34; 54.8 percent in 1934-35; 63.7 percent in 1935-36; and 70.3 percent in 1936-37. In other words, in four years the percentage of elementary-school teachers whose professional training was of the standard normal level or above, increased from 44.2 to 70.3, a gain of 26.1 percent or an average of 6.5 per year.

But conditions necessitating further progress are at hand. It seems to the writer that too many poorly-qualified teachers are employed, while many well-qualified teachers are denied an opportunity to make a living through their chosen vocation. There are 216 employed high-school teachers who hold standard normal or certificates of lower grade. On the other hand, more than 700 high-school teachers with first-class high-school certificates are unemployed. The answer to such a situation is obvious and clear. Similarly, 3,429 of the 11,554 employed elementary-school teachers of the state possess a short course or a certificate of lower grade, while 1400 unemployed hold standard normal or higher certificates. It seems that a change in personnel is also in order in this situation.

Probably the persons composing the excess supply of high-school teachers should be encouraged to qualify for the collegiate elementary certificate. Their comparatively high qualifications should increase their possibilities of securing positions in elementary schools. As far as the state minimum legal salaries are concerned, one position is as desirable (or should I say as undesirable) as another, provided the factor of qualifications is constant.

If such changes as were just outlined actually took place, the certificate standing of the teachers of the state would be greatly improved. About 847 college graduates and 1,279 standard normal graduates would succeed persons with lower qualifications, raising the percentage of all employed teachers who possess two years or more of professional and academic education from 78.6 percent to 92 percent. An accomplishment of this magnitude has taken approximately three years in the past, while still leaving 2,000 well-qualified teachers without positions.

SUMMARY AND CONCLUSIONS

A questionnaire study of the unemployed school teachers in West Virginia in 1936-37 revealed the following:

1. The largest percentages of unemployed high-school teachers were in Taylor county with 45.9 percent; Cabell with 41.4 percent;

Marion, 37.6; Jefferson, 32.6; Ohio, 29.3; Ritchie, 26.4; Wood, 25.2; Upshur, 24.4; and Kanawha, 23.1. In the state at large about eighteen out of every 100 high-school teachers available were unemployed.

2. Most of the unemployed high-school teachers were prospective teachers of English, social studies, and mathematics.

3. A total of 2,370 or 17.7 percent of the available elementary-school teachers of the state were unemployed. Counties with one-fourth or more of their available elementary-school teachers unemployed were: Gilmer, 46.3 percent; Barbour, 37.7; Cabell, 32.5; Taylor, 31.0; Roane, 29.7; Braxton, 28.4; Jefferson, 27.8; and Doddridge, 26.7. Ordinarily one finds considerable teacher unemployment in counties were colleges are located.

4. The median unemployed school-teacher possesses a standard normal certificate. The qualifications of employed elementary-school teachers are somewhat higher than those of the unemployed.

5. The issuance of all certificates ranking below the standard normal could be stopped now, without causing a deficiency in the supply of well-qualified teachers.

6. Much of the present unemployment could be avoided if the state followed a telic program of teacher education, based upon a continuing survey of supply and demand. Such research must differentiate the many teaching occupations.

THE RELIABILITY OF COLLEGE GRADES

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THE EVIDENCE is accepted as conclusive that a number of people, scoring the merit of some particular piece of work—an examination paper, for example—will (unless they use quite objective criteria) so disagree as to stamp their individual judgments as unreliable. Given judges enough, it appears that the paper may be assigned almost every possible rating. In such case there is just one variable—the standards of the judges—and all disagreements as to value are manifestations of that variable.

For some time I have suspected that the impression of unreliability of grades that grows out of that unquestioned situation is a gratuitous extension. Are semester grades unreliable? To get at least a partial answer to that question I have undertaken this simple inquiry.

Now it must be borne in mind that, in comparing grades made in different courses by a student working under different instructors, we have two variables. The variability of faculty standards of judgment is one factor; to that must be added the variability of student reaction to different courses and different teachers. There is no reason to believe that this second variable element is less influential than the first.

With two variables in operation our natural expectation is that we will find a more pronounced scattering of grades than is found in the rating of one piece of work by several judges, where there is but the one variable. To be sure, one influence may, in some cases, tend to offset the other, but the probability is against such event in many instances.

On the other hand, when a student pursues a course for a semester, his instructor has opportunity to score a more extensive piece of work than a single examination. I have sought to determine whether, in this more complex situation, there is greater or less predictability of outcome than there is in case a single paper is graded. This report offers one type of evidence. I hope to have data of another type to submit to the Section next year.

Illustrating the inquiry I cite the record of Miss C, an N. Y. A. worker in my office, a student in her last college semester. In the past seven semesters Miss C has taken 45 courses in 12 departments of instruction with 26 instructors. She received 27 A's for 70 hours of credit from 15 instructors in 10 departments, 17 B's for 43 hours of credit from 16 instructors in 9 departments, and one C for 3 hours. That Miss C has had 45 chances to vary the quality of her work, that 26 different instructors have recorded judgments, and that 44 of these 45 judgments placed the work as of A or of B quality, suggests the hypothesis that grading a semester's work is quite another thing than evaluating a single performance, and that to final

grades there attaches a degree of consistency and dependability and predictability not always conceded.

In pursuit of evidence bearing upon the hypothesis I have examined the records of 50 seniors in Marshall College. Names of seniors who are scheduled for June graduation from Teachers College and who entered in the autumn of 1933 were listed in alphabetical order. It was thought that students who had entered at an earlier date and stayed out of school for a time, perhaps to teach, might make records on return to college that would confuse the issue; consequently only those who entered in September 1933 were listed. This list consisted of 35 names. To these were added names of ten students who entered in September 1933 but whose graduation is scheduled for August rather than June. To round out the number to 50 names, five were added from the list of

TABLE 1

Student	Courses taken	Courses graded A	B	C	D	F	Total hours	Hours graded A	B	C	D	F
1	44	12	20	11	0	1	117	31	59	24	0	3
2	47	7	17	22	1	0	117	16	46	54	1	0
3	46	38	7	1	0	0	114	95	15	4	0	0
4	41	15	14	10	1	1	114	40	41	28	1	4
5	44	0	9	22	10	3	120	0	21	63	26	10
6	42	1	12	26	3	0	114	4	33	69	8	0
7	41	23	11	7	0	0	117	67	31	19	0	0
8	41	18	15	8	0	0	117	51	43	23	0	0
9	44	5	25	14	0	0	112	11	64	37	0	0
10	44	9	19	13	3	0	114	21	50	33	10	0
11	49	14	25	10	0	0	115	37	54	24	0	0
12	46	21	12	11	2	0	126	63	34	24	5	0
13	45	27	17	1	0	0	116	70	43	3	0	0
14	40	0	10	18	11	1	111	0	28	50	30	3
15	41	21	16	4	0	0	114	60	42	12	0	0
16	39	1	7	22	8	1	114	4	23	60	25	2
17	50	8	13	28	1	0	113	9	31	71	2	0
18	41	7	20	14	0	0	120	23	55	42	0	0
19	44	0	14	23	7	0	119	0	38	62	19	0
20	45	4	28	13	0	0	119	14	72	33	0	0
21	42	5	17	15	5	0	113	15	47	38	13	0
22	52	6	18	24	4	0	119	14	41	55	9	0
23	52	13	24	15	0	0	118	34	45	39	0	0
24	45	29	10	6	0	0	120	76	28	16	0	0
25	48	3	28	16	1	0	118	7	69	40	2	0
26	49	2	10	31	5	1	130	7	28	81	12	2
27	45	8	21	15	1	0	112	24	56	31	1	0
28	43	0	6	33	3	1	119	0	14	91	10	4
29	42	3	21	18	0	0	115	11	58	46	0	0
30	44	5	24	15	0	0	112	12	63	37	0	0
31	45	37	8	0	0	0	117	101	16	0	0	0
32	45	28	14	3	0	0	114	74	35	5	0	0
33	48	8	17	20	3	0	140	24	45	62	9	0
34	45	40	5	0	0	0	116	107	9	0	0	0
35	43	1	14	22	6	0	116	1	36	60	19	0
36	40	3	15	18	4	0	109	8	44	48	9	0
37	49	1	10	31	6	1	130	4	26	82	15	3
38	44	17	21	5	1	0	121	46	59	14	2	0
39	42	0	7	24	11	0	115	0	19	63	33	0
40	37	10	23	2	2	0	105	31	63	6	5	0
41	46	1	4	29	9	3	115	1	4	75	26	9
42	49	0	8	23	11	7	125	0	16	59	29	21
43	46	4	14	15	10	3	104	5	23	41	30	5
44	44	2	2	30	10	0	113	4	6	76	27	0
45	38	4	13	18	3	0	104	12	37	49	6	0
46	43	1	5	27	6	4	119	3	10	75	19	12
47	42	1	3	22	14	2	109	2	3	59	40	5
48	42	3	8	28	3	0	110	7	14	79	10	0
49	43	3	5	19	15	1	118	8	14	54	40	2
50	41	21	17	3	0	0	116	63	48	5	0	0

candidates for degrees in June from the College of Arts and Sciences; these were the first five on the alphabetical list for whom original date of entrance was fall of 1933. It is believed that we have here an unselected list of sufficient extent to show whatever there is to be shown.

Table 1 gives the distribution of grades for each student by number of courses and number of hours of credit involved in those courses. Courses taken in 3½ years vary in number from 37 to 52; number of hours varies from 104 to 140.

TABLE 2.—*Distribution by percentages*

Student	Grades					Hours graded				In consecutive hours	
	A	B	C	D	F	A	B	C	D	F	Two	Three
1	27	46	25	0	2	26	50	21	0	3	73	98
2	15	36	47	2	0	14	39	46	1	0	83	98
3	83	15	2	0	0	83	14	3	0	0	98	100
4	36	34	24	3	3	35	36	25	1	3	70	94
5	0	20	50	23	7	0	18	52	22	8	73	93
6	2	29	62	7	0	4	29	60	7	0	91	98
7	56	27	17	0	0	57	27	16	0	0	83	100
8	44	36	20	0	0	43	37	20	0	0	80	100
9	11	57	32	0	0	10	57	33	0	0	89	100
10	20	43	30	7	0	18	44	29	9	0	73	93
11	29	51	20	0	0	32	47	21	0	0	80	100
12	46	26	24	4	0	50	27	19	4	0	72	96
13	60	38	2	0	0	60	37	3	0	0	98	100
14	0	25	45	27	3	0	26	45	27	2	72	97
15	51	39	10	0	0	52	37	11	0	0	90	100
16	3	18	56	20	3	3	20	53	22	2	76	94
17	16	26	56	2	0	8	27	63	2	0	82	98
18	17	49	34	0	0	19	46	35	0	0	83	100
19	0	32	52	16	0	0	32	52	16	0	84	100
20	9	62	29	0	0	12	60	28	0	0	91	100
21	12	40	36	12	0	13	42	34	11	0	76	88
22	11	35	46	8	0	12	34	46	8	0	81	92
23	25	46	29	0	0	29	38	33	0	0	75	100
24	65	22	13	0	0	63	23	14	0	0	86	100
25	6	59	33	2	0	6	59	34	1	0	92	98
26	4	21	63	10	2	5	22	62	9	2	84	94
27	18	47	33	2	0	21	50	28	1	0	80	98
28	0	14	77	7	2	0	12	76	9	3	91	98
29	7	50	43	0	0	9	50	41	0	0	93	100
30	11	55	34	0	0	11	56	33	0	0	89	100
31	82	18	0	0	0	86	14	0	0	0	100	—
32	62	31	7	0	0	65	31	4	0	0	93	100
33	17	35	42	6	0	17	32	44	7	0	77	94
34	89	11	0	0	0	92	8	0	0	0	100	—
35	2	33	51	14	0	1	31	52	16	0	84	98
36	7	38	45	10	0	7	41	44	8	0	83	93
37	2	21	63	12	2	3	20	63	12	2	84	96
38	39	48	11	2	0	38	49	11	2	0	87	98
39	0	17	57	26	0	0	16	55	29	0	83	100
40	27	62	6	5	0	29	60	6	5	0	89	95
41	2	9	63	20	6	1	3	65	23	8	83	92
42	0	16	48	22	14	0	13	47	23	17	70	86
43	9	30	33	22	6	5	22	39	29	5	63	85
44	4	5	68	23	0	4	5	67	24	0	91	96
45	11	34	47	8	0	12	35	47	6	0	81	92
46	2	12	63	14	9	3	8	63	16	10	77	89
47	2	7	53	33	5	2	3	54	37	4	86	93
48	7	19	67	7	0	6	3	72	9	0	84	91
49	7	12	44	35	2	7	12	46	34	1	79	91
50	51	42	7	0	0	54	42	4	0	0	93	100

Table 2 shows the distribution of grades by percentage. Student 1, for example, has been given A in 27% of his courses (44 in number, according to Table 1), B in 46%, etc. A has been given to 26% of the hours of work taken by Student 1 (26% of the 117 hours shown in Table 1), B has been given to 50%, etc. Student 1, having

received 27% of all his course grade in A, with 46% in B, has 73% of all of his grades in two letters, A and B; if to these 73% we add the 25% of course grades that were C's, the total in three consecutive grades is 98%. In other words, the record of Student 1 is such as to lead us to expect that, should he continue work of the same kind in the future, 73% of all of his grades would be A's and B's and that 98% of them would be A's, B's, C's. In the case of Student 2, grades in B and C have been combined to give him 83%, with 98% in A, B, C. That is, the combinations of two and three grades have been so made as to give each student the largest possible percentages.

The following observations are based on Table 2: (1) two-thirds of all students (33 of 50) get at least half their grades in one letter; half of these students (17 of 50) get at least 60% of all their grades in one letter; (2) more than two-thirds of all students (36 of 50) get at least 80% of all grades within the range of two letters; it is the very rare student (1 of 50) who does not get at least 70% of all grades in two letters; (3) it is the exceptional student (4 of 50) who gets less than 90% of all grades in three letters, and about two out of five students (19 of 50) place all of their grades within the range of three letters.

From these observations I concluded that there is really a surprising degree of consistency in final grades of college students. Each final grade depends on two variables—the student's performance and the instructor's standards. Were we able to eliminate the first of these it is manifest that the consistency of grades would be greatly increased. It seems fair to college teachers generally to say that probably any one of them gives to a student's whole semester performance approximately the same grade that any other one of them would give to the same quality of performance.

It follows that one is justified in taking rather seriously any student's final grades as indicative of what the student actually did under the existing conditions, whether that performance may or may not be regarded as indicative of the student's probable performance under quite different conditions, life performances in later years, for example.

SEX DIFFERENCES IN INTELLIGENCE-TEST SCORES AT BETHANY COLLEGE

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INTEREST IN THE SUBJECT OF SEX DIFFERENCES has not subsided with all of the negative findings. Even when the accumulation of averages and standard deviations on intelligence test scores seems to be completely barren in terms of evidence for one point of view or the other, there remains an insistent curiosity that makes us dig into all the possible sources of data and take a look at each bit of new evidence. Wellman *(1)* recently cited 249 studies in this field. Anastasi *(2)* recently has given a valuable summary of data and generalizations from many studies and reports. Almost everyone who treats intelligence-test scores calls attention to differences or similarity in the data for the two sexes, and so we add this report from intelligence test results at Bethany College.

For a while it was contended that intelligence test scores for males were more variable than for females, although it has been conceded for some time that the central tendency is usually about the same. Careful investigations indicate, however, that there is little basis for the belief that one sex is more variable than the other in the capacities that are measured by intelligence tests. The selective factor, errors of sampling, or inappropriate measurement techniques are probably responsible for the data from which such conclusions have been drawn.

The claim that the male is more variable than the female and is often found at the extreme in a frequency distribution seems to have had its origin in certain sociological surveys which show that there are more males than females in the lists of eminent and accomplished persons. In a society such as ours, the selective factor operates in such a way that we dare not make generalizations from ordinary surveys. May *(3)* says of the various studies, "In respect to intelligence, or intellectual capacity as measured by a variety of intelligence tests, there are no consistent differences between the sexes when fair comparisons are made."

In the testing of freshmen at Bethany College for the past six years with the American Council on Education psychological examination *(4)*, it was found that both the median and the mean for the freshman women were higher than these same measures for freshman men in four years, but that in 1931 and in 1936 the situation was reversed. It was found that the standard deviation for the women was larger in four out of the six years. On the other hand the top scores made in five out of the six years were made by men, and the bottom scores were made by men in three out of the

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[1] Wellman, Beth L.: "Sex Differences," in "A Handbook of Child Psychology" (C. Murchison, ed.).
[2] Anastasi, Anne; "Differential Psychology" (Macmillan, 1937.)
[3] May, Mark A.: "Significance of Sex," in "The Foundations of Experimental Psychology," (C. Murchison, ed.) 1929.
[4] L. L. and T. G. Thurstone of the University of Chicago.

six years. The largest range of scores was made by men in 1933 and 1936 and by women in 1931, 1934, and 1935. The range was the same for both sexes in 1932.

These results differ somewhat from the results of the entire group of college students tested by this same instrument during these years. Thurstone's reports *(5)* of the testing of several thousand college freshmen during each of these years would indicate about the same average, both median and mean, for women and not a great difference in variability. The data for the testing at Bethany College are summarized in Tables 1, 2, and 3, below.

TABLE 1.—*Statistical summary of scores made on American Council on Education psychological examination by freshmen at Bethany College*

	N	Range	Md	Q	Mn	S. D.
1931	112	57-255	147	33	147.79	48.08
1932	95	66-312	172	39	171.06	54.74
1933	89	22-313	161	55.5	154.04	68.52
1934	141	69-279	179	38.5	178.44	56.88
1935	105	53-330	183	40	188.97	57.54
1936	152	45-338	187.5	40	187.8	62.12

TABLE 2.—*Statistical summary of scores made on American Council on Education psychological examination by freshman men at Bethany College*

	N	Range	Md	Q	Mn	S. D.
1931	72	57-255	149.5	32.5	148.85	47.8
1932	43	77-312	156	37.5	163.93	53.85
1933	52	22-313	136.5	49	139.52	63.68
1934	86	76-279	170	43.5	171.5	49.83
1935	64	53-284	175	41.5	178.47	53.49
1936	74	68-338	190.5	56.75	191.30	60.23

TABLE 3.—*Statistical summary of scores made on American Council on Education psychological examination by freshman women at Bethany College*

	N	Range	Md	Q	Mn	S. D.
1931	40	58-233	142.5	35.5	145.88	44.96
1932	52	66-301	187.5	38.5	179.46	55.84
1933	37	26-298	187	55.5	171.76	70.28
1934	55	69-276	193	35	189.29	45.512
1935	41	90-330	209	39.5	205.37	59.14
1936	78	45-303	177.5	47.75	177.6	61.39

These data from the Bethany College students add nothing to our general knowledge about sex differences in intelligence, but they do suggest a situation on the Bethany campus that is different from the freshman population in general. Certainly our "sample" of the college population shows some rather marked sex difference in intelligence-test scores, and it would seem that there should be some local explanation. It is interesting to note that there is the slight fluctuation from year to year. All this is significant in terms of our educational and guidance program.

The social requirements, and the professional and vocational stimulations of our society, operate so differently upon the two

[5] Educational Record of April 1932, April 1933, April 1934, April 1935, April 1936.

sexes that certain colleges are likely to get boys and girls with some divergence in background due simply to sex. It may be that the boys who enter small colleges such as Bethany come from homes which should probably have a greater variability and a lower mean on a comprehensive socio-economic scale than the homes from which our general run of college women come. The small college with its supervised activities may seem to provide the "protection" which the "best parents" want for their daughters.

We have no hopes that any number of such reports as this can suggest a probable answer to the whole question of sex differences. Such survey reports are subject to too many variables. It seems that we shall not be very close to answering the question by the results of college testing until we shall find a way to equate the conditions of environment, personality, and general stimulation which send boys and girls to college—and to certain colleges.

Wild Flowers Used by the Indians for Medical Purposes

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THE INDIANS used the roots, leaves, and flowers of many different kinds of plants for medical purposes long ago. White man has profited through the years by the Indian's experience. While much of the Indian doctoring was wrong and full of superstition, still there remains the fact that some of their preparations of herbs form the basis of modern medicine. Because of the sanctity of most Indian medicinal knowledge it is difficult to obtain full information and probably, according to the studies made by Smith *(3)* no white man will ever be able to get all of the data. The Indian practice of medicine is the really great feature of their religion—a very sacred and holy office—and since all white men are pagan to the Indians, they are greatly handicapped in such a study and must gather information from the very old Indians as well as from the doctors of the tribes and from those who have wandered from the faith.

Smith *(3)* has made field trips into the Menomini reservation in Wisconsin with a very excellent guide and interpreter and states concerning the origin of medicine among these Indians that the spirits of the first tier of heaven had the first medicine lodge. One of these spirits descended to earth and showed grandmother earth the medicine bag with its roots and berries. Then he gave her charge of them and she was to keep them and allow them to grow and obtain added power. The spirit Mänäpus decided that he would appear before the Menomini Indians. He instructed an old uncle to build a medicine lodge within four days. On the fourth day the spirit Mänäpus again appeared and sent the young Indians back and initiated the elders to the lodge. He instructed them fully in the uses of all plants and medicines and told them the proper ceremony for each.

The Indian doctor visited the patient and found where the pain was located and how it came about. Then he went through a ceremony which involved several hours of time. Later he came back with the combination of herbs and gave them to the patient. In four days the patient should be well—if not then the process must be repeated with more powerful herbs. When the patient is cured he must offer a gift to the doctor of equal value to the service rendered. It is usually cloth, food, tobacco, blankets or perhaps a cow or a horse.

The writer has collected the following Indian remedies from the literature cited and from information handed down from old settlers who obtained it directly from the Indians as well as from the Indians themselves. This study was started in 1924, when the

writer was able to obtain some information from the Indians at Baraboo, Wisconsin. From 1924 to 1927 regular trips were made into this locality, which aroused much interest in the subject and led to this study.

Jack-in-the-pulpit *(Arisaema triphyllum) (L.)*. The fiery root of this plant was used as a poultice for sore eyes by the Menomini Indians. The fiery prickles felt when taken into the mouth are due to mechanical punctures of oxylate crystals. The blood would be drawn to the eye and fight whatever infection might exist. Anyone having eaten the so-called Indian turnip can easily imagine the sensation on the tender eyeball. The Pawnee Indians used it as a plaster for rheumatism and for headaches.

Skunk cabbage *(Spathyema fœtida) (L.)* The root is used as a poultice. The root is first dried, then powdered and sprayed over the surface of the wound. It was also used as a remedy for cramps, and the root hairs were used to stop hemorrhages. It was one of the ingredients of the tattooing set and employed by the Menomini as a talisman against the return of disease, if tattooed over the seat of the pain.

Sweet flag *(Acorus calamus) (L.)* A very powerful remedy used in small quantities to cure cramps in the stomach. It is a good physic, but if too much is taken the Menomini say it will kill the patient. The root may be chewed to cure dyspepsia. The Omaha tribes put it into the feed of ailing horses.

Bellwort *(Uvularia grandiflora* Sm.*)* was used to reduce swellings.

Solomon's seal *(Polygonatum biflorum) (Walt.) (Ell.)* The root was dried and pulverized. It is then mixed with cedar balm and burned as a smudge to revive one who is unconscious. If the patient is about to die they blow this smoke into his nostrils to bring him back to life.

Large-flowered trillium *(Trillium grandiflora)*. The root was grated, steeped, and drunk as a tea for cramps and irregularity of menses. It was used to reduce eye-swelling by grating and applying as a poultice. According to the early settlers in this region the trillium was known as birthroot and was used by the Indians as a parturient.

Blue flag *(Iris versicolor L.)* was used by the Pawnees, Omahas, and Poncas as cure for earache. The Menomini did not use it.

Blue-eyed grass *(Sisyrinchium albidium)*. The Indians used it to ward off snakes. It was used either in the house or carried in the pocket. Sometimes it was put in the horse feed and it was supposed to make the animal's bite poisonous to any one except the owner.

Showy ladies' slipper *(Cypripedium acaule)* was supposed to produce a slight stimulating effect on the nervous system.

Yellow ladies' slipper *(Cypripedium parviflorum)*. The Indians used the root in curing female disorders. It has also been found in

sacred bundles where it was supposed to induce dreams of the supernatural.

Wild ginger *(Asarum canadense L.)* was called beaver potato and the Indians used it as a mild stomachic. When the patient was weak and it might be fatal to eat something that was craved, then he ate a part of this root. Whatever he wanted then might be eaten in safety.

Liverleaf *(Hepatica acutiloba* DC.*)*. The roots of this plant are used with the maidenhair fern roots for the cure of female disorders especially leucorrhoea.

Yellow water lily *(Nymphaea advena)*. This plant belongs to the underneath spirits and is thought to be a great medicine. The large underwater stems are powdered and used for poultices and cuts. The Menomini say this plant makes the fogs that hover over the lakes.

Red bane berry *(Actea rubra)*. The roots are used to relieve headache due to eye strain.

Black snake root or black cohosh *(Sanicula marilandica)*. This plant was a noted aboriginal remedy. Certain Indians used it for some evil purpose.

Blue cohosh *(Caulophyllum thalictroides)*. The tea of the roots of this plant is drunk for the suppression of profuse menstruation. It was held as a very valuable remedy for female disorders.

May apple *(Podophyllum peltatum* L.*)*. The Menomini Indians boiled the whole plant and sprinkled it on the potatoes to kill the potato bugs. The fruit was used as a food.

Bloodroot *(Sanguinaria canadensis* L.*)* The root of this plant was used with other medicines to strengthen them.

Dutchman's breeches *(Dicentra cucullaria)*. One of the most important love charms of the Menomini.

Wild lupine *(Lupinus perennis)*. The name means horse medicine in the Indian language. They call the plant paskigokasiwus. They use it to fatten the horse and make him full of fire.

Wild geranium *(Geranium maculatum)*. The Indians claim it has binding qualities in its roots and nearly all tribes have employed it as a treatment of flux.

Great St. John's wort *(Hypericum ascyron)*. This is a very important remedy. The root was used for weak lungs. With black cap raspberry was used for kidney troubles.

Ginseng *(Panax quinquefolium)* was supposed to act as a tonic and a strengthener of mental powers.

Wintergreen *(Gautheria procumbens)*. The leaf of this plant is steeped with the berry to make a tea, which is drunk for rheumatism.

Butterfly weed *(asclepias tuberosa)*. One of the most important medicines. The root was pulverized and used for cuts and bruises. It is used in combination with ginseng and sweet flag as a cure in

case a warrior cuts his foot with an ax. The Omaha and Ponca tribes use it as a raw medicine. They chew it and put it into the wounds. They consider it especially good for old sores.

Virginia water leaf *(Hydrophyllum virginianum)*. The root has a puckering quality and is used as a remedy for flux.

Blue vervain *(Verbena hastata* L.*)*. A tea is made out of the roots to clear up cloudy urine.

Wild bergamont *(Monarda fistulosa)*. The leaves and flowers of this plant were used to make a tea which was used for catarrh. The Dakota Indians used it for stomach pains and the Omaha and Poncas used it for pimples and skin eruptions.

Catnip *(Nepeta cataria)* combined with wild mint and peppermint was used as a cure for pneumonia.

Great mullein *(Verbascum thapsus L.)* The root was used for treatment of pulmonary diseases. The leaf was gathered and smoked as Indian tobacco.

Culver's Root *(Veronica virginica)*. The root of this plant was used as a reviver and purifier for those who have recently been touched by an individual who has been defiled by a recent death in the family. It was also used as a strong physic.

Partridge berry *(Mitchella repens)*. The leaves of the plant are used to make a tea which is used to cure insomnia.

Joe-pye-weed *(Eupatorium purpureum L.)*. This plant was used to cure diseases of the uro-genital system.

Boneset *(Eupatorium perfoliatum* L.*)*. The Menomini brewed a tea which was used to break a fever.

Yarrow. *(Achillea millefolium)*. A hot tea was made from the leaves and was used to cure a fever. They rubbed tops on eczema sores. The leaves were use as a poultice for rash on children. The Winnebago Indians used it to reduce swellings, and a wad of leaves was put into the ear for earache.

Leather wood *(Dirca palustris L.)*. The roots were steeped to make a tea which aided in curing kidney troubles.

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