

COWLES COMMISSION  
FOR RESEARCH IN ECONOMICS

DECENNIAL REPORT  
1932-1941

THE UNIVERSITY OF CHICAGO

# COWLES COMMISSION FOR RESEARCH IN ECONOMICS

THE COWLES COMMISSION FOR RESEARCH IN ECONOMICS is a not-for-profit corporation, founded in 1932 for the purpose of conducting and encouraging investigations into economic problems. A function of the COMMISSION is to issue from time to time papers and monographs of an econometric or economic-statistical nature without, however, assuming responsibility for theories or opinions expressed therein. The COMMISSION is affiliated with the ECONOMETRIC SOCIETY, an international society for the advancement of economic theory in its relation to statistics and mathematics.

## PRESIDENT

ALFRED COWLES

## RESEARCH DIRECTOR

THEODORE O. YNTEMA

## RESEARCH STAFF

FORREST DANSON

HAROLD T. DAVIS

JOEL DEAN

LEONID HURWICZ

OSCAR LANGE

DICKSON H. LEAVENS

H. GREGG LEWIS

JACOB L. MOSAK

JOHN H. SMITH

## ADVISORY COUNCIL

ARTHUR L. BOWLEY

IRVING FISHER

RAGNAR FRISCH

WESLEY C. MITCHELL

CARL SNYDER

JACOB VINER

THE UNIVERSITY OF CHICAGO

## THE COWLES COMMISSION FOR RESEARCH IN ECONOMICS

THE Cowles Commission for Research in Economics was founded in 1932, at which time it was incorporated under the laws of the State of Colorado as a not-for-profit corporation to encourage and conduct investigations into problems of current economic importance with particular reference to the application of statistics and mathematics in the solution of these problems. In the beginning the following Advisory Council for the Commission was appointed: Arthur L. Bowley, University of London; Irving Fisher, Yale University; Ragnar Frisch, University of Norway; Wesley C. Mitchell, Columbia University; Carl Snyder, for many years with the Federal Reserve Bank of New York. Jacob Viner, University of Chicago, was added to the Advisory Council in 1939.

During the first eight years of its existence the Commission had its headquarters in Colorado Springs and was affiliated with Colorado College where courses were regularly offered by members of the Commission's staff. From 1935 to 1940, inclusive, the Commission each summer conducted a research conference at Colorado College. At these conferences more than 100 different speakers presented lectures and the attendance included representatives from 17 foreign countries, as well as most of the important economic research institutions, government bureaus, institutions of

higher education, and many of the large corporations, in the United States.

In the Spring of 1939 an arrangement was completed with Robert Maynard Hutchins, president of the University of Chicago, to affiliate the Commission with the University. This provided for the increase of the research staff of the Commission by the addition of some members of the University faculty on a part-time basis and of other members of the faculty, who, while salaried by the University and giving most of their time to its service, have the assistance of the facilities of the Commission for carrying out research projects. The University furnishes the Commission with offices in the Social Science Research Building. The move from Colorado Springs to Chicago was made in September, 1939, and at that time the Commission was incorporated as a not-for-profit corporation under the laws of the State of Illinois.

Eighteen different individuals have been connected with the Commission as research associates, of whom 10 are at present affiliated in that capacity. An average of four full-time employees has been maintained for computing and other clerical work, as well as a large number of part-time student workers provided through the co-operation of the National Youth Administration.

During the 10 years of its existence the Commission has published six monographs, varying in length from 175 to 620 pages. In addition to these, members of the staff have published 14 other books and 106 journal articles, and have presented 152 papers before scientific societies. Staff members have also taken a major part in the administration

of the affairs of the Econometric Society and in the publication of its quarterly journal, *Econometrica*.

## RESEARCH PROGRAM OF THE COMMISSION

THE WAR has required major changes in the research work of the Commission. On the one hand, new and urgent economic problems have arisen, and on the other, the opportunities for current observation of normal price-making processes have nearly disappeared. The past and probable future losses of members of the staff to government agencies make it unwise to undertake at this time a large-scale research project continuing over several years. For these reasons, the Commission is deferring its long-range program, directed to the analysis of factors determining rates of investment and ultimately to a consideration of the obstacles to full employment of productive resources, and is devoting its energies, in so far as they can be efficiently used, to a study of war price controls.

This project is being undertaken jointly by the Cowles Commission and by the Price Conference of the National Bureau of Economic Research. It has three phases: theoretical analysis, study of statistics and other information relating to price and wage phenomena, and field investigation through interviews with buyers and sellers. The objective is to appraise various types of price-control methods and the administrative devices employed in implementing these methods. Besides having long-range significance, the findings will be useful in affording the public and parties

immediately interested an objective critique of methods of price control. Theodore O. Yntema and Joel Dean (to the extent the latter's obligations in the Office of Price Administration permit) are directing the project with assistance from the Committee on Price Determination organized under the Price Conference of the National Bureau. Oscar Lange is participating actively both as a member of the Committee and as a Cowles Commission research associate. After the middle of the year, Leonid Hurwicz and a staff of interviewers will devote full time to the undertaking. In addition to the resources made available for this enterprise by the Cowles Commission and the National Bureau, it is hoped that funds may be obtained from other sources to conduct the investigation on a larger scale.

The work in progress in the Commission includes also a considerable number of projects which were initiated prior to the war.

Alfred Cowles, Forrest Danson, and Dickson H. Leavens have continued their systematic appraisal of stock price forecasts to determine the degree of accuracy of predictions by professional forecasters.

Harold T. Davis has begun a compilation of price data in ancient-Egypt and Rome with the objective of extending time-series analysis of price into earlier periods of history.

Joel Dean has been on leave of absence to act as price executive for industrial and agricultural machinery in the Office of Price Administration. He has therefore been unable to proceed with his book which would integrate his various studies of cost and demand functions in the individual enterprise. It is hoped that this book will appear as a

Cowles Commission Monograph when Professor Dean resumes his academic activities.

Oscar Lange, assisted by Leonid Hurwicz, is investigating the effects of changes in national income and employment on savings and the pattern of consumption expenditures, and is studying the relationships among national income, employment, and investment. Professor Lange and Mr. Hurwicz are also investigating the possibility of analyzing time series by recently developed methods such as the correlogram and the harmonic dial, in order to obtain a more satisfactory test of certain theories of business cycles than has been possible by classical periodogram analysis.

Dickson H. Leavens, whose time is largely occupied with editorial work, has been continuing the collection of materials on silver and gold especially with reference to the monetary uses of these metals.

The analysis of the factors determining the demand for steel undertaken by H. Gregg Lewis has progressed far enough to be submitted as a doctoral dissertation. Mr. Lewis plans to refine and amplify his study before it is published as a Commission monograph. This pioneer investigation will help illuminate the demand for durable goods, a dark field in economics.

Jacob L. Mosak is on leave of absence to take a position in the Office of Price Administration. He has, however, completed the draft of his mathematical formulation of the theory of international trade. After minor revisions are made by the author, this study will appear as a Commission monograph. It affords a definitive statement of internation-

al trade theory constructed on the foundations of theoretical economics which have been laid by J. R. Hicks and others during the last decade.

John H. Smith is continuing his organization and integration of the theory of sampling. This work is designed to bring within the horizon of most statisticians a comprehension of sampling theory instead of a mere acquaintance with rules of thumb for making tests of significance. Theodore O. Yntema is collaborating in this project.

The Committee on Price Determination, established under the auspices of the National Bureau and functioning in co-operation with the Cowles Commission under the direction of Co-Chairmen Joel Dean and Theodore O. Yntema, has been engaged in an exploratory analysis of the factors determining price policies of business men. The work of this Committee has been done mainly by Mr. Hurwicz and a small interviewing and clerical staff. The scope and technique of the interview have been developed and approximately one hundred interviews have been completed. A preliminary report on this work is in preparation. When this report is finished, the Committee will shift its attention to the study of war price controls, as previously indicated.

At the invitation of the Director of the Financial Research Program of the National Bureau, the Cowles Commission is joining in a survey of the possibilities of determining the suitability of common stocks for investment by insurance companies. Francis McIntyre, a former research associate, Forrest Danson, and Theodore O. Yntema are participating in planing for this research.



## AFFILIATION WITH THE ECONOMETRIC SOCIETY

THE Cowles Commission since its organization has been affiliated with the Econometric Society, an international society founded in 1930 for the advancement of economic theory in its relation to statistics and mathematics. The Society's offices have been located at the headquarters of the Cowles Commission in Colorado Springs and later in Chicago, and its quarterly journal, *Econometrica*, has been published there. The Society now has 721 members in 40 countries, and nearly 300 other subscribers to *Econometrica*, chiefly libraries. Nine volumes of *Econometrica*, totalling nearly 3700 pages, have been published since its first issue in January, 1933.

Members of the Cowles Commission staff have taken an active part in the work of the Society. Charles F. Roos was secretary until the end of 1936; and Alfred Cowles has been treasurer from 1932 and secretary from 1937. The editor of *Econometrica* is Ragnar Frisch of the University of Norway, a member of the Advisory Council of the Cowles Commission. The following members of the Commission staff have assisted in the publication: William F. C. Nelson, assistant editor from 1933 until his death in May, 1936; Dickson H. Leavens, managing editor from October, 1936; Harold T. Davis, associate editor from 1933; Charles F. Roos, member of advisory editorial board from 1933; Alfred Cowles, business manager from 1933. Francis McIntyre since 1938 has served as secretary of the American program Committee which plans the meetings of the Society.

## RESEARCH CONFERENCES

THE Cowles Commission conducted a Research Conference on Economics and Statistics at Colorado Springs each summer from 1935 to 1940 inclusive. At these conferences papers were presented by more than 100 economists and statisticians from universities and research institutions throughout the United States and Europe. Over 500 persons attended one or more of the conferences.

The usual four-week program provided for two lectures and discussion periods in the mornings, Monday through Friday. Afternoons, evenings, and week ends were left free. Through the courtesy of Colorado College a convenient lecture room was provided in Palmer Hall and out-of-town participants were accommodated in the college dormitories. The opportunities afforded for getting acquainted and for informal discussions were a valuable supplement to the regular sessions of the conferences. Participants also took advantage of the opportunities for recreation in the Pikes Peak region, which aided in making the conferences a well-balanced combination of intellectual stimulation and of vacation.

A brief account of the special features of each annual conference is given below; in the appendix will be found a statistical summary and a list of the speakers.

The first conference, in 1935, was a series of informal meetings of members of the Econometric Society who remained in the vicinity of Colorado Springs after the meeting of the Society held there on June 22-24 of that year. These meetings were so successful that it was decided to

continue them in subsequent years.

The second conference, July 6 to August 8, 1936, was planned early in that year and invitations were sent out to members of the Econometric Society and to others who might be interested. The response was encouraging: an excellent list of speakers was secured and more than 50 persons from out of town attended. In addition to the morning sessions, four public evening lectures were given by Professor Irving Fisher, Professor Corrado Gini, Dr. Walter A. Shewhart, and Mr. Carl Synder.

The third conference was held June 28 to July 23, 1937. Preparations for this and future conferences were begun each October by issuing invitations to speakers, and in April a preliminary program was made up and circulated to a large list of economists and statisticians in the United States and Europe. The 1937 conference followed immediately after a meeting of the Econometric Society which was held at Denver from June 24 to 26 in connection with the One Hundredth Meeting of the American Association for the Advancement of Science, thus making it possible for many to attend both meetings. The out-of-town attendance in 1937 increased about 20 per cent. In addition to the conference lectures, public evening lectures were given by Dr. Thornton H. Fry, Professor James Harvey Rogers, and Mr. Carl Snyder.

The fourth conference was held from July 5 to 29, 1938. Since this year marked the hundredth anniversary of the publication by Antoine-Augustin Cournot of *Recherches sur les principes mathématiques de la théorie des richesses*, the pioneer work in mathematical economics, it was decided

to feature this centenary in the program. The opening lecture by Professor Harold T. Davis was devoted to "Cournot — Pioneer in Scientific Economics." On the invitation of the Cowles Commission, the French Government sent as its official representative to the conference Professor René Roy, chief engineer of the Department of Bridges and Roads, and professor at the National School of Bridges and Roads and at the Institute of Statistics of the University of Paris. Professor Roy gave a public lecture in French on "La vie d'Augustin Cournot, sa pensée, ses tendances philosophique et son oeuvre," and two lectures before the conference: "A propos d'un centenaire: l'oeuvre économique d'Augustin Cournot," and "Etude particulière d'une loi de demande: le trafic postale en France de 1873 à 1936." The out-of-town attendance reached nearly 100 this year, including participants from eight foreign countries.

The fifth conference was held from July 3 to 28, 1939, and again showed an increase in attendance, both from out-of-town and local. Six foreign countries were represented among the participants. The program included lectures by seven representatives of government organizations.

The sixth conference was held from July 1 to 26, 1940. Since the Cowles Commission had moved to Chicago its library and laboratory facilities were no longer available to participants, but a temporary office was opened in Palmer Hall to handle the details of the conference. Most of the Cowles Commission research staff came on from Chicago for part or all of the period. In addition to the council lectures, two public evening lectures were given by Professor Irving Fisher and Mr. Carl Snyder.

Reports of each conference except the first have been published by the Cowles Commission. Each report consists of about 100 pages and contains brief abstracts of each lecture presented. Copies of any of the reports will be sent without charge to those who ask for them.

## PUBLICATIONS

**A** FUNCTION of the Commission is to issue, from time to time, various monographs of an economic-statistical or econometric nature without, however, assuming responsibility for theories or opinions expressed therein. Six monographs have been published for the Commission by the Principia Press, Bloomington, Indiana.

Monograph No. 1, *Dynamic Economics, Theoretical and Statistical Studies of Demand, Production and Prices*, 275 pp., by Charles F. Roos, was published in September, 1934. This book applies mathematical analysis in the investigation of economic theory and differentiates between the old theories of static economics and the new developments of dynamic economics. The theoretical parts of the studies presented are chiefly concerned with the modification and extension of classical theories by the introduction of various dynamic elements. A theoretical investigation is made of problems in joint demand and loss leaders, demand and consumers' goods and capital goods, growth and decline of industry, production incentives, and the behavior of free and restrained prices. The book also contains two statistical analyses, one of the automotive demand for gasoline, which is an example of the demand for a consumers' good,

the other of the factors influencing residential building, as an instance of demand for a capital good.

Monograph No. 2, *NRA Economic Planning*, 596 pp., by Charles F. Roos, was published in February, 1937. Since the author had served as principal economist and director of research on policy matters of the National Recovery Administration from July, 1933, to September, 1934, this study is based on firsthand knowledge of the subject. The book first traces the factors which had their part in the development of NIRA, the drafting and passage of the Act, and the personnel and organization of the National Recovery Administration. Later chapters discuss the background of issues involving hours of work, wages, collective bargaining, costs, prices, fair trade practices, effects on small business men, and the whole problem of economic planning. Solutions attempted by the NRA are described, the reasons for adopting them given, and the degree of their success appraised. Many fundamental policy memoranda are reproduced in part or in full. In each chapter an attempt is made to outline the rapidly changing decisions and the reasons therefor. Finally, an endeavor is made to appraise the NRA constructively and to throw light on the important question: What can we expect from economic planning?

Monograph No. 3, *Common-Stock Indexes*, by Alfred Cowles 3rd and Associates, 499 pp., was published in August, 1938; a second edition was published in November, 1939. This is the result of a major project on which the staff of the Cowles Commission was engaged for several years, the construction of new common-stock indexes from 1871 through 1938. All industrial and utility common

stocks, and about 93 per cent in market value of all rail stocks, quoted on the New York Stock Exchange from 1871 to 1917, are included in the indexes. Subsequent to 1917 (in some cases 1926 or later) the indexes cover the stocks included in the Standard Statistics weekly indexes, which represent in market value 90 per cent of all common shares listed on the New York Stock Exchange. There are represented separately each of 59 groups of stocks, classified according to industry, as well as 10 combinations of these groups. For each of these 69 groups there were computed 7 different series, a total of 483 indexes. The 7 series are: monthly indexes of (1) stock prices, (2) stock prices adjusted for reinvestment of cash dividends, (3) yield expectations; and annual indexes of (4) yields, (5) dividend payments, (6) earnings-price ratios, and (7) earnings. All necessary corrections have been made for changes in capital structure. Appendixes include brief descriptions of all important United States and foreign indexes of common-stock prices, lists of the stocks included in the Cowles Commission indexes, and supplementary annual indexes of the prices of stocks used in the earnings indexes.

Mimeographed supplements containing the indexes for 1939 and for 1940 have been issued by the Cowles Commission.

Monograph No. 4, *Silver Money*, by Dickson H. Leavens, 439 pp., was published in March, 1939. It sketches the nineteenth-century background of the use of silver as money, the abandonment of bimetallism or the silver standard by the principal nations, the special position of the white metal in India and China, and the effects of the

World War on the price and monetary use of silver. More detailed consideration is given to the silver agitation during the world depression, to American legislation on the subject and its effect on world monetary use of silver, and in particular to the abandonment of the silver standard by China.

Monograph No. 5, *The Variate Difference Method*, by Gerhard Tintner, 175 pp., was published in February, 1940. It gives a full account of the history and use of this method, focusing attention on the role of the random element in the analysis of time series. The author emphasizes the meaning of the mathematical operations involved in terms of their application to economic data. He presents certain new analytical devices and gives extensive tables to facilitate calculations which hitherto required a prohibitive amount of labor.

Monograph No. 6, *The Analysis of Economic Time Series*, by Harold T. Davis, 620 pp., was published in December, 1941. This study evolved from previous research in the Commission which revealed the need for a comprehensive survey of statistical methods required in the analysis of time series. The historical development of the problem is first reviewed; techniques of harmonic analysis in particular, and of regression analysis in general, are described; numerous periodograms are given together with an analysis of the conclusions to be derived from them; problems associated with trends, forecasting, random statistical series, and cycle analysis are treated; and finally applications are made to the equation of exchange, stock prices, the distribution of income, interest rates, the building cycle, and other economic phenomena. Statisticians and economists



will find in this work many new and stimulating developments as well as a critical survey of methods in current use.

In the course of the next few years research now in process will lead to monographs on the theory of international trade, on the statistical determination of cost functions, on the theory of sampling, on the character of the demand for steel, and on other topics.

The Commission, in addition to its own monographs, assisted in the publication of a textbook, *Elements of Statistics*, 424 pp., by Harold T. Davis and William F. C. Nelson, published in July, 1935, by the Principia Press. This has been adopted as a text by a number of colleges and universities in the United States and abroad. A revised and enlarged second edition (434 pp.) was published in March, 1937.

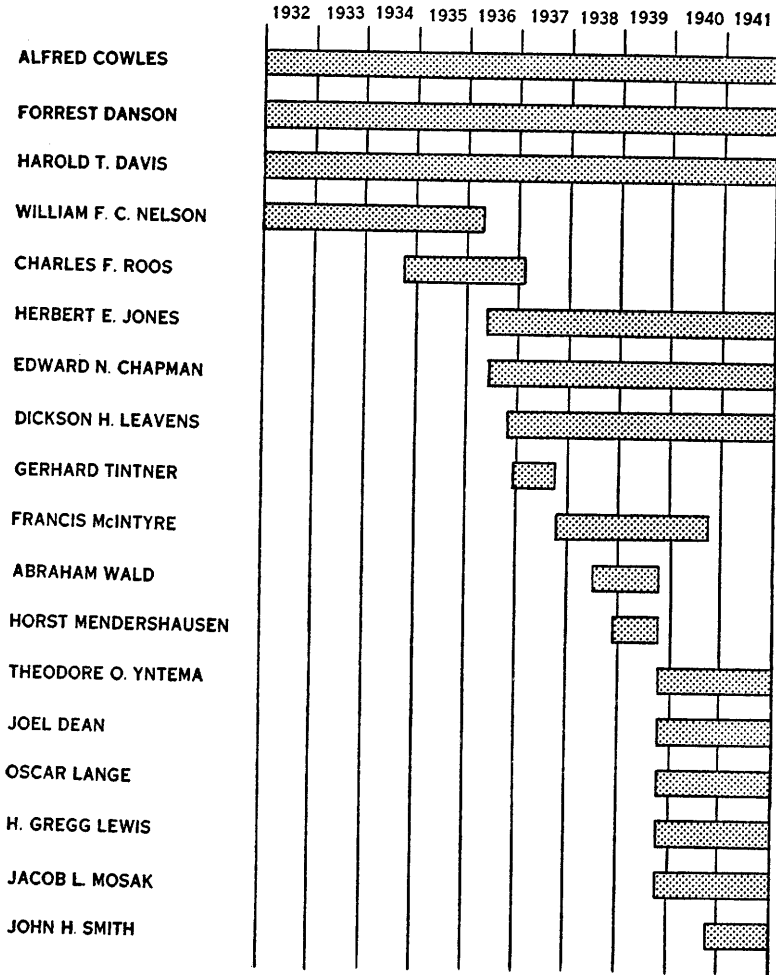
Members of the Commission's staff, during the years of their connection with it, have published 19 books and other separate publications and 106 journal articles, and have presented 152 papers before scientific societies and other meetings. These are summarized in the table below and a detailed list of them is given in the Appendix.

Year	Books and monographs	Articles published	Papers read
1932 - - - - -	----	----	5
1933 - - - - -	1	4	3
1934 - - - - -	1	1	9
1935 - - - - -	3	5	8
1936 - - - - -	1	6	16
1937 - - - - -	1	11	22
1938 - - - - -	1	9	18
1939 - - - - -	1	26	26
1940 - - - - -	3	14	20
1941 - - - - -	7	30	25
TOTAL - - - -	19	106	152



## APPENDIXES

COWLES COMMISSION RESEARCH STAFF



## RESEARCH STAFF

The staff of the Cowles Commission has included the following:

ALFRED COWLES, B.A., Yale, 1913. Mr. Cowles was the founder of the Cowles Commission and has been its president since the beginning. For 10 years prior to its foundation he maintained a private organization for statistical research on problems pertaining to investment and finance. He is secretary and treasurer and a Fellow of the Econometric Society and trustee of Colorado College, the Fountain Valley School of Colorado, the Colorado Foundation for Research in Tuberculosis, and the Colorado Springs Fine Arts Center.

EDWARD N. CHAPMAN, B.A., Yale, 1917; M.D., Harvard, 1921. Dr. Chapman was a research associate of the Cowles Commission from 1936 to 1941. For several years prior to this time he had devoted himself to economic research.

FORREST DANSON, A.B., Colorado College, 1929. Mr. Danson has been in charge of the computing clerks of the Cowles Commission since its beginning in 1932, and is a research associate.

HAROLD T. DAVIS, A.B., Colorado College, 1915; A.M., Harvard, 1919; Ph.D., Wisconsin, 1926. Professor Davis has been a research associate of the Cowles Commission since its beginning, spending several months of each year in the Commission's laboratory while it was at Colorado Springs and functioning actively as a consultant throughout the balance of the time. From February to August, 1937, he was acting research director. He was professor of mathematics at Indiana University, 1923-1937, and at Northwestern University, 1937-. He is a fellow of the Econometric Society. In addition to his publications listed in this report he is the author of *Philosophy and Modern Science*, *The Volterra Integral Equation*, and numerous papers in mathematical journals. He is an associate editor of *Econometrica*, *Isis*, and the *Bulletin of the American Mathematical Society*.

JOEL DEAN, A.B., Pomona College, 1927; M.B.A., Harvard University, 1929; Ph.D., the University of Chicago, 1936. Professor Dean joined the staff as a research associate in September, 1939. He was on the staff of the International Business Machines Corporation, 1930-32; assistant professor of economics, Indiana University, 1934-37; consulting economist, McKinsey, Wellington and Co., 1937-38; executive secretary of the Conference on Price Research, National Bureau of Economic Research, 1938-39; assistant professor of statistics and marketing, the School of Business, and director of the Institute of Statistics, the University of Chicago, 1939-. At present Professor Dean is on leave of absence to act as a price executive in the Office of Price Administration. In addition to his publications listed in this report, he is the author of a monograph, *Statistical Determina-*

*tion of Costs with Special Reference to Marginal Costs*, 1936, and of several articles in statistical and economic journals.

LEONID HURWICZ, L.I.M., University of Warsaw, 1938. Mr. Hurwicz joined the staff as a research associate in January, 1942. He has studied at the London School of Economics, the Postgraduate Institute of International Studies at Geneva, the University of Chicago, and Harvard University, and has held a research and teaching assistantship at the Massachusetts Institute of Technology. At present he is assisting Professor Lange in his statistical testing of business-cycle theories and Professors Yntema and Dean in the work of the Committee on Price Determination.

HERBERT E. JONES, A.B., Stanford University, 1926; Degree in Engineering, 1928. Mr. Jones was a research fellow of the Cowles Commission from April, 1936 to September, 1937, and continued as a research associate until his death on January 17, 1942. Previous to coming to the Commission he had been a hydraulic engineer for the Federal Water Service Corporation in San Francisco and New York. An account of his work will be found on pages 24 and 25.

OSCAR LANGE, LL.D., University of Cracow, 1928. Professor Lange joined the staff as a research associate in September, 1939. He was lecturer in statistics and economics at the University of Cracow, 1931- (on leave); lecturer in economics at the Polish Free University, Warsaw, 1937- (on leave); lecturer in economics at the University of Michigan, 1936, at the University of California, 1937-38, and at Stanford University, 1938; assistant professor of economics, 1938-39, and associate professor of economics, 1939-, at the University of Chicago. He is a fellow of the Econometric Society and the author of several monographs: *Foundations of Towns on German Law in Western Poland during the Middle Ages*, 1925; *The Statistical Study of Economic Fluctuations* (in Polish), 1931; *Die Preisdispersion als Mittel zur statistischen Messung wirtschaftlicher Gleichgewichtsstörungen*, 1932; and *On the Economic Theory of Socialism*, 1938; and of a number of articles in economic journals.

DICKSON H. LEAVENS, B.A., Yale, 1909; M.A., 1915. Mr. Leavens has been a research associate of the Cowles Commission since September, 1936, and has also served as managing editor of *Econometrica*. He taught mathematics and other subjects at the College of Yale in China, Changsha from 1909 to 1928 and was treasurer from 1916 to 1928. From 1929 to 1933 he was on the research staff of the Harvard Graduate School of Business Administration. In 1934 he served in China and India as a special agent of the United States Treasury Department to investigate the silver situation. He has specialized in the study of the monetary use of silver, and has published a number of articles on the subject.

H. GREGG LEWIS, A.B., the University of Chicago, 1936. Mr. Lewis joined the staff as a research associate in September, 1939. He was a university fellow in economics at the University of Chicago,

1937-38; fellow of the Brookings Institution, 1938-39; and instructor in economics at the University of Chicago, 1939-. He has written a number of papers on economics and statistics and is currently engaged in an analysis of the demand for steel.

FRANCIS MCINTYRE, A.B., Stanford, 1931, Ph.D., the University of Chicago, 1941. Professor McIntyre was a research associate of the Cowles Commission from September, 1937, to September, 1940. He was research assistant, Social Science Research Committee, the University of Chicago, 1931-32; university fellow in economics, the University of Chicago, 1932-34; and instructor in statistics and economics, Stanford University, 1934-1937. He was associate professor of economics at Colorado College from September, 1937, to September, 1939. During the academic year 1939-40 he was on leave of absence from the Cowles Commission to hold a temporary position as assistant professor of economics at Stanford University, and resigned from the Commission's staff in 1940 to become assistant professor of economics and director of the central statistical bureau at Indiana University.

HORST MENDERSHAUSEN, Ph.D., Geneva, 1937. Dr. Mendershausen joined the staff as a research fellow in November, 1938. He is a native of Koethen, Germany. Between the years 1930 and 1937 he studied at the Universities of Freiburg, Heidelberg, Berlin, and Geneva, and the Graduate Institute of International Studies at Geneva. He is the author of two books: *Changes of Seasonality in the Building Industry*, Geneva, 1937 (in French), and *The Economics of War*, 1940, and of several papers on economic and statistical topics. During the year 1937-38, he held a fellowship of the Rockefeller Foundation. He left the staff of the Commission in September, 1939, to join the faculty of Colorado College, and has since been associated with the National Bureau of Economic Research and with Bennington College.

JACOB L. MOSAK, A.B., the University of Chicago, 1935, Ph.D., 1941. Dr. Mosak joined the staff as a research associate in September, 1939. He was research assistant to Professor Henry Schultz at the University of Chicago, 1935-38; Social Science Research Council Fellow, 1938-39; and instructor in economics at the University of Chicago, 1939-. He has published several articles in statistical and economic journals. Since September, 1941, he has been on leave of absence in the Office of Price Administration.

WILLIAM F. C. NELSON, A.B., University of Toronto, 1921. Mr. Nelson from 1932 until his death in May, 1936, was a research associate of the Cowles Commission. He also served as assistant editor of *Econometrica*, and was a lecturer in statistics at Colorado College.

CHARLES F. ROOS, B.A., Rice Institute, 1921; M.A., 1924; Ph.D., 1926. Dr. Roos was director of research of the Cowles Commission from September, 1934, to January, 1937. He was National Research Council fellow in mathematics 1926-1928; assistant professor of mathematics at Cornell University, 1928-31; secretary of Sec-

tion K (Economics, Sociology, and Statistics) American Association for the Advancement of Science, 1928-31, and permanent secretary and member of the executive committee of this organization, 1931-33; fellow of the John Simon Guggenheim Memorial Foundation, 1933; director of research, National Recovery Administration, 1933-34; professor of econometrics, Colorado College, 1934-37. He was one of the founders of the Econometric Society; secretary-treasurer, 1931-32; secretary, 1932-36. He is a fellow and member of the council of the Society. He resigned from the staff of the Commission in January, 1937, to accept a business research position and later organized the Institute of Applied Econometrics, Inc.

JOHN H. SMITH, Ph.D., the University of Chicago, 1941. Dr. Smith joined the staff as a research associate in September, 1940. He was research and teaching assistant in the School of Business, the University of Chicago, 1936-41, and instructor in statistics, 1941-. He has specialized in sampling theory and is the author of two monographs, *Tests of Significance and How to Use Them*, published in 1939 by the University of Chicago Press, and *Statistical Deflation in the Analysis of Economic Series*, privately printed in 1941.

GERHARD TINTNER, Ph.D., Vienna, 1928. Professor Tintner was a research fellow of the Cowles Commission from November, 1936, to September, 1937. He studied at the University of Vienna and the Universities of London, Cambridge, and Harvard. During 1934 and 1935 he held a Rockefeller fellowship. He is the author of *Prices in the Trade Cycle*, published in Vienna in 1935 by the London School of Economics and the Austrian Institute for Trade Cycle Research, with which he was formerly connected, and of *The Variate Difference Method*, Monograph No. 5 in the Cowles Commission series. A number of his articles on economic and statistical topics have appeared in the journals. He is now associate professor of economics and mathematics at Iowa State College.

ABRAHAM WALD, Ph.D., Vienna, 1930. Dr. Wald joined the staff as a research fellow for one year in July, 1938, but went on leave of absence in September to accept a Carnegie fellowship at Columbia University, where he remained as lecturer in statistics. Dr. Wald is a native of Cluj, Rumania, and received his doctor's degree in mathematics. For several years he was a collaborator of Professor Karl Menger at the University of Vienna and also was an associate of the Institute for Business Cycle Research in Vienna. Before coming to the United States he held a fellowship from the Geneva Research Center in Switzerland, where he was engaged in the study of economic problems. His special topic of investigation during his connection with the Commission was index numbers and family incomes. He has published a large number of papers on mathematical, statistical, and economic subjects in the journals both abroad and in the United States.

THEODORE O. YNTEMA, A.B., Hope College, 1921; A.M., University of Illinois, 1922; C.P.A., Illinois, 1924; Ph.D., the Uni-



versity of Chicago, 1929. Professor Yntema became director of research of the Cowles Commission at the time of the move to Chicago in September, 1939. He has served on the faculty of the University of Chicago since 1923 and has been professor of statistics in the School of Business since 1930. He was economic consultant in the NRA, 1934-35; head of economics and statistics in the division of industrial materials of the Defense Commission, 1940; consulting economist and statistician for the United States Steel Corporation and other businesses at various times; and a director of the National Bureau of Economic Research, 1940-. He is a fellow of the Econometric Society and of the American Statistical Association. He is the author of *A Mathematical Reformulation of the General Theory of International Trade* and of a number of articles in economic journals, and director of most of the research leading to Volume I of TNEC Studies, published by United States Steel Corporation. During the spring quarter of 1942 Professor Yntema is on leave of absence in Washington with the War Shipping Administration.

In addition to the foregoing, the Commission has regularly employed from two to four secretaries and computers. Through its affiliation first with Colorado College and then with the University of Chicago, the Commission has also had the services of a considerable numbers of workers paid by the National Youth Administration.

## IN MEMORIAM

HERBERT E. JONES

1904-1942

During his brief period of active participation in the work of the Cowles Commission, Herbert Jones made a number of significant contributions to statistical and econometric science. Trained in electrical engineering and equipped with an excellent understanding of fundamental mathematics, he brought to bear upon the problems of the Commission a keen and analytical point of view. His breadth of interest is readily observed from the variety and difficulty of the studies which he made.

His first contribution was in the field of engineering economics, where the cost functions associated with hydraulic pumping were analyzed. From this he turned to the study of the statistics of time series, where new techniques were called for, and where analytical leads were obscured by many difficult considerations.

He began his work by exploring the nature of regression functions in correlation analysis and seized upon the concept of statistical hysteresis as a fruitful lead. He differentiated between "lag hysteresis," which depends primarily upon sinusoidal characteristics in the series, and "skew" hysteresis, which depends upon a lack of symmetry in the cycles of the component series. His principle contribution was that the "lag hysteresis" could be corrected for by serial correlation, but that "skew hysteresis" could not be so corrected. Closely associated with this problem was that of the nature of regression lines obtained by minimizing squared residuals taken in directions other than those parallel to two perpendicular axes.

The properties of runs in economic time series intrigued his fancy and he devoted much thought to this problem. He established frequency functions for such runs as they are observed in various types of series, and in a joint paper with Alfred Cowles he applied these findings to stock price movements. This paper has furnished us with a very important example of the application of an abstract theory to actual economic data.

One clue to the analysis of economic time series is found in the concept of a random series. The work of Herbert Jones in this field was of the highest character. He extended some of the important results of Yule, and by a clever device replaced random sequences by certain analytical functions which possessed identical properties.

His last investigation was a collaborative study with Forrest Danson on problems associated with tax-exemption laws. This was published as a leading article in *Barron's* in 1939.

In all of these studies Herbert Jones proved himself to be a young man with an exceptional imagination and an analytical power far beyond the average. Perhaps there is no higher encomium possible than to repeat what was said about the remarkable English mathematician, W. K. Clifford, who died very young: "If he had lived we might have known something."

## EQUIPMENT AND LIBRARY

In Colorado Springs the Cowles Commission occupied rented quarters in the Mining Exchange Building. At the University of Chicago its offices are located in the Social Science Building, 1126 East 59th Street.

The Commission has adequate equipment for the statistical work of its staff, including calculating machines, typewriters, and drafting materials. In Colorado Springs, Hollerith punched-card machines were leased full time; in Chicago similar equipment is available at the Comptroller's office on an hourly rental basis.

The Commission has built up a library of about 1500 volumes, containing the important current books on statistics and mathematical economics and a working collection of general economic literature. Several hundred pamphlets and reprints have also been accumulated and catalogued for easy reference. Some 60 periodicals are received currently, including all the more important economic and statistical journals published in the United States and foreign countries.

When the library was moved to Chicago, it was supplemented by the library of the late Professor Henry Schultz, which was presented to the University of Chicago after his death in 1938 and has been deposited in the Commission's offices. This comprises several hundred books on economics (particularly mathematical economics), statistics, and related subjects, including many rare items. In addition, Professor Irving Fisher of Yale University has deposited with the Commission his extensive collection of material on index numbers, gathered over a long period of years.

With the Schultz library and the Commission's own library providing most of the specialized material needed in its field of research, and with the extensive libraries of the University of Chicago for more general material, the Commission is excellently equipped in this respect.

## RESEARCH CONFERENCES STATISTICS

	1935	1936	1937	1938	1939	1940	Total
Number of conference lectures	8	33	40	38	38	38	195
Number of public lectures	---	4	3	1	---	2	10
Number of lecturers	7	20	26	27	32	37	102*
Average attendance per lecture	15	27	36	47	51	32	38
Participants: local	20	24	41	99	122	103	200*
out of town	4	45	62	80	100	91	303*
foreign	1	10	5	13	12	10	43*
Total	25	79	108	192	234	204	546*
Number of foreign countries represented	1	7	4	8	6	4	17*

\* Excluding duplications

### SPEAKERS

	Lectures given					
	'35	'36	'37	'38	'39	'40
Allen, Mr. R. G. D., London School of Economics - - - - -	---	---	---	3	---	---
Bartky, Professor Walter, The University of Chicago - - - - -	---	---	---	---	---	1
Bean, Mr. Louis H., United States Department of Agriculture - - - - -	---	---	2	---	---	---
Bratt, Professor Elmer C., Lehigh University - - - - -	---	---	---	---	1	---
Brown, Professor Theodore H., Harvard Business School - - - - -	---	---	2	---	---	---
Burgess, Dr. Robert W., Western Electric Company - - - - -	---	---	---	---	1	1
Camp, Professor Burton H., Wesleyan University - - - - -	---	---	---	---	---	1
Canning, Professor John B., Stanford University - - - - -	---	---	---	---	1	---
Ciriacy-Wantrup, Professor S. v., University of California - - - - -	---	---	---	1	---	---

	Lectures given					
	'35	'36	'37	'38	'39	'40
Court, Mr. Andrew T., Automobile Manufacturers Association - -	---	---	---	---	1	---
Cowles, Mr. Alfred, Cowles Commission - - - - -	1	1	---	---	---	---
Davies, Dr. Maurice B., The Denver and Rio Grande Western Railroad Company - - - - -	---	---	---	---	---	1
Davis, Professor Harold T., Indiana University, Northwestern University, and Cowles Commission - - - - -	1	2	2	2	3	2
Dean, Professor Joel P., The University of Chicago and Cowles Commission - - - - -	---	---	---	---	---	1
Deming, Dr. W. Edwards, Bureau of the Census, United States Department of Commerce - - -	---	---	---	---	---	1
Derksen, Dr. J. B. D., Netherlands Central Bureau of Statistics - -	---	---	---	---	1	---
Dodd, Professor Edward L., The University of Texas - - - -	---	2	2	1	1	1
Dresch, Dr. Francis W., University of California - - - - -	---	---	---	---	1	1
Evans, Professor Griffith C., University of California - - - - -	---	---	3	---	---	---
Ezekiel, Dr. Mordecai, United States Department of Agriculture - -	---	---	---	3	1	---
Ferger, Dr. Wirth F., United States Department of Agriculture - -	---	---	---	---	1	---
Fisher, Mr. Arne, New York City -	---	---	---	2	---	---
Fisher, Dr. Ernest M., The American Bankers Association - - - -	---	---	---	---	---	1
Fisher, Professor Irving, Yale University - - - - -	---	5	---	---	---	2
Fisher, Dr. R. A., University of London - - - - -	---	3	---	---	---	---
Flood, Dr. M. M., Princeton University - - - - -	---	---	---	1	---	1
Frisch, Professor Ragnar, University of Norway - - - - -	---	---	4	---	---	---
Fry, Dr. Thornton T., Bell Telephone Laboratories, Inc. - -	---	---	2	---	---	---
Garnsey, Professor Morris E., University of Colorado - - - - -	---	---	---	---	1	---

	Lectures given					
	'35	'36	'37	'38	'39	'40
Geiringer, Dr. Hilda, Bryn Mawr College - - - - -	---	---	---	---	---	1
Gill, Mr. Corrington, Work Projects Administration - - - - -	---	---	---	---	1	---
Gini, Professor Corrado, University of Rome - - - - -	---	3	---	---	---	---
Goldenweiser, Dr. E. A., Board of Governors of the Federal Reserve System - - - - -	---	---	---	---	---	1
Griffin, Professor Frank L., Reed College - - - - -	---	---	---	1	---	---
Grove, Professor C. C., College of the City of New York - - -	---	1	---	---	---	---
Haavelmo, Mr. Trygve, University of Norway - - - - -	---	---	---	---	1	1
Hartkemeier, Professor Harry Pelle, University of Missouri - - -	---	1	1	---	---	---
Harvill, Professor Richard A., University of Arizona - - - - -	---	---	---	---	1	---
Hayes, Dr. Anson, The American Rolling Mills Company - - -	---	1	---	---	---	---
Hotelling, Professor Harold, Columbia University - - - - -	---	1	---	---	---	---
Huntington, Professor Edward V., Harvard University - - - - -	---	---	2	---	---	---
Ingraham, Professor Mark H., The University of Wisconsin - - -	---	---	---	---	---	1
Jones, Mr. Herbert E., Cowles Commission - - - - -	---	1	1	1	---	---
Joseph, Miss Margaret F. W., National Economics Institute - -	---	---	---	1	---	---
Joy, Dr. Aryness, Bureau of Labor Statistics, United States Department of Labor - - - - -	---	---	---	---	---	1
Kelley, Professor Truman L., Harvard University - - - - -	---	---	---	---	2	---
Kreps, Professor Theodore J., Stanford University and Temporary National Economic Committee - -	---	---	---	---	---	1
Lange, Professor Oscar, The University of Chicago and Cowles Commission - - - - -	---	---	---	---	---	1
Laursen, Mr. Svend, University of Copenhagen - - - - -	---	---	---	---	---	1

	Lectures given					
	'35	'36	'37	'38	'39	'40
Leavens, Mr. Dickson H., Cowles Commission - - - - -	---	1	1	---	---	---
Lederer, Professor Emil, New School for Social Research - - - -	---	---	---	1	---	---
Leontief, Professor Wassily, Harvard University - - - - -	---	---	---	---	---	1
Lerner, Mr. Abba P., The London School of Economics - - - -	---	---	---	1	1	---
Lewis, Mr. H. Gregg, The University of Chicago and Cowles Commission - - - - -	---	---	---	---	---	1
Loesch, Dr. August, University of Bonn - - - - -	2	---	---	---	---	---
Lotka, Dr. A. J., Metropolitan Life Insurance Company - - - -	---	1	---	---	---	---
Lovitt, Professor William V., Colorado College - - - - -	---	---	1	---	---	---
McIntyre, Professor Francis, Stanford University and Cowles Commission - - - - -	---	---	1	1	2	1
Marschak, Professor Jakob, University of Oxford - - - - -	---	---	2	---	2	---
Mayer, Dr. Joseph, Library of Congress - - - - -	---	2	---	2	---	---
Mendershausen, Dr. Horst, Colorado College and Cowles Commission	---	---	---	1	1	1
Menger, Professor Karl, The University of Notre Dame - - - -	---	---	1	---	---	---
Molina, Mr. Edward C., Bell Telephone Laboratories, Inc. - -	---	---	---	---	---	1
Myers, Dr. Howard B., Work Projects Administration - - - - -	---	---	---	---	---	1
Newbury, Mr. F. D., Westinghouse Electric and Manufacturing Company - - - - -	---	---	---	1	---	---
Palander, Dr. Tord, University of Stockholm - - - - -	---	1	---	---	---	---
Papi, Professor Ugo, University of Rome - - - - -	---	---	---	1	---	---
Petersen, Mr. Kaare, Central Statistical Bureau of Norway - -	---	---	---	---	---	1
Petersen, Dr. O. Strange, University of Aarhus - - - - -	---	---	---	1	---	---
Pribam, Dr. Karl, Social Security Board - - - - -	---	---	---	---	2	---



	Lectures given					
	'35	'36	'37	'38	'39	'40
Rashevsky, Professor Nicolas, The University of Chicago - - -	---	---	---	---	---	1
Rawles, Dean Thomas H., Colorado College - - - - -	1	1	1	---	---	---
Reed, Dr. Vergil D., Bureau of the Census, United States Department of Commerce - - - -	---	---	---	2	---	---
Rogers, Professor James Harvey, Yale University - - - - -	---	---	1	---	---	---
Roll, Professor Erich, University College, Hull - - - - -	---	---	---	---	---	1
Roos, Dr. Charles F., Cowles Commission, Colorado College, Mercer-Allied Corporation, The Institute of Applied Econometrics, Inc. - - - - -	1	2	2	2	1	1
Roy, Professor René, University of Paris - - - - -	---	---	---	3	---	---
Samuelson, Professor Paul A., Massachusetts Institute of Technology - - - - -	---	---	---	---	---	1
Sarle, Dr. Charles F., Bureau of Agricultural Economics, United States Department of Agriculture - - - - -	---	---	---	---	1	---
Schultz, Professor Henry, The University of Chicago - - - -	---	---	---	2	---	---
Scoville, Mr. John W., Chrysler Corporation - - - - -	---	---	---	---	1	---
Secrist, Professor Horace, Northwestern University - - - - -	---	---	---	1	---	---
Shepherd, Professor Geoffrey, Iowa State College - - - - -	---	---	---	---	1	---
Shewhart, Dr. Walter A., Bell Telephone Laboratories, Inc. - -	---	2	---	---	---	---
Smit, Dr. Carel Jan, Ottawa Beach, Michigan - - - - -	---	---	---	---	1	---
Smith, Dr. John H., The University of Chicago and Cowles Commission - - - - -	---	---	---	---	---	1
Snyder, Mr. Carl, for many years with The Federal Reserve Bank of New York - - - - -	---	4	3	---	---	2
Stafford, Mr. Jack, The Victoria University of Manchester - - -	---	---	---	---	1	---

	Lectures given					
	'35	'36	'37	'38	'39	'40
Stine, Dr. Oscar C., United States Department of Agriculture - -	---	---	2	---	---	---
Sturges, Mr. Alexander, Bureau of Labor Statistics, United States Department of Labor - - -	---	---	---	---	1	---
Tintner, Professor Gerhard, Iowa State College, Colorado College, and Cowles Commission - - -	---	---	1	1	1	---
Triffin, Dr. Robert, Harvard University - - - - -	---	---	---	---	1	---
Truesdell, Dr. Leon E., Bureau of the Census, United States Department of Commerce - - - -	---	---	---	---	1	---
van Dyk, Miss Phyllis, National Bureau of Economic Research and Cowles Commission - - - -	---	---	---	---	---	1
Vinci, Professor Felice, University of Bologna - - - - -	---	---	1	---	---	---
Vinogradoff, Mr. D. I., Westinghouse Electric and Manufacturing Company - - - - -	---	1	---	---	---	---
Wald, Dr. Abraham, Columbia University and Cowles Commission - - - - -	---	---	---	1	1	1
Watkins, Professor Ralph S., University of Pittsburgh - - -	---	---	---	1	---	---
Wilks, Professor S. S., Princeton University - - - - -	---	---	1	---	---	---
Working, Professor Elmer J., University of Illinois - - - - -	---	2	1	1	---	---
Working, Professor Holbrook, Stanford University - - - - -	---	---	2	---	---	1
Yntema, Professor Theodore O., The University of Chicago and Cowles Commission - - - -	---	---	1	1	1	1

## STAFF BIBLIOGRAPHY

EDWARD N. CHAPMAN  
(1936-1941)

"Suppose there IS a War," *Barron's*, Vol. 19, No. 6, Feb. 6, 1939, p. 7.

"Markets Highly Selective in Wartime," *Barron's*, Vol. 19, No. 43, Oct. 23, 1939, p. 20.

(With C. H. Boissevain) "Leucocyte Count and Recovery from Tuberculosis," *The American Review of Tuberculosis*, Vol. 44, July, 1941, pp. 58-72.

"Growth Stocks and the Investor," *Barron's*, Vol. 21, Oct. 6, 1941, pp. 3-4; Oct. 13, p. 7; Oct. 20, p. 18; Oct. 27, p. 13; Nov. 3, p. 13; Nov. 10, p. 8; Nov. 17, p. 20; Nov. 24, p. 13; Dec. 1, p. 13; Dec. 8, p. 13; Dec. 15, p. 13; Dec. 22, p. 20; Dec. 29, p. 20.

ALFRED COWLES  
(1932- )

*Common-Stock Indexes*, Bloomington, Indiana, Principia Press, 1938; second edition, 1939. xii + 499 pp.

"Can Stock Market Forecasters Forecast?" presented at Cincinnati, Dec. 31, 1932, before the Econometric Society and the American Statistical Association (abstract in *Econometrica*, Vol. 1, April, 1933, pp. 212-213); published in *Econometrica*, Vol. 1, July, 1933, pp. 309-324.

"The Meeting of the Econometric Society in Cincinnati, Ohio, December, 1932," *Econometrica*, Vol. 1, April, 1933, pp. 209-217.

"The Meeting of the Econometric Society in Chicago, June, 1933," *Econometrica*, Vol. 1, October, 1933, pp. 431-444.

"The Meetings of the Econometric Society in Philadelphia and Boston, December, 1933," *Econometrica*, Vol. 2, April, 1934, pp. 204-220.

(With Edward N. Chapman) "The Effect of Climate on Pulmonary Tuberculosis: A Statistical Study," presented at Pittsburgh, Dec. 28, 1934, before Sections K and N of the American Association for the Advancement of Science; published as "A Statistical Study of Climate in Relation to Pulmonary Tuberculosis," *Journal of the American Statistical Association*, Vol. 30, September, 1935, pp. 517-556.

"Practical Problems in the Methodology of Multiple Correlation Analysis," presented at Colorado Springs, June 24, 1935, before the Econometric Society (abstract in *Econometrica*, Vol. 3, October, 1935, p. 476).

"Multiple Correlation Analysis of Intercorrelated Variates," presented at Colorado Springs, July, 1935, before the Cowles Commission First Annual Research Conference.

"Effects of Building Activity and Other Factors on Security Prices," presented at St. Louis, Jan. 3, 1936, before the Econometric Society and the American Association for the Advancement of Science (abstract in *Econometrica*, Vol. 4, April, 1936, pp. 190-191).

"Evidence of Structure in Common Stock Prices," presented at Colorado Springs, Aug. 7, 1936, before the Cowles Commission Second Annual Research Conference (abstract in *Conference Abstracts*, pp. 97-99).

(With Herbert E. Jones) "Some a Posteriori Probability Considerations of Stock Market Action," presented at Chicago, Dec. 29, 1936, before the Econometric Society (abstract in *Econometrica*, Vol. 5, April, 1937, p. 190); published as "Some a Posteriori Probabilities in Stock Market Action," *Econometrica*, Vol. 5, July, 1937, pp. 280-294.

FORREST DANSON  
(1932- )

(With Herbert E. Jones) "Getting the Most in Tax Exempts," *Barron's*, Vol. 19, No. 30, July 24, 1939, p. 3.

HAROLD T. DAVIS  
(1932- )

*Tables of the Higher Mathematical Functions*, Vol. I, Bloomington, Indiana, Principia Press, 1933. xiii + 377 pp.

*Tables of the Higher Mathematical Functions*, Vol. II, Bloomington, Indiana, Principia Press, 1935. xiii + 391 pp.

*A Course in General Mathematics*, Bloomington, Indiana, Principia Press, 1935. xi + 316 pp.

(With W. F. C. Nelson) *The Elements of Statistics*, Bloomington, Indiana, Principia Press, 1935. xi + 424 pp. Second edition, 1937. xii + 434 pp.

*The Theory of Linear Operators*, Bloomington, Indiana, Principia Press, 1936. xiv + 628 pp.

*College Algebra*, New York, Prentice-Hall, 1940. xiii + 423 pp.

*The Theory of Econometrics*, Bloomington, Indiana, Principia Press, 1941. xiv + 482 pp.

*The Analysis of Economic Time Series*, Bloomington, Indiana, Principia Press, 1941. xiv + 620 pp.

---

"New Technique in the Analysis of Trend Lines," presented at Indianapolis, May 7, 1932, before the Indiana Section of the Mathematical Association of America.

"The Perturbation Problem for Economic Series," presented at Syracuse, June, 1932, before the Econometric Society (abstract in *Econometrica*, Vol. 1, January, 1933, p. 100).

"A Technique for the Study of the Interaction of Economic Series," presented by title at Ames, Nov. 26, 1932, before the American Mathematical Society.

"Harmonic Interaction of Economic Series," presented at Atlantic City, Dec. 26, 1932, before the Econometric Society and Section K of the American Association for the Advancement of Science (abstract in *Econometrica*, Vol. 1, April, 1933, p. 205).

"The Predictable Elements in Economic Series," presented at Columbus, Apr. 6, 1933, before the Ohio Section of the Mathematical Association of America.

"Contributions to the Theory of the Harmonic Analysis of Economic Series," presented at Chicago, June 29, 1933, before the Econometric Society and Section K of the American Association for the Advancement of Science (abstract in *Econometrica*, Vol. 1, October, 1933, pp. 434-435).

"Polynomial Approximations by the Method of Least Squares," *Annals of Mathematical Statistics*, Vol. 4, August, 1933, pp. 155-195.

"Some Statistical Aspects of Random Series," presented at Philadelphia, Dec. 28, 1933, before the Econometric Society and the American Statistical Association (abstract in *Econometrica*, Vol. 2, April, 1934, pp. 213-214).

"Properties of the Polygamma Function," presented at Lafayette, May 12, 1934, before the Indiana Section of the Mathematical Association of America.

"Can Man's Group Activity be Measured?" presented at Indianapolis, Nov. 30, 1934, before the Central Association of Science and Mathematics Teachers.

"How Periodic Elements are Discovered in Statistical Series," presented at Indianapolis, Nov. 30, 1934, before the Mathematics Section of the Central Association of Science and Mathematics Teachers.

"Statistical Proofs of Periodicity in Economic Series," presented at Pittsburgh, Dec. 28, 1934, before the Econometric Society, the American Mathematical Society, the Mathematical Association of America, and Sections A and K of the American Association for the Advancement of Science.

"An Extension to Polygamma Functions of a Theorem of Gauss," *Bulletin of the American Mathematical Society*, Vol. 41, April, 1935, pp. 243-247.

"Some Periodic Aspects of the Stock Market," presented at Colorado Springs, June 24, 1935, before the Econometric Society (abstract in *Econometrica*, Vol. 3, October, 1935, p. 474).

"The Statistical Validity of Harmonic Analysis," presented at Colorado Springs, July, 1935, before the Cowles Commission First Annual Research Conference.

"Report of the Meeting of the Econometric Society, Colorado Springs, June 22-24, 1935," *Econometrica*, Vol. 3, October, 1935, pp. 473-476.

"Statistical Validity of the Forty-Month Cycle in Stock Prices," presented at St. Louis, Jan. 2, 1936, before the Econometric Society and the American Association for the Advancement of Science (abstract in *Econometrica*, Vol. 4, April, 1936, pp. 189-190).

"Mathematics and Social Phenomena," presented at North Manchester, May 1, 1936, before the Indiana Section of the Mathematical Association of America.

"Significance of Analysis of Variance of Time Series," presented at Colorado Springs, Aug. 7, 1936, before the Cowles Commission Second Annual Research Conference (abstract in *Conference Abstracts*, pp. 99-102).

"Significance Tests for Periodogram Analysis with Application to Prices of Common Stocks," presented at Colorado Springs, Aug. 8, 1936, before the Cowles Commission Second Annual Research Conference (abstract in *Conference Abstracts*, pp. 102-103).

"The Application of Functionals in Economics," presented at Denver, June 24, 1937, before the Econometric Society and Sections A and K of the American Association for the Advancement of Science (abstract in *Econometrica*, Vol. 5, October, 1937, p. 384).

"The Econometric Problem," presented at Colorado Springs, June 28, 1937, before the Cowles Commission Third Annual Research Conference (abstract in *Conference Report*, pp. 11-13).

"The *Fonctionnelle* Nature of Utility," presented at Colorado Springs, July 16, 1937, before the Cowles Commission Third Annual Research Conference (abstract in *Conference Report*, pp. 73-79).

"Mathematical Adventures in Social Science," presented at State College, Pennsylvania, Sept. 7, 1937, before the Mathematical Association of America; published in *American Mathematical Monthly*, Vol. 45, February, 1938, pp. 93-109.

"The Pareto Distribution of Income," presented at Atlantic City, Dec. 28, 1937, before the Econometric Society (abstract in *Econometrica*, Vol. 6, April, 1938, pp. 184-185).

(With Herbert E. Jones) "Some Results of the Theory of Random Series," presented at Indianapolis, Dec. 30, 1937, before the American Mathematical Society and the Institute of Mathematical Statistics.

"The Centennial of Cournot's *Theory of Riches*," presented at Indianapolis, Dec. 30, 1937, before the History of Science Society and Section L of the American Association for the Advancement of Science.

"Table I, Values of  $J_0(x)$  and  $J_1(x)$  from 15.50 to 25.00," "Table II, Zeros of  $J_0(x)$  and  $J_1(x)$ ," in *British Association Mathematical Tables, VI, Bessel Functions, Part I*, Cambridge University Press, 1937, pp. 162-170, 171-173.

"The Place of Mathematics in the Modern World," presented at Chicago, Feb. 18, 1938, before a joint meeting of the Men's and Women's Mathematical Clubs of Chicago.

"Mathematical Adventures in Social Science," presented at Pittsburgh, Feb. 23, 1938, before the University of Pittsburgh Chapter of Sigma Xi.

"Can Economic Phenomena be Measured?" presented at Bethlehem, Mar. 14, 1938, before the Lehigh University Chapter of Pi Mu Epsilon.

"Cournot—Pioneer in Scientific Economics," presented at Colorado Springs, July 5, 1938, before the Cowles Commission Fourth Annual Research Conference (abstract in *Conference Report*, pp. 15-16).

"The Significance of the Curve of Income," presented at Colorado Springs, July 6, 1938, before the Cowles Commission Fourth Annual Research Conference (abstract in *Conference Report*, pp. 19-22).

"Social Implications of the Pareto Distribution of Special Abilities," presented at Richmond, Dec. 28, 1938, before Section K of the American Association for the Advancement of Science.

"Some Lessons from the Equation of Exchange," presented at Detroit, Dec. 30, 1938, before the Econometric Society (abstract in *Econometrica*, Vol. 7, April, 1939, pp. 189-190).

"Mathematical Economics," presented at the Armour Institute, Chicago, Jan. 12, 1939.

"The Philosophy of Science," presented at Ames, Apr. 21, 1939, before the Iowa Academy of Science; published in *Proceedings of the Iowa Academy of Science for 1939*, Vol. 46, pp. 58-69.

"The Theory of Utility in Economics," presented at Iowa State College, Ames, Apr. 24, 1939.

"The Theory of Economic Time Series," presented at Iowa State College, Ames, Apr. 24, 1939.

"Random Numbers," presented at Galesburg, May 13, 1939, before the Illinois Section of the Mathematical Association of America.

"The Theory of Random Numbers," presented at Chicago, May 16, 1939, before the Mathematical Club of the University of Chicago.

"The Postulate of Determinism in Economics," presented at Evanston, May 20, 1939, before the Chaos Club.

"Problems in the Theory of Business Cycles," presented at Colorado Springs, July 3, 1939, before the Cowles Commission Fifth Annual Research Conference (abstract in *Conference Report*, pp. 13-16).

"Relationships between the Distribution of Income and Total Real Income," presented at Colorado Springs, July 24, 1939, before the Cowles Commission Fifth Annual Research Conference (abstract in *Conference Report*, pp. 76-77).

"The Money Factor in Trends of Trade," presented at Colorado Springs, July 28, 1939, before the Cowles Commission Fifth Annual Research Conference (abstract in *Conference Report*, pp. 92-93).

"Some Methods in the Analysis of Lag Effects," presented at Philadelphia, Dec. 27, 1939, before the American Statistical Association and the Institute of Mathematical Statistics.

"The Mathematical Analysis of Social Patterns," presented at Bloomington, May 10, 1940, before the Illinois Section of the Mathematical Association of America (abstract in *American Mathematical Monthly*, Vol. 47, November, 1940, p. 600).

"Dynamics of the Business Cycle," presented at Colorado Springs, July 1, 1940, before the Cowles Commission Sixth Annual Research Conference (abstract in *Conference Report*, pp. 11-13).

"The Economic Interpretation of History," presented at Colorado Springs, July 26, 1940, before the Cowles Commission Sixth Annual Research Conference (abstract in *Conference Report*, pp. 89-91).

"The Mathematical Interpretation of History," presented at Cleveland, Nov. 22, 1940, before the general section of the Central Association of Science and Mathematics Teachers.

"Mathematics and the Social Sciences," presented at Cleveland, Nov. 22, 1940, before the mathematics section of the Central Association of Science and Mathematics Teachers.

"The Place of Statistics in Science," presented at Evanston, Feb. 10, 1941, before the Northwestern University Chapter of Sigma Kappa Epsilon.

"Functionals in the Theory of Economics," presented at Notre Dame, Feb. 28, 1941, before the Fifth Annual Mathematical Symposium of the University of Notre Dame.

"The History of Calculation," presented at Evanston, Mar. 13, 1941, before the Physics Club of Northwestern University.

"The Economic Theory of History," presented at Rockford, Apr. 9, 1941, before the Rockford Division of the Institute of Electrical Engineers.

"The Mathematical Theory of History," presented at Chicago, Apr. 18, 1941, before the Men's Mathematics Club of Chicago.

"Lucretius and His Message to the Modern World," presented at Evanston, Apr. 23, 1941, before the Eta Sigma Phi classical fraternity.

"The Statistics of Time Series," in *Mathematical Monographs*, edited by R. D. Curtiss, Northwestern University Studies, No. 1 in Mathematics and Physics Series, October, 1941, pp. 47-85.

"Mysteries of the Fourth Dimension," presented at Chicago, Dec. 3, 1941, before Carl Schurz Junior College.

"The Theory of Runs in Random Data," presented at New York, Dec. 27, 1941, before the Econometric Society and the Institute of Mathematical Statistics.

JOEL DEAN  
(1939- )

*The Management Council Profession*, Indiana University Publications, Social Science Series No. 2, 1940. Bloomington, 1940. 89 pp.  
*Statistical Cost Functions of a Hosiery Mill*, Studies in Business



Administration, The School of Business, The University of Chicago, Vol. 11, No. 4. Chicago, 1941. 116 pp.

*The Relation of Cost to Output for a Leather Belt Shop*, New York, National Bureau of Economic Research, Technical Paper No. 2, 1941. 72 pp.

---

"Statistical Cost Curves in Various Industries," presented at Philadelphia, Dec. 29, 1939, before the American Economic Association and the Econometric Society (abstract in *Econometrica*, Vol. 8, April, 1940, pp. 188-189).

"Alternative Statistical Methods for Estimating Marginal Cost Functions," presented at Colorado Springs, July 5, 1940, before the Cowles Commission Sixth Annual Research Conference (abstract in *Conference Report*, pp. 24-26).

"Indexes of Prices Farmers Pay," presented at Chicago, Dec. 27, 1940, before the American Statistical Association.

"Statistical Cost-Curves and Price Policy," presented at Notre Dame, Mar. 1, 1941, before the Fifth Annual Mathematical Symposium of the University of Notre Dame.

(With Mary Hilton Wise) "An Appraisal of Index Numbers of Prices Farmers Pay," *Journal of the American Statistical Association*, Vol. 36, June, 1941, pp. 210-218.

"The Role of Cost Functions in Price Administration," presented at New York, Dec. 29, 1941, before the American Economic Association and the Econometric Society.

HERBERT E. JONES  
(1935- )

"The Economics of Overhead Costs with Application to Pumping," presented at Colorado Springs, July, 1935, before the Cowles Commission First Annual Research Conference.

"Meetings of the Econometric Society in New York City, December, 1935, and St. Louis, January, 1936," *Econometrica*, Vol. 4, April, 1936, pp. 184-192.

"The Nature of Regression Functions in the Correlation Analysis of Time Series," presented in preliminary form at Colorado Springs, July 21, 1936, before the Cowles Commission Second Annual Research Conference (abstract in *Conference Report*, pp. 43-44), and in final form at Chicago, Dec. 28, 1936, before the American Statistical Association and the Institute of Mathematical Statistics; published in *Econometrica*, Vol. 5, October, 1937, pp. 305-325.

(With Alfred Cowles) "Some a Posteriori Probability Considerations of Stock Market Action," presented at Chicago, Dec. 29, 1936, before the Econometric Society (abstract in *Econometrica*, Vol. 5, April, 1937, p. 190); published as "Some a Posteriori Probabilities

in Stock Market Action," *Econometrica*, Vol. 5, July, 1937, pp. 280-294.

"Some Geometrical Considerations in the General Theory of Fitting Lines and Planes," *Metron*, Vol. 13, Feb. 28, 1937, pp. 21-30.

"The Theory of Runs as Applied to Time Series," presented at Colorado Springs, July 2, 1937, before the Cowles Commission Third Annual Research Conference (abstract in *Conference Report*, pp. 33-36).

(With Harold T. Davis) "Some Results of the Theory of Random Series," presented at Indianapolis, Dec. 30, 1937, before the American Mathematical Society and the Institute of Mathematical Statistics.

(With Forrest Danson) "Getting the Most in Tax Exempts," *Barron's*, Vol. 19, No. 30, July 24, 1939, p. 3.

OSCAR LANGE  
(1939- )

"Saving in Process Analysis," *Quarterly Journal of Economics*, Vol. 53, August, 1939, pp. 620-622.

"Is the American Economy Contracting?" *American Economic Review*, Vol. 29, September, 1939, pp. 503-513.

"The Neo-Classical School in Economics," *The Encyclopaedia of Political Science* (in Polish), Warsaw, 1939, Vol. IV, pp. 1-13.

"Quantification: the Quest for Precision," round-table paper given at the University of Chicago, Dec. 1, 1939, reported in *Eleven Twenty-Six: A Decade of Social Science Research*, Louis Wirth, editor, Chicago, The University of Chicago Press, 1940, pp. 158-162, 191-193.

"The Theory of Technological Unemployment," presented at Colorado Springs, July 22, 1940, before the Cowles Commission Sixth Annual Research Conference (abstract in *Conference Report*, pp. 68-72).

"Complementarity and Interrelations of Shifts in Demand," *The Review of Economic Studies*, Vol. 8, October, 1940, pp. 58-63.

"Economic Aspects," in *Economic Mobilization*, Washington, American Council on Public Affairs, 1940, pp. 12-28.

"The Theory of Interest: A Synthetic Approach," presented at Toronto, Dec. 9, 1940, at the University of Toronto.

"Price Flexibility, Interest, and Full Employment," presented at New Orleans, Dec. 28, 1940, before the Econometric Society (abstract in *Econometrica*, Vol. 9, April, 1941, pp. 176-177).

"The Theory of Technological Unemployment," presented at Notre Dame, Feb. 28, 1941, before the Fifth Annual Mathematical Symposium of the University of Notre Dame.

"The Theory of Imperialism," presented at Madison, March, 1941, before the University of Wisconsin.

"Derivation of Elasticities of Demand and Supply: A Direct

Method," presented at Chicago, Sept. 4, 1941, before the Econometric Society and the Institute of Mathematical Statistics (abstract in *Econometrica*, Vol. 10, January, 1942, pp. 93-95).

"The Foundation of Welfare Economics," presented at Chicago, Sept. 4, 1941, before the Sixth International Congress for the Unity of Science.

"The Calculus of Elasticities and Its Application in Economic Theory," presented at Chicago, Oct. 17, 1941, before the Mathematical Biophysics Seminar of the University of Chicago.

"The Stability of Economic Equilibrium," presented at New York, Dec. 28, 1941, before the Econometric Society.

DICKSON H. LEAVENS  
(1936- )

*Silver Money*. Bloomington, Indiana, Principia Press, 1939. xix + 439 pp.

---

"The Accumulation of the Precious Metals in India and China," presented at Colorado Springs, July 15, 1936, before the Cowles Commission Second Annual Research Conference (abstract in *Conference Report*, pp. 30-32).

"Silver at the Second Session of the Seventy-fourth Congress," *Finance and Commerce*, Shanghai, Vol. 28, July 29, 1936, pp. 125-127.

"The Silver Clause in China," *American Economic Review*, Vol. 26, December, 1936, pp. 650-659.

"Silver [Review of 1936]," *Engineering and Mining Journal*, Vol. 138, February, 1937, pp. 55-56.

"Report of the Chicago Meeting [of the Econometric Society], Dec. 28-30, 1936," *Econometrica*, Vol. 5, April, 1937, pp. 184-197.

"Drawings from Rectangular Distributions," presented at Colorado Springs, July 2, 1937, before the Cowles Commission Third Annual Research Conference (abstract in *Conference Report*, pp. 31-32).

"Report of the Denver Meeting [of the Econometric Society], June 24-26, 1937," *Econometrica*, Vol. 5, October, 1937, pp. 384-392.

"Silver at the First Session of the Seventy-fifth Congress," *Financial News*, Bombay, Vol. 5, No. 42, Oct. 23, 1937, p. 14; also published in *Finance and Commerce*, Shanghai, Vol. 30, Nov. 3, 1937, p. 345.

"Five Years of American Silver Policy," presented at Atlantic City, Dec. 27, 1937, before the Econometric Society (abstract in *Econometrica*, Vol. 6, April, 1938, p. 183); published as "Five Years of Silver Subsidy," *The Annalist*, Vol. 51, Jan. 7, 1938, pp. 4-5.

"Silver [Review of 1937]," *Engineering and Mining Journal*, Vol. 139, February, 1938, pp. 36, 37, 40.

"Report of the Atlantic City and Indianapolis Meetings [of the Econometric Society], December 27-30, 1937," *Econometrica*, Vol. 6, April, 1938, pp. 180-192.

"International Factors in the Postwar Silver Market," presented at Albuquerque, Apr. 25, 1938, before the Southwestern Division, American Association for the Advancement of Science.

"A Bead-Sampling Machine for Use in the Class Room," presented at Detroit, Dec. 28, 1938, before the American Statistical Association, and the Institute of Mathematical Statistics.

"Silver [Review of 1938]," *Engineering and Mining Journal*, Vol. 140, February, 1939, pp. 37, 38, 46.

"Report of the Detroit Meeting [of the Econometric Society], Dec. 27-30, 1938," *Econometrica*, Vol. 7, April, 1939, pp. 167-190.

"Silver at the First Session of the Seventy-sixth U. S. Congress," *Finance and Commerce*, Shanghai, Vol. 34, Sept. 13, 1939, pp. 229-230; also published in abridged form in *Financial News*, Bombay, Vol. 7, Sept. 9, 1939, pp. 17-18.

(With John J. Croston) "Gold and Silver," chapter in *The Mineral Industry during 1938*, New York, McGraw-Hill, 1939, pp. 189-303.

"Silver and the War: Supplies Ample; Recurrence of 1915-1919 Boom not Likely," *The Annalist*, Vol. 55, Jan. 4, 1940, p. 7.

"Report of the Philadelphia Meeting [of the Econometric Society], December 27-29, 1939," *Econometrica*, Vol. 8, April, 1940, pp. 176-192.

(With William J. Hail) "Planetary Groupings Recorded in China," *Popular Astronomy*, Vol. 48, June, 1940, pp. 292-295.

(With John J. Croston) "Gold and Silver," chapter in *The Mineral Industry during 1939*, New York, McGraw-Hill, 1940, pp. 191-286.

"Rupee Circulation in India," *The American Economic Review*, Vol. 31, March, 1941, pp. 87-90.

"Report of the Chicago and New Orleans Meetings [of the Econometric Society], December 27-30, 1940," *Econometrica*, Vol. 9, April, 1941, pp. 165-184.

"Debates on Silver in the American Congress," *Finance & Commerce*, Shanghai, Vol. 37, May 14, 1941, pp. 488-489; also published in abridged form in *Financial News*, Bombay, Vol. 9, No. 10, Mar. 8, 1941, p. 7.

(With John J. Croston) "Gold and Silver," chapter in *The Mineral Industry during 1940*, New York, McGraw-Hill, 1941, pp. 215-291.

(With Theodore O. Yntema) "An Appraisal of the 1940 [Census] Sampling Scheme," presented at New York, December 29, 1941, before the American Statistical Association and the Institute of Mathematical Statistics.

H. GREGG LEWIS  
(1939- )

*An Analysis of Changes in the Demand for Steel and in Steel Prices—1936-1939.* New York, United States Steel Corporation, 1939. 61 pp.

*A Statistical Analysis of the Demand for Steel, 1919-1938.* New York, United States Steel Corporation. 1939. 52 pp.

The above two pamphlets were included in *United States Steel Corporation T.N.E.C. Papers*, 1940, pp. 7-71 and pp. 165-221; and were reprinted in *Hearings Before the Temporary National Economic Committee*, Part 26, Washington, 1940, as Exhibit No. 1412, pp. 13942-81, Exhibit No. 1411, pp. 13913-42.

---

(With Paul H. Douglas) "Some Problems in the Measurement of Income Elasticities," *Econometrica*, Vol. 7, July, 1939, pp. 208-220.

"The Demand for Steel," presented at Colorado Springs, July 2, 1940, before the Cowles Commission Sixth Annual Research Conference (abstract in *Conference Report*, pp. 15-18).

"The Nature of the Demand for Steel," presented at Chicago, Dec. 27, 1940, before the American Statistical Association and the Econometric Society (abstract in *Econometrica*, Vol. 9, April, 1941, p. 165); published in *Journal of the American Statistical Association*, Vol. 36, March, 1941, pp. 110-115.

"The Outlook," in *Economic Mobilization*, Washington, American Council on Public Affairs, 1940, pp. 37-43.

"On the Probability Distribution of the Partial-Elasticity Coefficient," *Journal of the American Statistical Association*, Vol. 36, September, 1941, pp. 413-416.

FRANCIS MCINTYRE  
(1937-1940)

"Monopolistic Elements in Pricing: The Domestic-Export Spread," presented at Colorado Springs, July 7, 1937, before the Cowles Commission Third Annual Research Conference (abstract in *Conference Report*, pp. 45-46).

"The Cowles Commission Stock Indexes, 1871-1937," presented at Boulder, Nov. 26, 1937, before the Colorado-Wyoming Social Science Association.

"Price Discrimination between Two Markets under Imperfect Competition and Monopoly," presented at Atlantic City, Dec. 27, 1937, before the Econometric Society (abstract in *Econometrica*, Vol. 6, April, 1938, pp. 180-181).

"International Aspects of the Copper Industry," presented at Albuquerque, Apr. 25, 1938, before the Southwestern Division, American Association for the Advancement of Science.

"Factors Determining Domestic and Foreign Copper Consumption," presented at Colorado Springs, July 8, 1938, before the Cowles Commission Fourth Annual Research Conference (abstract in *Conference Report*, pp. 29-30).

"The Problem of the Stock Price Index Number," *Journal of the American Statistical Association*, Vol. 33, September, 1938, pp. 557-563.

"The Nature and Achievements of Foundations for Economic Research in the United States," presented at Stanford University, Oct. 20, 1938.

"The Effect of the Undistributed Profits Tax upon the Distribution of Corporate Earnings—A Statistical Appraisal," presented at Detroit, Dec. 28, 1938, before the Econometric Society (abstract in *Econometrica*, Vol. 7, April, 1939, pp. 176-177); published in *Econometrica*, Vol. 7, October, 1939, pp. 336-348.

"The Adaptation of Index-Number Construction to Punched-Card Equipment," presented at Colorado Springs, July 13, 1939, before the Cowles Commission Fifth Annual Research Conference (abstract in *Conference Report*, pp. 43-45).

"Durable Goods and the Business Cycle," presented at Colorado Springs, July 17, 1939, before the Cowles Commission Fifth Annual Research Conference (abstract in *Conference Report*, pp. 52-54).

"Corporate Earnings in Durable Goods Industries in Prosperity and Depression," presented at Philadelphia, Dec. 28, 1939, before the American Statistical Association.

"Some Uses of Iso-Outlay Curves in Economic Analysis," presented at Colorado Springs, July 19, 1940, before the Cowles Commission Sixth Annual Research Conference (abstract in *Conference Report*, pp. 64-66).

"The Effect of the Undistributed Profits Tax: A Reply," *Econometrica*, Vol. 8, October, 1940, pp. 357-360.

"The Dilemma of the Conservative," presented at Cleveland, Nov. 22, 1940, before the Cleveland Chapter of the American Statistical Association.

"Wholesale Price Indexes," presented at Chicago, Dec. 27, 1940, before the American Statistical Association (published in *Journal of the American Statistical Association*, Vol. 36, June, 1941, pp. 185-190).

HORST MENDERSHAUSEN  
(1938-1939)

"On the Significance of Professor Douglas' Production Function," *Econometrica*, Vol. 6, April, 1938, pp. 143-153.

"The Definition of 'Equal Well-Being' in Frisch's Double-Expenditure Method," *Econometrica*, Vol. 6, July, 1938, pp. 285-286.

"'Clearing Variates' in Confluence Analysis," presented at Colorado Springs, July 7, 1938, before the Cowles Commission Fourth

Annual Research Conference (abstract in *Conference Report*, pp. 24-26); published in *Journal of the American Statistical Association*, Vol. 34, March, 1939, pp. 93-105.

"The Relationship between Income and Savings of American Metropolitan Families," presented at Detroit, Dec. 29, 1938, before the Econometric Society (abstract in *Econometrica*, Vol. 7, April, 1939, pp. 180-181); published in *American Economic Review*, Vol. 29, September, 1939, pp. 521-537.

"Differences in Consumers' Savings between American Communities of Different Size and Location," presented at Milwaukee, June 19, 1939, before Section K of the American Association for the Advancement of Science.

"On the Measurement of the Degree of Inequality of Income Distributions," presented at Colorado Springs, July 19, 1939, before the Cowles Commission Fifth Annual Research Conference (abstract in *Conference Report*, pp. 63-65).

"On the Significance of Professor Douglas' Production Function: A Correction," *Econometrica*, Vol. 7, October, 1939, p. 362.

"Eliminating Changing Seasonals by Multiple Regression Analysis," *Review of Economic Statistics*, Vol. 21, November, 1939, pp. 171-177.

"Changing Methods of Diverting the National Income to War Purposes," presented at Philadelphia, Dec. 28, 1939, before the Econometric Society (abstract in *Econometrica*, Vol. 8, April, 1940, pp. 179-180).

JACOB L. MOSAK  
(1939- )

*An Analysis of the Demand for Steel in the Automobile Industry.* New York, United States Steel Corporation. 1939. 28 pp. Included in *United States Steel Corporation T.N.E.C. Papers*, 1940, pp. 73-103, and reprinted in *Hearings before the Temporary National Economic Committee*, Part 26, Washington, 1940, as Exhibit No. 1413, pp. 13981-98.

*General Equilibrium Theory in International Trade*, thesis presented in partial fulfilment of the requirements for the degree of Doctor of Philosophy at the University of Chicago, 1941, (typed).

---

"The Least-Squares Standard Error of the Coefficient of Elasticity of Demand," *Journal of the American Statistical Association*, Vol. 34, June, 1939, pp. 353-361.

"Some Theoretical Implications of the Statistical Analysis of Demand and Cost Functions for Steel," presented at Chicago, Dec. 27, 1940, before the American Statistical Association and the Econometric Society (abstract in *Econometrica*, Vol. 9, April, 1941, p. 167); pub-

lished in *Journal of the American Statistical Association*, Vol. 36, March, 1941, pp. 100-109.

"The General-Equilibrium Theory of International Trade," presented at Chicago, Dec. 28, 1940, before the Econometric Society (abstract in *Econometrica*, Vol. 9, April, 1941, p. 171).

"Wage Increases and Unemployment," *American Economic Review*, Vol. 31, June, 1941, pp. 330-332.

"On the Workings of a General Equilibrium System," presented at Chicago, Sept. 4, 1941, before the Econometric Society and the Institute of Mathematical Statistics (abstract in *Econometrica*, Vol. 10, January, 1942, pp. 93).

WILLIAM F. C. NELSON  
(1932-1936)

(With Harold T. Davis) *The Elements of Statistics*. Bloomington, Indiana, Principia Press, 1935. xi + 424 pp. Second edition, 1937. xii + 434 pp.

---

"A New Index of Investment Experience in American Industrial and Public Utility Common Stocks, 1872-1906," presented at Berkeley, June 22, 1934, before the Econometric Society, the American Statistical Association, and Section K of the American Association for the Advancement of Science (abstract in *Econometrica*, Vol. 2, October, 1934, pp. 444).

"Painting and Prices," presented at Colorado Springs, June 24, 1935, before the Econometric Society (abstract in *Econometrica*, Vol. 3, October, 1935, pp. 475-476).

CHARLES F. ROOS  
(1934-1937)

*Dynamic Economics*. Bloomington, Indiana, Principia Press, 1934. xvi + 275 pp.

*NRA Economic Planning*. Bloomington, Indiana, Principia Press, 1937. xxii + 596 pp.

---

"Economic Theory of the Shorter Work Week," presented at Pittsburgh, Dec. 28, 1934, before the Econometric Society; published in *Econometrica*, Vol. 3, January, 1935, pp. 21-39.

"What Do Time-Series Correlation Coefficients Show?" presented at Pittsburgh, Dec. 28, 1934, before the Econometric Society, the American Mathematical Society, the Mathematical Association of America, and Sections A and K of the American Association for the Advancement of Science.

"Labor vs. Machine Cost: Some Theoretical and Statistical Stud-



ies of Replacement of Men by Machines," presented at Pittsburgh, Dec. 29, 1934, before the Econometric Society and Sections K and M of the American Association for the Advancement of Science.

"Cost Experiments of the NRA," presented at Colorado Springs, June 24, 1935, before the Econometric Society.

"Meetings of the Econometric Society in Chicago and Pittsburgh, December, 1934," *Econometrica*, Vol. 3, July, 1935, pp. 345-352.

"Lag Analysis with Special Reference to the Building Industry," presented at Colorado Springs, July, 1935, before the Cowles Commission First Annual Research Conference.

"Annual Survey of Statistical Information: Capital Formation and the Flow of National Income in the United States," *Econometrica*, Vol. 3, October, 1935, pp. 366-375.

"Effects of Credit, Building Costs, and Rent on Building Activity," presented at St. Louis, Jan. 3, 1936, before the Econometric Society (abstract in *Econometrica*, Vol. 4, April, 1936, p. 191).

"Some Economic Effects of Wage Regulation on Interstate Trade," presented at Colorado Springs, July 25, 1936, before the Cowles Commission Second Annual Research Conference (abstract in *Conference Abstracts*, pp. 60-62).

"A General Invariant Criterion of Fit for Lines, Planes, and Functions Expandable in Series, Where All Variates Are Subject to Error," presented in preliminary form at Colorado Springs, Aug. 5, 1936, before the Cowles Commission Second Annual Research Conference (abstract in *Conference Abstracts*, pp. 93-95), and in final form at Chicago, Dec. 28, 1936, before the American Statistical Association and the Institute of Mathematical Statistics; published as "A General Invariant Criterion of Fit for Lines and Planes Where All Variables Are Subject to Error," *Metron*, Vol. 13, 1937, pp. 3-20.

"Annual Survey of Statistical Techniques: The Correlation and Analysis of Time Series—Part II," *Econometrica*, Vol. 4, October, 1936, pp. 368-381.

"New Indexes of Stock Prices and Yields and Their Relation to the Theories of Capital and Savings," presented at Chicago, Dec. 28, 1936, before the Econometric Society, the American Statistical Association, and the Institute of Mathematical Statistics (abstract in *Econometrica*, Vol. 5, April, 1937, pp. 184-185).

"Measuring Economic Impacts," presented at Denver, June 25, 1937, before the Econometric Society, Section K of the American Association for the Advancement of Science, the American Sociological Society, and the Sociological Research Association (abstract in *Econometrica*, Vol. 5, October, 1937, pp. 388-389).

"The Relation of Stock Prices to Earnings and Other Factors," presented at Colorado Springs, June 29, 1937, before the Cowles Commission Third Annual Research Conference, abstract in *Conference Report*, pp. 17-19).

"The Dynamics of the Security Market," presented at Colorado

Springs, July 1, 1937, before the Cowles Commission Third Annual Research Conference (abstract in *Conference Report*, pp. 26-31).

"Dynamics of the Security Markets," presented at Atlantic City, Dec. 28, 1937, before the Econometric Society (abstract in *Econometrica*, Vol. 6, April, 1938, pp. 185-186).

(With Victor S. von Szeliski) "Economic Balance and Its Relation to Production and Pricing Problems," presented at Atlantic City, Dec. 29, 1937, before the Econometric Society (abstract in *Econometrica*, Vol. 6, April, 1938, pp. 189-190).

JOHN H. SMITH  
(1940- )

*Statistical Deflation in the Analysis of Economic Series*, thesis presented in partial fulfilment of the requirements for the degree of Doctor of Philosophy at the University of Chicago, privately printed, Chicago, 1941. vi + 123 pp.

*Added Column Method for Computing Multiple Correlation Constants*. The University of Chicago Bookstore, 1941. 33 pp.

---

"The Use of Weighted Regressions in the Analysis of Economic Series," presented at Colorado Springs, July 16, 1940, before the Cowles Commission Sixth Annual Research Conference (abstract in *Conference Report*, pp. 53-55).

"Curve Fitting by Cumulative Addition," presented at Chicago, Sept. 3, 1941, before the Econometric Society and the Institute of Mathematical Statistics (abstract in *Econometrica*, Vol. 10, January, 1942, pp. 91-92).

"Confidence Intervals for the Unknown Median of Any Type of Universe," presented at New York, Dec. 27, 1941, before the Econometric Society and the Institute of Mathematical Statistics.

GERHARD TINTNER  
(1936-1937)

"A Note on Distribution of Income over Time," *Econometrica*, Vol. 4, January, 1936, pp. 60-66.

"Internationale Konjunkturforschung," *Der Oesterreichische Volkswirt*, Vol. 28, July 4, 1936, pp. 783-784.

"Expectations and the Statistical Theory of Errors," presented at Chicago, Dec. 29, 1936, before the Econometric Society (abstract in *Econometrica*, Vol. 5, April, 1937, pp. 189-190).

"Monopoly over Time," *Econometrica*, Vol. 5, April, 1937, pp. 160-170.

"The Economic Meaning of Functionals," presented at Denver, June 24, 1937, before the Econometric Society and Sections A and K of the American Association for the Advancement of Science (abstract in *Econometrica*, Vol. 5, October, 1937, p. 385).

"The Maximization of Utility over Time," presented at Colorado Springs, July 21, 1937, before the Cowles Commission Third Annual Research Conference (abstract in *Conference Report*, pp. 91-93); published in *Econometrica*, Vol. 6, April, 1938, pp. 154-158.

"A Dynamic Theory of Duopoly: A Problem in Econometrics," presented at Iowa City, Nov. 26, 1937, before the American Mathematical Society (abstract in *Bulletin of the American Mathematical Society*, Vol. 44, January, 1938, p. 29).

"The Definition and Dynamic Significance of Randomness in Time Series," presented at Atlantic City, Dec. 27, 1937, before the Econometric Society (abstract in *Econometrica*, Vol. 6, April, 1938, p. 181).

ABRAHAM WALD  
(1938-1939)

"The Approximative Determination of Indifference Surfaces by Means of Engel Curves," presented at Colorado Springs, July 12, 1938, before the Cowles Commission Fourth Annual Research Conference (abstract in *Conference Report*, pp. 39-41); published in *Econometrica*, Vol. 8, April, 1940, pp. 144-175.

"Generalization of the Inequality of Markoff," *Annals of Mathematical Statistics*, Vol. 9, December, 1938, pp. 244-255.

"A Contribution to the Theory of Statistical Estimation," presented at Detroit, Dec. 27, 1938, before the Institute of Mathematical Statistics (abstract in *Annals of Mathematical Statistics*, Vol. 10, March, 1939, pp. 86-87).

"Criteria for a Constant Preference Scale Expressed in Terms of Engel Curves," presented at Detroit, Dec. 29, 1938, before the Econometric Society (abstract in *Econometrica*, Vol. 7, April, 1939, pp. 179-180).

"Lower and Upper Limits of a Distribution Function Determined by Moments and Inequalities Satisfied by Moments," presented at New York, Feb. 25, 1939, before the American Mathematical Society (abstract in *Bulletin of the American Mathematical Society*, Vol. 45, March, 1939, p. 238).

(With J. Wolfowitz) "Confidence Limits for Continuous Distribution Functions," presented at New York, Feb. 25, 1939, before the American Mathematical Society (abstract in *Bulletin of the American Mathematical Society*, Vol. 45, March, 1939, pp. 232-233); published in *Annals of Mathematical Statistics*, Vol. 10, June, 1939, pp. 105-118.

"Long Cycles as a Result of Repeated Integration," *American Mathematical Monthly*, Vol. 46, March, 1939, pp. 136-141.

"The Fitting of Straight Lines if Both Variables Are Subject to Error," presented at Colorado Springs, July 6, 1939, before the Cowles Commission Fifth Annual Research Conference (abstract in

Conference Report, pp. 25-28); published in *Annals of Mathematical Statistics*, Vol. 11, September, 1940, pp. 284-300.

"Limits of a Distribution Function Determined by Absolute Moments," *Transactions of the American Mathematical Association*, Vol. 46, September, 1939, pp. 280-306.

"A New Formula for the Index of Cost of Living," *Econometrica*, Vol. 7, October, 1939, pp. 319-331.

"Contributions to the Theory of Statistical Estimation and Testing Hypotheses," *Annals of Mathematical Statistics*, Vol. 10, December, 1939, pp. 299-326.

"A Note on the Analysis of Variance with Unequal Class Frequencies," presented by title at Philadelphia, Dec. 27, 1939, before the Institute of Mathematical Statistics (abstract in *Annals of Mathematical Statistics*, Vol. 11, March 1940, pp. 114-115); published in *Annals of Mathematical Statistics*, Vol. 11, March, 1940, pp. 96-100.

(With J. Wolfowitz) "On a Test whether Two Samples Are from the Same Population," presented at Philadelphia, Dec. 27, 1939, before the Institute of Mathematical Statistics (abstract in *Annals of Mathematical Statistics*, Vol. 11, March, 1940, p. 112); published in *Annals of Mathematical Statistics*, Vol. 11, June, 1940, pp. 147-162.

THEODORE O. YNTEMA  
(1939- )

Professor Yntema planned and directed the research leading to the following papers published first in pamphlet form in 1939 and then collected in *United States Steel Corporation T.N.E.C. Papers*, 1940, Vol. 1, 411 pp. They were also reprinted as exhibits in *Hearings Before the Temporary National Economic Committee, Congress of the United States, Seventy-sixth Congress, Third Session, Pursuant to Public Resolution No. 113 (Seventy-fifth Congress)*. Part 26. *Iron and Steel Industry, United States Steel Corporation Studies, Prices and Costs. January 23, 24, and 25, 1940*. Washington, Government Printing Office, 1940, pp. 13585-14128. T.N.E.C. Exhibit numbers and pages in the *Hearings* are given in parentheses.

No. 1. "An Analysis of Changes in the Demand for Steel and in Steel Prices—1936-1939," pp. 7-71 (T.N.E.C. Exhibit No. 1412, pp. 13942-81).

No. 2. "An Analysis of the Demand for Steel in the Automobile Industry," pp. 73-103 (T.N.E.C. Exhibit No. 1413, pp. 13981-98).

No. 3. "An Analysis of the Demand for Steel in the Railroad Industry," pp. 105-135 (T.N.E.C. Exhibit No. 1414, pp. 13999-14016).

No. 4. "An Analysis of the Demand for Steel in the Container Industry," pp. 137-164 (T.N.E.C. Exhibit No. 1415, pp. 14016-32).

No. 5. "A Statistical Analysis of the Demand for Steel, 1919-1938," pp. 165-221 (T.N.E.C. Exhibit No. 1411, pp. 13913-42).

No. 6. "An Analysis of Steel Prices, Volume and Costs Controlling Limitations on Price Reductions," pp. 223-302 (T.N.E.C. Exhibit No. 1416, pp. 14032-82).

No. 7. "An Analysis of Steel Prices, Volume and Costs Controlling Limitations on Price Reductions — Summary," pp. 303-323 (T.N.E.C. Exhibit No. 1417, pp. 14082-94).

No. 8. "The Distribution of Steel to Major Consuming Industries," pp. 325-336 (T.N.E.C. Exhibit No. 2180, pp. 14095-101).

No. 9. "Indexes of Mill-Net Yields on Products Shipped by United States Steel Corporation Subsidiaries," pp. 337-354 (T.N.E.C. Exhibit No. 2181, pp. 14101-09).

---

"Competitive Norms in Durable-Goods Industries," presented at Colorado Springs, July 10, 1939, before the Cowles Commission Fifth Annual Research Conference (abstract in *Conference Report*, pp. 32-34).

"Quantification: the Quest for Precision," round-table paper given at the University of Chicago, Dec. 1, 1939, reported in *Eleven Twenty-Six: A Decade of Social Science Research*, Louis Wirth, editor, Chicago, The University of Chicago Press, 1940, pp. 170-172, 182.

"Organization for National Defense," presented at Colorado Springs, July 2, 1940, before the Cowles Commission Sixth Annual Research Conference.

"Some Economic Problems in the Expansion of Capacity to Produce Military Goods," presented at New Orleans, Dec. 30, 1940, before the American Economic Association, published in *American Economic Review*, Vol. 30, February, 1941, pp. 373-378.

"Emergency Price Control," presented at Chicago, June 6, 1941, before the University of Chicago Law School Conference on Public Law (printed in *Report of the Conference*, 1941, pp. 19-31).

"Competition as a Norm of Economic Behavior," *The Journal of Business*, Vol. 14, July, 1941, pp. 270-283.

"Weights to Compensate for Transformation in Curve Fitting," presented at Chicago, Sept. 3, 1941, before the Econometric Society and the Institute of Mathematical Statistics (abstract in *Econometrica*, Vol. 10, January, 1942, p. 91).

"Relation of Price Control to Fiscal Policy," in *Price Problems in a Defense Economy*, New York, National Bureau of Economic Research, privately printed, 1941, pp. 115-120.

"The Future Role of Large-Scale Enterprise," presented at Chicago, Sept. 23, 1941, in connection with the celebration of the Fiftieth Anniversary of the University of Chicago; published in *The Journal of Political Economy*, Vol. 49, December, 1941, pp. 833-848.

"Major Factors Having Current Bearing on Wage Determination," presented at Chicago, Oct. 17, 1941, before the Eighth Annual Midwest Conference on Industrial Relations.

"The Impact of the Defense Program on Business," presented at Chicago, Dec. 4, 1941, before the Citizens Board of Sponsors of the University of Chicago.

(With Dickson H. Leavens) "An Appraisal of the 1940 [Census] Sampling Scheme," presented at New York, Dec. 29, 1941, before the American Statistical Association and the Institute of Mathematical Statistics.

## COWLES COMMISSION MONOGRAPHS

No. 1. **DYNAMIC ECONOMICS**, by Charles F. Roos, 1934. 275 pages. Price \$3.50. This book applies mathematical analysis in the investigation of economic theory, especially by differentiating between theories of static and dynamic economics.

No. 2. **NRA ECONOMIC PLANNING**, by Charles F. Roos, 1937. 596 pages. Price \$5.00 This book describes the policies and working of the NRA and discusses the general question of economic planning.

No. 3. **COMMON-STOCK INDEXES**, by Alfred Cowles and Associates. Second edition, 1939. 499 pages. Price \$6.00. New monthly indexes of (1) stock prices, (2) stock prices adjusted for the reinvestment of cash dividends, and (3) yield expectations; and annual indexes of (4) yields, (5) dividend payments, (6) earnings-price ratios, and (7) earnings; all for 69 industry groups or combinations of groups, and running from 1871 through 1938.

No. 4. **SILVER MONEY**, by Dickson H. Leavens, 1939. 439 pages. Price \$4.00. A sketch of the history of the monetary use of silver, followed by more detailed consideration of developments in recent years.

No. 5. **THE VARIATE DIFFERENCE METHOD**, by Gerhard Tintner, 1940. 175 pages. Price \$2.50. This method focuses attention on the role of the random element in the analysis of time series.

No. 6. **THE ANALYSIS OF ECONOMIC TIME SERIES**, by Harold T. Davis, 1941. 620 pages. Price \$6.00. This book reviews the historical development of the subject, describes the methods used, and makes applications to a variety of economic phenomena.

---

In addition, the Cowles Commission has sponsored the publication of a text book by two members of its staff:

**ELEMENTS OF STATISTICS**, by Harold T. Davis and W. F. C. Nelson. Second edition, 1937. 434 pages. Price \$4.00. The elements of the subject are presented without recourse to calculus, but with as complete mathematical treatment as is possible with this limitation. The illustrative materials and problems have been taken chiefly from data of economic significance.

*Orders should be sent to*  
**PRINCIPIA PRESS, INC.**  
BLOOMINGTON, INDIANA