THE RICE INSTITUTE PAMPHLET

Vol. XXXIV July, 1947 No. 3

GRADUATE ANNOUNCEMENTS FOR 1947–1948 OF THE RICE INSTITUTE

FOUNDED IN THE CITY OF HOUSTON, TEXAS
BY WILLIAM MARSH RICE

OPENED FOR THE RECEPTION OF STUDENTS
IN THE AUTUMN OF
NINETEEN HUNDRED AND TWELVE

THE BOARD OF TRUSTEES
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GEORGE RUFUS BROWN: VICE-CHAIRMAN
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GUS SESSIONS WORTHAM

TRUSTEES EMERITI
ALEXANDER SESSUMS CLEVELAND
EDGAR ODELL LOVETT
BENJAMIN BOTTIS RICE
JOHN THADDEUS SCOTT
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iv
ACADEMIC CALENDAR

1947

September 18-19 . . . Registration
September 20 . . . Matriculation Address
September 22 . . . Opening of Courses
November 26 . . . Beginning of Thanksgiving Recess at 6:00 P.M.
December 1 . . . Resumption of Courses at 8:00 A.M.
December 20 . . . Beginning of Christmas Recess at 1:00 P.M.

1948

January 5 . . . Resumption of Courses at 8:00 A.M.
January 26-February 5 . . February Examinations
February 9 . . . Resumption of Courses at 8:00 A.M.
February 22 . . . Washington's Birthday (Monday, February 23, a holiday)
March 2 . . . Texas Independence Day
April 21 . . . San Jacinto Day
April 24 . . . Main Entrance Examination Period
May 24-June 4 . . . Final Examinations
June 5-7 . . . Thirty-Fifth Commencement
June 19 . . . Second Entrance Examination Period (principally for transfers)

1949

September 16-17 . . . Registration
September 18 . . . Matriculation Address
September 20 . . . Opening of Courses
November 24 . . . Beginning of Thanksgiving Recess at 6:00 P.M.
November 29 . . . Resumption of Courses at 8:00 A.M.
December 18 . . . Beginning of Christmas Recess at 1:00 P.M.

January 3 . . . Resumption of Courses at 8:00 A.M.
January 24-February 3 . . February Examinations
EDGAR ODELL LOVETT, Ph.D., Sc.D., LL.D.
President Emeritus

OFFICERS OF ADMINISTRATION

WILLIAM VERMILLION HOUSTON, Ph.D.
President

HARRY BOYER WEISER, Ph.D.
Dean

HUGH SCOTT CAMERON, M.E.
Assistant Dean for Student Activities

SAMUEL GLENN McCANN, M.A.
Registrar

JOSEPH DAVID THOMAS, A.M.
Assistant Registrar

JOHN THOMAS McCANTS, M.A.
Bursar

VERNE FRANKLIN SIMONS, A.M., C.P.A.
Assistant Bursar
GRADUATE
ANNOUNCEMENTS FOR 1947–1948
THE RICE INSTITUTE

GENERAL STATEMENT

The Rice Institute bears the name of the founder, the late William Marsh Rice. Dedicated to the advancement of literature, science, and art, its educational program of liberal and technical learning may justify the designation “Institute” as representing the functions of a teaching university and, at least in some of its departments, those of a research institution. The Institute was incorporated in 1891 under a broad charter granting the trustees large freedom in the future organization of a non-political and non-sectarian institution to be dedicated to the advancement of letters, science, and art.

Since the opening in 1912, the highest ideals of scholarship have been upheld, and graduate study and research have been carried on as a principal means of advancing the several fields of learning. At the present time the degree of Doctor of Philosophy is awarded in the fields of mathematics, physics, chemistry, and biology. This degree represents the completion of at least three years of advanced study after the award of a suitable bachelor’s degree, and in most cases four or more years are required. It also represents the completion of an original piece of investigation, the report of which constitutes the thesis. The thesis must be published in an accredited journal or series, and a copy must be deposited in the Institute library. As final evidence of his preparation for this degree, the candidate must pass a public oral examination.

The degree of Master of Arts is available in the foregoing and other fields of study, and the degree of Master in Architecture or Master of Science in a branch of engineering (M.S. in Ch.E., M.S. in C.E., M.S. in E.E., or M.S. in M.E.) may be obtained. Each of these degrees will be awarded upon the completion of one full year of advanced work in a special field. Such programs will generally include a piece of original work embodied in a thesis, and the candidate’s preparation will be evidenced by a public examination. Students whose undergraduate preparation has not included
sufficient specialized work, or whose time is partly occupied with teaching duties, may require at least two years to complete the requirements for a master's degree.

Application for admission to graduate study should be made to the Registrar as early as possible.
INSTRUCTIONAL STAFF

FACULTY

Allgood, Jay R.
B.S. in M.E. (Rice) 1947
Instructor in Civil Engineering

Alsworth, Charles C.
B.S. in M.E. (Rice) 1947
Instructor in Mechanical Engineering

Altenburg, Edgar
A.B. (Columbia) 1911, M.A. (Columbia) 1912, Ph.D. (Columbia) 1916
Assistant Professor of Biology

Battista, Joseph Lloyd
Certificat d’Études françaises (Bordeaux) 1919, Diplomé d’Études supérieures (Bordeaux) 1919, B.A. (Michigan) 1920, M.A. (Washington Univ.) 1923, M.A. (Harvard) 1929
Instructor in Spanish and Italian

Bonner, Tom Wilkerson
B.S. (Southern Methodist) 1931, M.A. (Rice) 1932, Ph.D. (Rice) 1934
Professor of Physics

Bourgeois, André Marie Georges
Bachelier ès Lettres (Paris) 1921, Bachelier en Droit (Paris) 1923, Certifié d’Études supérieures de lettres (Paris) 1930, M.A. (Texas) 1934, Docteur d’Université (Paris) 1945, Officier de l’Instruction Publique 1945
Assistant Professor of French

Bray, Hubert Evelyn
B.A. (Tufts) 1910, M.A. (Harvard) 1916, Ph.D. (Rice) 1918
Professor of Mathematics

Brunk, Hugh Daniel
A.B. (California) 1940, M.A. (Rice) 1942, Ph.D. (Rice) 1944
Instructor in Mathematics
Calhoun, Harold Eugene
B.A. (Rice) 1932
Visiting Critic in Architecture

Calkin, John Williams
Associate Professor of Mathematics

Camden, Charles Carroll
A.B. (Centre College) 1925, M.A. (Iowa) 1928, Ph.D. (Iowa) 1930
Associate Professor of English

Cameron, Hugh Scott
M.E. (Stevens) 1925
Assistant Professor of Mechanical Engineering and Assistant Dean for Student Activities

Chandler, Asa Crawford
B.A. (Cornell) 1911, M.S. (California) 1912, Ph.D. (California) 1914
Professor of Biology

Chapman, Alan Jesse
B.S. in M.E. (Rice) 1945
Instructor in Engineering

Chillman, James, Jr.
B.S. in Arch. (Pennsylvania) 1913, M.S. in Arch. (Pennsylvania) 1914, F.A.A.R. (Am. Acad. in Rome) 1922
Associate Professor of Architecture

Craig, Hardin, Jr.
Associate Professor of History

Davies, Joseph Iloot
B.A. (Rice) 1928, M.A. (Rice) 1929, Ph.D. (Rice) 1937
Assistant Professor of Biology

DeZurko, Edward R.
B.S. in Ed. (Illinois) 1939, B.S. in Arch. (Illinois) 1940, M.S. in Arch. (Columbia) 1942
Assistant Professor of Architecture
DIX, WILLIAM S.
B.A. (Virginia) 1931, M.A. (Virginia) 1932, Ph.D. (Chicago) 1946
Assistant Professor of English

DOGGETT, JOHN RENTZ, JR.
B.S. in M.E. (Rice) 1936
Instructor in Mechanical Engineering

DUNAWAY, JAMES KARL
B.A. (Rice) 1936, B.S. in Arch. (Rice) 1937, M.A. (Rice) 1938, M.S. (Columbia) 1941
Assistant Professor of Architecture

FISCHER, KATHERINE MARTHA
B.A. (Rice) 1944, M.A. (Rice) 1945
Instructor in History

FREUND, FRIEDRICH ERNST MAX
Ph.D. (Leipzig) 1902
Professor Emeritus of German

FULTON, JAMES STREET
B.A. (Vanderbilt) 1925, M.A. (Vanderbilt) 1929, Ph.D. (Cornell) 1934
Assistant Professor of Philosophy

FUJON, REYNOLD CLAYTON
A.B. (Montana) 1920, A.M. (California) 1921, Ph.D. (Minnesota) 1924
Visiting Professor of Chemistry

GALLEGGY, JOSEPH S., JR.
B.A. (Rice) 1925, M.A. (Rice) 1926
Instructor in English

GARRISON, ALLEN DARNABY
B.A. (Rice) 1918, M.S. (Rice) 1920, Ph.D. (Rice) 1921
Associate Professor of Chemical Engineering

GIRARD, PIERRE LÉON
Bachelier ès Lettres (Paris) 1932, Licencié ès Lettres (Paris) 1934, Diplomé d'Études supérieures (Paris) 1936, Agrégé de l'Université (Paris) 1943
Assistant Professor of French
Hartsook, Arthur J.
A.B. (Nebraska Wesleyan) 1911, B.S. in Ch.E. (M.I.T.) 1920, M.S. (M.I.T.) 1921
Professor of Chemical Engineering

Heaps, Claude William
B.S. (Northwestern) 1909, Ph.D. (Princeton) 1912
Professor of Physics and Director of the Library

Hermance, Gilbert Leslie
B.S. (Oregon) 1927, M.A. (Columbia) 1930
Associate Professor of Physical Education

Hodges, John Elton
B.B.A. (Texas) 1935, M.B.A. (Texas) 1937
Assistant Professor of Economics

Hodges, Lee
S.B. (Harvard) 1930, M.A. (Rice) 1934
Instructor in French and Spanish

Houston, William Vermillion
B.A., B.S. in Ed. (Ohio State) 1920, S.M. (Chicago) 1922, Ph.D. (Ohio State) 1925
Professor of Physics and President of the Rice Institute

Hudspeth, C. M.
B.A. (Rice) 1940, LL.B. (Texas) 1946
Instructor in Government

Kilpatrick, John Edgar
B.A. (Stephen F. Austin) 1940, A.M. (Kansas) 1942, Ph.D. (California) 1945
Assistant Professor of Chemistry

Lear, Floyd Seyward
Professor of History

Leifeste, A. A., Jr.
A.B. (Southwestern) 1934, B.S. in Arch. (Rice) 1941
Instructor in Architecture

Lewis, Arthur Orcutt, Jr.
Instructor in English
INSTRUCTIONAL STAFF

LOUIS, ANDREW
Ph.B. (Wesleyan) 1929, Ph.D. (Cornell) 1935
Assistant Professor of German

LOVETT, EDGAR ODELL
A.B. (Bethany) 1890, M.A., Ph.D. (Virginia) 1895, Ph.D. (Leipzig) 1896, LL.D. (Drake, Tulane, Baylor, Bethany), Sc.D. (Colorado College)
President Emeritus of the Rice Institute

LYLE, C. COLLIS, JR.
B.A. (Cornell) 1933, M.A. (Cornell) 1934
Instructor in German

McCANN, SAMUEL GLENN
Ph.B. (Wooster) 1914, M.A. (Rice) 1917
Instructor in Jurisprudence and Registrar

McCANTS, JOHN THOMAS
B.S. (Marion Inst.) 1902, B.A. (Marion Inst.) 1905, M.A. (Virginia) 1906, M.A. (Yale) 1909
Instructor in Business Administration and Bursar

McDOUGLE, CLYDE CALVIN
B.S. in Ph. Ed. (Rice) 1942
Instructor in Physical Education

McENANY, MICHAEL VINCENT
B.S. in E.E. (Colorado College) 1929, M.A. in Physics (Dartmouth) 1931
Assistant Professor of Electrical Engineering

MACKAY, WILLIAM STURGES, JR.
B.A. (Rice) 1943
Instructor in Business Administration

McKILLOP, ALAN DUGALD
Professor of English

MANDELBROJT, SZOLEM
B.S. (Warsaw) 1917, Docteur ès Science (Paris) 1923
Professor of Mathematics
Mandeville, Charles Earle, Jr.
B.A. (Rice) 1940, M.A. (Rice) 1941, Ph.D. (Rice) 1943
Instructor in Physics
(On leave of absence)

March, Malcolm Ray
B.S. in C.E. (Texas) 1927
Instructor in Engineering Drawing

Milligan, Winfred O.
Associate Professor of Chemistry

Money, Lloyd J.
B.S. in E.E. (Rice) 1942
Instructor in Electrical Engineering

Moraud, Marcel
Bachelier ès Lettres (Poitiers) 1907, Licencié ès Lettres (Paris) 1908, Diplomé d'Études supérieures (Paris) 1910, Agrégé de l'Université (Paris) 1914, Docteur ès Lettres (Paris) 1933
Professor of French

Morehead, James Caddall, Jr.
A.B. (Princeton) 1935, B.Arch. (Carnegie Inst. of Tech.) 1939
Assistant Professor of Architecture

Morledge, Joe W.
B.S. in M.E. (Rice) 1947
Instructor in Engineering

Neely, Jess Claiborne
LL.B. (Vanderbilt) 1924
Director of Athletics and Head Football Coach

Nicholas, Henry Oscar
A.B. (Oberlin) 1919, Ph.D. (Yale) 1923
Associate Professor of Chemistry

Oberlé, Eugene Jean
A.B. (Stanford) 1915, A.M. (Stanford) 1916
Instructor in French

Parish, John Edward
B.A. (Sam Houston) 1934, M.A. (Texas) 1941
Instructor in English
INSTRUCTIONAL STAFF

PERRY, WILLIAM C.
B.A. (Rice) 1938, LL.B. (Texas) 1941
Instructor in Business Law

PFEIFFER, PAUL E.
B.S. in E.E. (Rice) 1938
Instructor in Electrical Engineering

RICHTER, GEORGE HOLMES
B.A. (Rice) 1926, M.A. (Rice) 1927, Ph.D. (Rice) 1929
Professor of Chemistry

RISSE, J. R.
A.B. (Franklin and Marshall) 1931, M.A. (Princeton) 1935,
Ph.D. (Princeton) 1938
Assistant Professor of Physics

RYON, LEWIS BABCOCK
C.E. (Lehigh) 1917
Professor of Civil Engineering

SHELTON, FRED VERNON
B.A. (Rice) 1926, M.A. (Rice) 1928, M.A. (Univ. Nac. de Mexico) 1942
Assistant Professor of French

SIMONS, VERNE FRANKLIN
A.B. (Kansas) 1923, A.M. (Kansas) 1925, C.P.A. 1931
Assistant Professor of Economics and Assistant Bursar

SIMS, JAMES REDDING
B.S. in C.E. (Rice) 1941
Assistant Professor of Civil Engineering

SLAUGHTER, JOHN WILLIS
A.B., B.D. (Lombard) 1898, Ph.D. (Michigan) 1901
Lecturer Emeritus in Civics and Philanthropy

SMITH, JOHN TREANOR
B.S. in Ch.E. (Rice) 1940, M.S. (Michigan) 1941, Ph.D. (Michigan) 1943
Assistant Professor of Chemistry

SQUIRE, CHARLES FRANCIS
Ph.D. (Johns Hopkins) 1937
Assistant Professor of Physics
TALMAGE, ROY V.
A.B. (Maryville College) 1938, M.A. (Richmond) 1940, Ph.D. (Harvard) 1947
Instructor in Biology

THOMAS, JOSEPH DAVID
Ph.B. (Chicago) 1929, A.M. (Chicago) 1930
Assistant Professor of English and Assistant Registrar

TSANOFF, RADOSLAV ANDREA
B.A. (Oberlin) 1906, Ph.D. (Cornell) 1910
Professor of Philosophy

ULRICH, FLOYD EDWARD
Associate Professor of Mathematics

WATERS, JAMES STEPHEN
B.S. (Rice) 1917
Professor of Electrical Engineering

WATKIN, WILLIAM WARD
B.S. in Arch. (Pennsylvania) 1908
Professor of Architecture

WEISER, HARRY BOYER
B.A. (Ohio State) 1911, M.A. (Ohio State) 1912, Ph.D. (Cornell) 1914
Professor of Chemistry and Dean

WELSH, HUGH CLAYTON
M.D. (Texas) 1923
Instructor in Biology

WHITING, GEORGE WESLEY
A.B. (West Virginia) 1908, A.M. (Harvard) 1913, Ph.D. (Chicago) 1926
Associate Professor of English

WILLIAMS, GEORGE GUION
B.A. (Rice) 1923, M.A. (Rice) 1925
Assistant Professor of English

WILSON, HAROLD ALBERT
Professor Emeritus of Physics
INSTRUCTIONAL STAFF

Wischmeyer, Carl Riehle
B.S. in E.E. (Rose Polytechnic) 1937, M.Eng. in E.E. (Yale) 1939, E.E. (Rose Polytechnic) 1942
Assistant Professor of Electrical Engineering

Wyatt, Edwin Mather
B.S. (Kansas Teachers College) 1917, M.S. (Wisconsin) 1927
Instructor in Engineering Drawing

Young, Homer Harry
B.A. (Austin College) 1930, M.A. (Southern Methodist) 1937
Instructor in Education

ASSISTANTS AND FELLOWS
(Previo~ degrees of fellows indicated to July, 1947)

Bame, Samuel Jarvis, Jr.
Fellow in Physics

Banewicz, John Joseph
Sc.B. in Chem. (Brown) 1944
Fellow in Chemistry

Baumgarten, Henry Ernest
B.A. (Rice) 1943, M.A. (Rice) 1944
Humble Fellow in Chemistry

Besdin, David Jacob
B.S. (Miami) 1946, M.A. (Rice) 1947
Fellow in Physics

Bischel, Kenneth H.
Shell Fellow in Chemical Engineering

Blunt, Robert Francis
B.A. (Rice) 1943, M.A. (Rice) 1947
Fellow in Physics

Bott, Lawrence L.
Fellow in Chemistry

Brunson, Emmett Evander
B.A. (Rice) 1929, M.A. (Columbia) 1932
Assistant in Physical Education and Coach of Track
Bushey, Gordon Lake
B.S. in Ch.E. (Rice) 1943, M.A. (Rice) 1944
Procter and Gamble Fellow in Chemistry

Costa, Phillip B.
B.S. in Ph. Ed. (Rice) 1947
Assistant in Physical Education

Darnell, Rezneat Milton, Jr.
B.S. (Southwestern at Memphis) 1946
Fellow in Biology

Dean, Alice Crowell
B.A. (Rice) 1916, M.A. (Rice) 1919
Librarian Emerita

De la Garza, Rodolfo
B.S. in E.E. (Rice) 1947
Fellow in Electrical Engineering

Evans, John Ellis
B.A., B.S. in Ed. (Ohio State) 1936, M.A. (Ohio State) 1937,
Ph.D. (Rice) 1947
Research Fellow in Physics

Farris, Robert Elwyn
B.S. (Rice) 1942
Fellow in Chemistry

Godfrey, Norman Bell
B.S. (California) 1946
Fellow in Chemistry

Harris, James Colwell
B.A. (Rice) 1942, M.A. (Rice) 1944
Humble Fellow in Physics

Hay, Wallace Simpson
Sc.B. in Chem. (Brown) 1943
Fellow in Chemistry

Hettler, G. William
B.S. (Bethany) 1939
Fellow in French

Johnson, Burnett Hood
B.S. (Sam Houston) 1944
Fellow in Chemistry
INSTRUCTIONAL STAFF

JONSSON, SUZANNE  
B.A. (Rice) 1946  
Fellow in History

LANDUA, ALTON JOHN  
B.S. (Texas A. and M.) 1942  
Fellow in Chemistry

LINDSAY, ROBERT  
Sc.B. in Physics (Brown) 1947  
Fellow in Physics

LOVE, WILLIAM FREEMAN  
B.S. (Rice) 1945, M.A. (Rice) 1947  
Fellow in Physics

McATEE, JAMES LEE, JR.  
B.S. (Texas A. and M.) 1947  
Fellow in Chemistry

McCALL, MILDRED  
B.A. (Rice) 1946  
Fellow in History

MERRIFIELD, PAUL E.  
A.B. (Colby) 1947  
Fellow in Chemistry

MILLER, EMERY BERNLEE  
Fellow in Chemistry

MILLER, JOHN WILLIAM  
B.S. in E.E. (Rice) 1946  
Fellow in Electrical Engineering

MILLER, LEE WELLS  
A.B. (Cedarville College) 1942  
Fellow in English

MORGAN, CHESTER STEPHEN, JR.  
B.S. in Ch.E. (Rice) 1944  
Humble Fellow in Chemistry

MUT, STUART CREIGHTON  
B.S. in E.E. (Rice) 1947  
Fellow in Electrical Engineering
Pearson, Angus George
B.A. (Texas) 1938
Socony-Vacuum Fellow in Physics

Pearson, Erna Herzog
B.A. (Texas) 1945, M.A. (Texas) 1946
Assistant in Mathematics

Phillips, Gerald Cleveland
B.A. (Rice) 1944, M.A. (Rice) 1947
Fellow in Physics

Randall, Royal William, Jr.
B.A. (Rice) 1944
Fellow in Physics

Read, Clark P., Jr.
Fellow in Biology

Richardson, Jasper Edgar
B.S. (Yale) 1944
Fellow in Physics

Skomal, Edward Nelson
B.A. (Rice) 1947
Fellow in Physics

Smith, Ralph Burns
B.A. (Ohio State) 1947
Fellow in History

Summers, Joseph Franklin
B.A. (Houston) 1942, M.A. (Texas) 1947
Fellow in Mathematics

Taylor, Howard Edward
B.A. (Rice) 1942, M.S. (Calif. Inst. of Tech.) 1943
Assistant in Mathematics

Terrell, Nelson James, Jr.
B.A. (Rice) 1944, M.A. (Rice) 1947
Fellow in Physics

Vondy, Elizabeth Carol
B.A. (Rice) 1946
Fellow in English
INSTRUCTIONAL STAFF

Whaling, Ward
B.A. (Rice) 1944, M.A. (Rice) 1947
Fellow in Physics

White, Thomas Jefferson
B.A. (Rice) 1940
Assistant in Mathematics

Whitehurst, Harry Bernard
B.A. (Rice) 1944
Humble Fellow in Chemistry

Wojecki, Edward J.
B.S. (Louisiana Tech.) 1936
Assistant in Physical Education

Zuefeldt, Richard Daniel
B.S. in E.E. (Rice) 1946
Fellow in Electrical Engineering

FACULTY COMMITTEES

The President is ex officio a member of all committees.

Committee on Admissions: Mr. McCann, chairman; Messrs. Dunaway, Garrison, Lear, Ryon, Thomas, and Ulrich.

Committee on Graduate Instruction: Mr. Houston, chairman; Messrs. Bonner, Bray, Chandler, Tsanoff, Weiser, and Wischmeyer.

Committee on Examinations and Standing: Mr. Ryon, chairman; Messrs. Craig, McEnany, Morehead, and Richter.

Committee on Schedules: Mr. McCann, chairman; Messrs. Calkin, Camden, Hartsook, J. Hodges, Nicholas, and Risser.

Committee on the Library: The Director of the Library, ex officio, chairman; Messrs. Chandler, Chillman, McKillop, and Tsanoff.

Committee on Student Activities: The Assistant Dean for Student Activities, ex officio, chairman; Messrs. Davies, Dix, Gallegly, Hermance, Shelton, and J. Smith; the Adviser to Women; the Chairman of the Hall Committee; the Chairman of the Honor Council; the President of the Student Association; the President of the Women’s Council.
Committee on Grounds and Buildings: Mr. Watkin, chairman; Messrs. Hartsook, Milligan, Sims, and Waters.

Committee on Publications: Mr. Thomas, chairman; Messrs. Louis, Moraud, Simons, Whiting, and Williams.

Committee on Public Lectures: Mr. Fulton, chairman; Messrs. Altenburg, Bonner, Bourgeois, and Milligan.

Committee on Outdoor Sports: Mr. Bray, chairman; Messrs. Hermance and Nicholas; representatives of the R Association: Messrs. H.P. Melton and A.M. Tomforde.

Navy Committee: Mr. Ryon, chairman; the Professor of Naval Science; Messrs. Craig, Hermance, McCann, McEnany, and Weiser.

Committee on Health Service: Mr. Hermance, chairman; Dr. Welsh; Messrs. Cameron, Chandler, McCann, and McCants; the Adviser to Women; the Manager of the Residential Halls.

Executive Committee: The President, ex officio, chairman; the Dean; Messrs. McKillop, Richter, and Waters.
EXPENSES

The opportunities for study and research offered by the Rice Institute are open without tuition both to young men and to young women. Students, of course, are expected to meet all expenses incurred in the purchase of textbooks, drafting instruments, notebooks, examination papers, and certificates and diplomas. Laboratory expenses in the experimental courses in pure and applied science are met by laboratory fees. Extra charges will be made for excessive use of material, for excessive and unusual breakage, and for other damage to equipment.

FEES

Registration fee ........................................... $25.00
(An annual fee required of all students.)

Late registration fee .................................. 5.00

Examination fee ......................................... 5.00
(A fee to cover the cost of examinations and transcripts.)

Diploma fee .................................................. 5.50
(A fee required of all candidates for degrees.)

Blanket-tax .................................................. 9.60
(An annual charge for student activities.)

Health Service fee
DORMITORY RESIDENTS ..................................... 10.00
TOWN STUDENTS ............................................ 5.00

Gymnasium fee
Every male student pays this fee for the use of gymnasium equipment during his undergraduate residence. The fee is paid once only by a student entering as a
FRESHMAN .................................................... 16.00
SOPHOMORE .................................................. 12.00
JUNIOR ......................................................... 8.00
SENIOR ......................................................... 4.00
GRADUATES (Annual charge, optional.) .................. 4.00
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<td><strong>Architecture</strong> (Every student enrolled in the department.)</td>
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EXPENSES

ARCHITECTURE 210, 410, if taken alone.................. $15.00

No student in arrears in his bills, including obligations to loan funds, will be admitted to any of the examinations, or be given any certificate or report of academic standing.

RESIDENTIAL ACCOMMODATIONS

Rooms in the residential halls for men, completely furnished exclusive of linen, may be had for one hundred and thirty dollars per year, twenty-five dollars of the rental being paid when the lease is signed, sixty-five dollars paid on September sixteenth, and the remainder paid on February ninth. As the charge for table board will be made at actual cost, the monthly price, payable in advance, will probably vary during the year. Until November first, a blanket-charge of approximately one dollar and forty-five cents per day will be made. Rooms in the halls will be let in the order of applications received. Such applications should be addressed to the Office of the Bursar. The residential halls are governed by a student Hall Committee, under the general supervision of the Assistant Dean for Student Activities.

Accommodations for the residence of young women on the university grounds are not available at present, but there is access to rooms for rest and study, and to tennis courts and other forms of recreation, under the supervision of Miss Sarah Louise Lane, B.A. (Rice), B.S. in Library Service (Columbia), Adviser to Women. Information concerning desirable places of residence for young women students may be had from Miss Lane.

HEALTH SERVICE

A health service located in West Hall is maintained for students. This service includes dispensary and infirmary care. The school physician makes scheduled sick calls and can be called in case of an emergency. A registered nurse is on duty during school hours; a qualified attendant is available at all hours. Information regarding the facilities and care can be secured at the Office of the Health Service (reached by the east entrance of West Hall).
STIPENDS AND FUNDS

FELLOWSHIPS

Provision is made for a variety of fellowships available to graduates of this and other institutions. There are several memorial fellowships that have been founded and endowed by gift or bequest on the part of friends of the Rice Institute. These provide a stipend designed to enable the holder to devote his time to study and research in his chosen field. There are also several industrial fellowships maintained by companies interested in the development of technical fields and the training of competent scientists and engineers. In addition, a number of teaching fellowships are available.

Persons desiring to be considered for appointment as fellows should consult with the department in which they desire to work and should make application to the Registrar as early as possible.

THE WALTER B. SHARP MEMORIAL FUND FOR RESEARCH IN PURE AND APPLIED SCIENCE

In memory of her husband, the late Walter B. Sharp, one of the earliest and most successful of the pioneers in the development of the petroleum industry in this country, Mrs. Estelle B. Sharp, of Houston, has endowed at the Rice Institute the Walter B. Sharp Memorial Fund for Research in Pure and Applied Science. The income from this fund is to be used for the maintenance of resident or traveling fellowships in scientific research, preference to be given to geological research, with special reference to petroleum and allied products. A requisite for eligibility to these fellowships is the degree of Doctor of Philosophy, or similar standing in this or other institutions. The awards are to be known as the Walter B. Sharp Fellowships, and the holders thereof as the Walter B. Sharp Fellows of the Rice Institute. The first Walter B. Sharp Fellow, at a stipend of $2500, was appointed for the academic year 1931–32.

THE SAMUEL FAIN CARTER FELLOWSHIP

The late Mrs. Carrie B. Carter established at the Rice Institute in 1932 the Samuel Fain Carter Fellowship in memory of her hus-
band, one of the first promoters of the lumber industry in Texas and the founder of the Second National Bank of Houston. In accordance with the terms of the gift, the endowment of $20,000 is administered in trust by the Second National Bank. The annual income of this trust fund is to be awarded to a graduate student of the Rice Institute, or a white graduate of an approved institution of learning, for the purpose of enabling the student to continue in postgraduate work, preferably at the Rice Institute, and, when the appropriate graduate schools shall have been organized, precedence is to be given to candidates in banking, business administration, and forestry. In the meantime, the award is to be made for the prosecution of postgraduate work in history and allied subjects, in science or engineering, or other branches of liberal and technical learning for which facilities for advanced work may be available at the Rice Institute. Should a graduate of any institution other than the Rice Institute receive the award, then the postgraduate work shall be done only at the Rice Institute. The holder is to be known as the Samuel Fain Carter Fellow of the Rice Institute. The award is to be made by the faculty, on the basis of highest standing in scholarship, with consideration of financial circumstances, personality, and physical fitness. The first Samuel Fain Carter Fellow was appointed for the academic year 1933–34.

ORA N. ARNOLD FELLOWSHIP FUND

Under the will of Mrs. Ora Nixon Arnold there was established in 1936 a fund to assist in securing a better understanding between the people and governments of Mexico, the South American States, the West Indies, and the Philippine Islands. The income is to be used in financing traveling fellowships to be allotted to graduates of the Rice Institute of outstanding ability and character, or to a graduate of the University of Mexico of equal distinction.

THE TRAVELING FELLOWSHIP IN ARCHITECTURE

Provision for a Rice Institute Traveling Fellowship in Architecture has been made by the Alumni of the Department of Architecture and the Architectural Society of the Rice Institute, who have pledged themselves to raise funds to be given each year to a student in architecture for the purposes of foreign and domestic
travel and study. The selection of the holder of the Traveling Fellowship is to be made annually by the faculty by means of a formal competition, in which students or graduates of the Rice Institute are eligible to participate.

THE JAMES A. BAKER AND ALICE GRAHAM BAKER BEQUEST

By the last will and testament of the late Captain James A. Baker, for more than fifty years Chairman of the Board of Trustees of the Institute, the trustees have received a fund in excess of $60,000 to be known as the James A. Baker and Alice Graham Baker Bequest. The fund is to be kept invested by the trustees and the income thereof “used in part, by the Institute, in establishing scholarships and fellowships, and to pay in whole or in part the salaries of its professors, teachers and lecturers, and in the payment of annual prizes to the students to stimulate their interest in their work.”

THE CATHARINE WITHERS ROPER AND BENJAMIN E. ROPER MEMORIAL FUND

The late Mary Withers Roper has bequeathed to the Rice Institute the residue of her estate in a sum in excess of $11,000 as a memorial to her mother and father, Catharine Withers Roper and Benjamin E. Roper, pioneering contemporaries of the founder of this institution. Only the income of this fund may be expended; the principal thereof is to be kept intact in the permanent endowment fund of the Institute. Miss Roper passed away at the advanced age of eighty-four years. She began teaching very early in life, and at the time of her retirement a few years ago she had spent an active life of sixty years in teaching in the schools of this vicinity. Through this memorial there become associated in perpetuity the family names of two long lives that were lived for the children of others.

THE EASTMAN KODAK COMPANY FELLOWSHIP

The Eastman Kodak Company maintains on a year-to-year basis a fellowship for predoctoral study in physical chemistry. The present amount of the stipend is $1200.
THE DOW CHEMICAL COMPANY SCHOLARSHIP OR FELLOWSHIP

On the initiative of Dr. Willard H. Dow, President of the Dow Chemical Company, a scholarship or fellowship was established by the Company in September, 1943, on a year-to-year basis, to be awarded to a Rice student in chemistry, chemical engineering, or physics. A Senior student receiving the award will be the Dow Chemical Company Scholar; a graduate student receiving this award will be the Dow Chemical Company Fellow. The present amount of the stipend is $750.

THE HUMBLE OIL AND REFINING COMPANY FELLOWSHIPS

In September, 1945, the Humble Oil and Refining Company established at the Rice Institute two fellowships for X-ray diffraction research. The amount of the stipend will be based in each case on the previous training of the fellow. Effective in September, 1947, the Humble Company has also established one fellowship in chemistry and one in physics carrying stipends of $1250. No limitation is placed on the nature of the research carried on by these two fellows.

SOCONY-VACUUM FELLOWSHIP

The Socony-Vacuum Oil Company has established at the Rice Institute a fellowship for research work in the general field of physics of the liquid and solid state. This fellowship carries a stipend of $1500 per year, and is awarded to a graduate student who has completed one or more years of graduate work in physics.

PROCTER AND GAMBLE FELLOWSHIP IN CHEMISTRY

The Procter and Gamble Company has established a fellowship in chemistry, the stipend of which will be based on the previous training of the fellow.

SHELL FELLOWSHIP IN CHEMICAL ENGINEERING

The Shell Fellowship Committee has established at the Rice Institute a Shell Fellowship in Chemical Engineering. The stipend of this fellowship is $1200 and its award is subject to the final approval of the Shell Fellowship Committee.
RICE INSTITUTE FELLOWSHIPS

The Rice Institute provides a number of fellowships for graduate students which carry stipends up to $1000 per year and exemption from all fees. A graduate fellow is expected to do a small amount of teaching, which provides him valuable training both in the subject matter of his specialty and in preparation for an academic career. Students holding fellowships ordinarily plan to spend a minimum of four years preparing for the degree of Doctor of Philosophy.

ASSISTANTSHIPS

A certain number of persons with outstanding qualifications may be appointed as assistants in the various departments of the Rice Institute. These assistants will be expected to carry a teaching load comparable with and, in general, somewhat less than that carried by instructors, but they will be permitted to work toward an advanced degree. In general, assistants will be able to do only about half-time graduate study.

Persons interested in being considered for appointment as assistants should communicate with one of the professors in the department concerned.
GRADUATE WORK IN MATHEMATICS

Professors: H. E. Bray, S. Mandelbrojt
Associate Professors: J. W. Calkin, F. E. Ulrich
Instructor: H. D. Brunk

The Rice Institute has always placed great emphasis on the study of mathematics, and has acquired a very complete mathematical library including all the important mathematical journals.

Admission to graduate study in mathematics will be granted to a limited number of students who have earned the bachelor's degree from the Rice Institute, or another institution of similar standing, and whose undergraduate work in mathematics is such as to indicate the ability for advanced and original work. Those students who have completed a large amount of undergraduate mathematics and who devote full time to graduate study may earn the degree of Master of Arts in one year. The minimum time required by candidates for the degree of Doctor of Philosophy is three years. It is to be expected that most students will require longer than the minimum time, particularly holders of fellowships that call for a small amount of teaching.

For the master's degree, the requirements are:
(a) The completion with high standing of at least three advanced courses.
(b) The presentation of a written thesis on a subject approved by the department.
(c) The passing of an oral examination given by the faculty.

For the doctor's degree, the requirements are:
(a) The completion with high standing of at least six advanced courses.
(b) The presentation of a written thesis on a subject approved by the department. The purpose of the doctor's thesis is to demonstrate the candidate's ability to make an original contribution to a field of mathematics in which he has become expert.
This is a more extensive and advanced type of study than that required for the master's degree, and is expected to reveal definite originality and inventiveness, and to be suitable for publication.

(c) The passing of an oral examination given by the faculty.

In order that they may obtain adequate experience in collegiate teaching, students holding fellowships are assigned a moderate schedule of regular teaching duties in the department. These duties usually consist of the instruction of one or two small sections in courses of elementary or intermediate character, and constitute an important part of the training for a teaching career.

Courses in Mathematics

Among courses which have been offered in recent years, and which may be offered in more or less modified form from time to time in the very near future, are the following:

Mathematics 310. *Advanced Calculus and Differential Equations.* This course is primarily for undergraduates, especially Juniors who have considerable facility in mathematical reasoning. It may be taken by graduate students of other departments. Three lectures per week.

*Mr. Calkin*

Mathematics 400. *Theory of Functions of a Complex Variable.* This course is fundamental in analysis. Besides giving an introduction to basic concepts of analysis, it includes the study of analytic functions of a complex variable, the Cauchy-Riemann equations, Cauchy's Integral Theorem, Taylor's series, calculus of residues, and conformal mapping. Three lectures per week.

*Mr. Ulrich*

Mathematics 410. *Differential Geometry.* The properties of general classes of curves and surfaces, the area of a surface, the problem of Plateau. Three lectures per week.

*(Not offered in 1947–48)*

Mathematics 420. *Infinite Processes.* Sequences, series, Stieltjes integrals, summability, and related topics. Three lectures per week.

*Mr. Brunk*
Mathematics 430. *Modern Geometry.* Synthetic and algebraic geometry, theory of groups, invariants, etc. Three lectures per week.

(Not offered in 1947-48)

Mathematics 440. *Differential Equations and Introduction to the Calculus of Variations.* Three lectures per week.

(Not offered in 1947-48)


*Mr. Bray*


*Mr. Bray*

Mathematics 530. *Laplace Transforms.* Applications to the solution of differential systems. Three lectures per week.

*Mr. Ulrich*

Mathematics 540. *Introduction to Modern Algebra.* The purpose of this course is to provide the student with a knowledge of the foundations of modern algebra. The topics to be presented will include the theory of sets, groups, rings and fields, Galois theory, polynomials, algebraic numbers and ideals. The course will be open to graduate students and, with the consent of the instructor, to well-qualified Seniors. Three lectures per week.
Mathematics 540b. Topics selected from Mathematics 540 covering a half-year's work. Three lectures per week during the second half-year.

(Not offered in 1947-48)


Mr. Ulrich


Mr. Mandelbrojt


(Not offered in 1947-48)


Mr. Brunk


Mr. Calkin

(Not offered in 1947–48)

Mathematical Colloquium. The colloquium usually meets one afternoon every other week in order to allow the exposition of original investigations by its members.

Besides the courses listed above, others will be given from time to time to fit the needs of students. Reading courses are also offered in other fields of analysis in connection with research.
GRADUATE WORK IN PHYSICS

Professor Emeritus: H. A. Wilson
Professors: T. W. Bonner, C. W. Heaps, W. V. Houston
Assistant Professors: J. R. Risser, C. F. Squire

A minimum of one year of graduate study is required for the degree of Master of Arts and at least two more years for the degree of Doctor of Philosophy. To be recommended for the degree of Doctor of Philosophy, a student must present an original thesis describing the results of his experimental or theoretical research in form suitable for publication. He must also attend a sufficient number of courses to acquire a broad fundamental knowledge of physics in addition to his research specialization. His mastery in the field of physics will be tested by an oral examination given by the faculty.

The research done in the department has included work on the following subjects among others:

1. Electrical conductivity of flames.
2. Electrical conductivity of gases at low pressure.
3. Thermionics.
4. Magnetic properties of iron and other materials.
5. Cosmic rays.
7. Energies of β and γ rays.
8. Variation of e/m for electrons with velocity.
10. Scattering of neutrons by different elements.
11. Nuclear energy levels.
12. Hall effect in metals and gases.

At present experimental research in nuclear reactions, neutrons, γ rays, and separation of isotopes is in progress, besides theoretical work. Preparation for work on superconductivity at very low temperatures is in progress.

The physics laboratories contain ten rooms suitable for research, several of which are large enough for more than one man to work in. There is a well-equipped workshop in which three instrument
makers are employed, and another workshop for graduate students. One of the instrument makers is a skilled glassblower.

Two small research rooms are air-conditioned and can be kept at nearly constant temperature.

The research equipment includes a Van de Graaff machine, giving over two million volts, and a Cockcroft and Walton voltage doubler, giving two hundred thousand volts, for work on nuclear reactions. The Van de Graaff machine is in a separate air-conditioned building. Automatic expansion chambers for photographing particle tracks in gases, and a specially-designed microscope for measuring tracks in photographic plates, are available. Geiger counters, coincidence counters, electroscopes, and other equipment for nuclear research are provided.

The department has a large electromagnet, the current for which is supplied by a 25 kw. generator, and a large cobalt steel permanent magnet with poles 15 cms. in diameter.

The research rooms are supplied with three-phase a.c. at 110 volts, and with d.c. from two batteries, one of 300 ampere hours capacity, giving up to 120 volts, and also from two 10 kw. d.c. generators. Gas, water, and compressed air are also available.

Cathode-ray oscillographs, oscillators, amplifiers, power supplies, and klystrons and magnetrons are available for research on electronics and high-frequency electromagnetic waves.

The optical equipment includes a large Michelson echelon and several interferometers, a large quartz spectrograph, a spectrophotometer, an infrared spectrometer, an ultraviolet spectrometer, and several wave-length spectrometers. There are several dark-rooms in the laboratory. Equipment for work on X rays is also available.

A sound-level meter, a sound analyzer, and quartz plate oscillators are available for work on sound and supersonics.

The library is especially well equipped with a very complete file of periodicals.
Courses in Physics

Two or more of the following courses for graduate students will be given each year.


Physics 510. *Electricity in Gases, X Rays, and Crystal Structure.* Two lectures per week.

Physics 520. *Principles of Quantum Mechanics.* A deductive presentation of the principles of quantum mechanics with some illustrative applications. Two lectures per week.

Physics 530. *Statistical Mechanics and General Dynamics.* Two lectures per week.

Physics 540. *Nuclear Physics.* Two lectures per week.


Physics 560. *Structure of Solids.* Two lectures per week.


Physics 580. *Low-temperature Physics.* Two lectures per week.

A number of courses for graduate students are also offered by the department of mathematics and may be attended by graduate students in physics.

A physics colloquium meets once a week at which original papers and reports on published work are given by members of the faculty and graduate students.
A student who has completed a course for the degree of Bachelor of Arts may be admitted as a candidate for the degree of Master of Arts or of Doctor of Philosophy.

A candidate for the degree of Master of Arts must elect a principal subject and arrange a schedule which represents the equivalent of four advanced courses to be passed with high credit. The work shall consist of (a) personal investigation, the results of which must be submitted as a thesis; (b) at least two advanced courses, one of which must be a graduate course in the principal subject. In addition, the candidate for the master's degree is required to pass a public oral examination.

Preparation for the degree of Doctor of Philosophy involves at least three years of graduate work. Candidates for the degree must submit a thesis and pass a public oral examination. The thesis must present a distinctly original contribution to the subject. It should be acceptable for publication in an accredited journal or series, and a copy deposited in the Institute library.

In addition to the general requirements outlined above, the following specific requirements must be met by candidates for advanced degrees taking their major work in chemistry:

For admission to full graduate standing, candidates for advanced degrees must have completed general courses equivalent to those of the Rice Institute in Inorganic Chemistry and Qualitative Analysis, Quantitative Analysis, Organic Chemistry, and Physical Chemistry, and at least one full-year course of more advanced work equivalent to corresponding Senior work in chemistry of the Rice Institute.
A candidate for the degree of Master of Arts is required to complete, in addition to a thesis, two full-year courses in chemistry, one of which must be a 500 course; and one approved 300 or 400 course in mathematics, physics, or biology. The first week in May of the last year of residence, the candidate will be given three-hour written examinations in general chemistry and organic chemistry, and must pass also a final public oral examination.

A candidate for the degree of Doctor of Philosophy is required to complete, in addition to a thesis, a minimum of four full-year graduate courses in chemistry, and one advanced course in mathematics, physics, or biology. He must satisfy the members of the staff under whom he is working that he possesses a reading knowledge of scientific French and German. The first week in May of the last year of residence, the candidate will be given comprehensive written examinations covering the main branches of chemistry, with special emphasis on the branch in which the candidate is working, and in addition must pass a final public oral examination.

For admission to Chemistry 600 (Thesis), a graduate student must satisfactorily pass comprehensive qualifying examinations covering inorganic, analytical, organic, and physical chemistry, and scientific German. These examinations will be given at the beginning of the academic year before October first.

Courses in Chemistry

Chemistry 410. Colloid Chemistry. Three lectures and four hours of laboratory work weekly during the first half-year. An introductory course dealing with the theories of colloid chemistry and their applications. Prerequisites: Organic Chemistry and Physical Chemistry.

Mr. Weiser

Chemistry 420. Advanced Physical Chemistry. Two lectures and one conference on problems weekly during the second half-year. Structure of matter, methods in physical chemistry, phase rule, X-ray and electron diffraction analysis, electro- and optical methods.

Mr. Milligan
Chemistry 430. *Advanced Inorganic Qualitative Analysis.* Two lectures and four hours of laboratory work weekly during the second half-year. The course includes the application of organic reagents for the identification of metallic ions, and a study of the detection of some of the less familiar elements. Prerequisite: Physical Chemistry.

*Mr. Nicholas*

Chemistry 440. *Advanced Organic Chemistry and Qualitative Analysis.* Two lectures and six hours of laboratory work weekly during the second half-year. This course embodies a systematic procedure for the separation and identification of pure organic compounds. It aims to review, by actual laboratory contact, the important reactions of the main series of organic substances.

*Mr. Richter*

Chemistry 450. *Advanced Quantitative Analysis.* Two lectures and six hours of laboratory work weekly during the first half-year. A study of advanced topics in quantitative analysis with emphasis on recent methods. The laboratory work includes examples of the types of analyses covered in the lectures. Prerequisites: Organic Chemistry and Physical Chemistry.

(Not offered in 1947-48)

Chemistry 480. *Chemical Literature.* One lecture weekly during the first half-year. The course is devoted to a study of the arrangement of chemical literature and its use in industrial and research work. A topic will be assigned to each student every week for a thorough library investigation.

*Mr. Richter*

Chemical Engineering 405. *Unit Operations.* Three lectures and six hours of laboratory work weekly. This course deals with the principles upon which the mechanical operations involved in the chemical manufacturing industries depend, and with the types of equipment available for such operations and the kind of work for which each is best adapted. The application of the principles is illustrated both by discussion in the classroom and by the solution of typical problems. Among the subjects considered are: heat transmission; evaporation; humidification and dehumidification;
GRADUATE WORK IN CHEMISTRY

air conditioning; drying; distillation and fractionation; filtration; absorption and adsorption; extraction; crystallization; crushing; grinding; separation; agitation; transportation of solids, liquids, and gases; water softening; corrosion and water treatment for boiler use; pyrometry; etc. The laboratory work consists of experimental studies of the various types of unit operations equipment from the standpoint of operation, testing, and theory. Prerequisite: Junior Chemical Engineering.

Mr. Hartsook

Chemical Engineering 425a. Chemical Engineering Thermodynamics. Three hours of lectures weekly during the first half-year. A course in theoretical and applied thermodynamics. Prerequisite: Physical Chemistry.

Mr. Garrison

Chemical Engineering 425b. Chemical Engineering Thermodynamics. Three hours of lectures weekly during the second half-year. A continuation of theoretical and applied thermodynamics. Prerequisite: Chemical Engineering 425a.

Mr. Garrison

Chemistry 500. M.A. Thesis. The program of the department permits a student to take the degree of Master of Arts after the successful completion of one or two years of graduate work. Students who elect to take the degree of Master of Arts are required to prepare a thesis, under the direction of some member of the staff of instruction.

Chemistry 510. Adsorption. Three lectures or conferences weekly during the second half-year. A course in advanced colloid chemistry dealing with the nature and mechanism of adsorption and its relation to such phenomena, among others, as the stability of colloidal systems and contact catalysis.

Mr. Weiser

Chemistry 520. Theory of Valence. Three lectures weekly during the second half-year. A consideration of inter-atomic forces and their relationship to the structure and properties of matter. (Alternates with Chemistry 530.)

Mr. Smith (Not offered in 1947-48)
Chemistry 530. *Heterogeneous Equilibrium.* Two lectures weekly during the second half-year. A study of the problems of heterogeneous equilibrium from the standpoint of the phase rule. (Alternates with Chemistry 520.)  

*Mrs. Smith*

Chemistry 540. *Advanced Organic Chemistry.* Two lectures weekly during the first half-year. A consideration of some of the theoretical aspects of organic chemistry with particular reference to such topics, among others, as tautomerism, geometrical and optical isomerism, and the chemistry of carbohydrates. (Alternates with Chemistry 560.)  

*Mrs. Richter* (Not offered in 1947-48)

Chemistry 545. *Advanced Organic Chemistry.* Two lectures weekly during the first half-year. A consideration of the theoretical aspects of organic chemistry with special reference to reactions and reaction mechanisms.  

*Mrs. Fuson*

Chemistry 550. *Microchemical Analysis.* One lecture and six hours of laboratory work weekly during the first half-year. A course in quantitative micro-analysis based on the procedures of Fritz Pregl. Prerequisite: Chemistry 440.  

*Mrs. Richter*

Chemistry 560. *Advanced Physiological Chemistry.* Two lectures weekly during the first half-year. The course is open only to graduate students who have some knowledge of the fundamentals of physiological chemistry. The course deals with the chemistry of blood, respiration, urine, energy metabolism, and the endocrines. (Alternates with Chemistry 540.)  

*Mrs. Nicholas*

Chemistry 600. *Ph.D. Thesis.* Graduate students who are working toward the Ph.D. degree in chemistry are expected to elect at least twelve hours a week in research under the direction of some member of the staff of instruction. Prerequisite: Satisfactory completion of qualifying examinations.  

inorganic and colloid chemistry. Identification of solid phases, determination of particle size, X-ray analysis of simple types of structures, electron diffraction, and principles and operation of modern X-ray apparatus.

Mr. Milligan

Chemistry 620. Advanced Inorganic Chemistry. Two lectures weekly and a seminar fortnightly. A study of the chemical elements and their compounds from the standpoint of the periodic law. Modern developments in inorganic chemistry will receive special attention.

Mr. Smith (Not offered in 1947-48)

Chemistry 640. Heterocyclic Chemistry. Two lectures weekly. A consideration of the chemistry of heterocyclic systems.

Mr. Richter
GRADUATE WORK IN BIOLOGY

Professor: A. C. Chandler
Assistant Professors: E. Altenburg, J. I. Davies
Instructor: R. V. Talmage

Graduate work in biology is offered in the special fields of interest of the faculty members, including parasitology, medical entomology, some phases of protozoology and bacteriology, immunology, and genetics.

The department is well equipped with the usual apparatus and supplies for work in general biology, physiology, bacteriology, and microscopic technique, and is prepared to obtain reasonable quantities of special apparatus or supplies which may be needed in connection with particular research problems. The library is well supplied with books and periodicals in the subjects mentioned above, and will make efforts to obtain additional material that may be needed in connection with research problems under investigation.

The biology department is a comprehensive one, embracing general biology, zoology, physiology, embryology, genetics, parasitology, bacteriology, and immunology. No botany is offered except a little that is given in the beginning course in general biology. It has been the policy of the Rice Institute to try to do a few things well, rather than to spread its efforts too thinly over too many fields of interest. Upper-class courses are given in alternate years in order to give the students a wider range of subjects.

There are no formal graduate courses, but special courses in a wide range of subjects are arranged for graduate students to fit their particular needs. Under the direction and supervision of members of the department, the student is given weekly assignments in library, laboratory, or field work, as the subject may require. Such courses have been given in the past in medical entomology, general entomology, helminthology, protozoology, invertebrate zoology, ichthyology, herpetology, ornithology, endocrinology, and others. Such courses are usually based on eight semester hours a year as in the case of the regularly scheduled laboratory science courses.
About three hours of laboratory or field work counts as the equivalent of one hour of lecture, recitation, or library work.

The research is done on the same basis, some students taking the equivalent of one, some of two, eight-semester-hour courses, according to the time put in. Most students take advanced courses in the chemistry department also, and sometimes in other departments.

As a rule only graduate students planning to work for the degree of Doctor of Philosophy are accepted, although a degree of Master of Arts is usually given as a preliminary. In this department only research master's degrees are given since neither time nor space is available for the teacher's master's degree, consisting of a year of advanced study in a specialized field, as given by some universities.

For students who are doing part-time assisting on a fellowship, a minimum of two years is required for the master's degree and a total of four years for the doctor's degree. In their assisting work, as far as it is feasible, fellows are permitted to assist with different courses in different years to obtain as much teaching background as possible.
GRADUATE WORK IN THE HUMANITIES

Students who hold the degree of Bachelor of Arts and who give evidence of their qualifications to the satisfaction of the department concerned and the Committee on Graduate Instruction may be admitted to candidacy for the degree of Master of Arts in the following fields: English, German, history, philosophy, Romance languages. These departments, while not organized for graduate work on the doctoral level, are in a position to direct well-qualified students in the earlier stages of graduate study. Library facilities in these fields are adequate for research of considerable range and variety. A limited number of fellowships are available for students of marked promise.

A minimum of one year of graduate study is required for the degree of Master of Arts. A candidate for this degree must elect a principal subject and arrange a schedule which represents the equivalent of four advanced courses, to be passed with high credit. The work shall consist of (a) personal investigation, the results of which must be submitted as a thesis; (b) at least two advanced courses, one of which must be a graduate course in the principal subject. The candidate must also pass a public oral examination given by the faculty. In addition to the general requirements here outlined, other specific requirements may be imposed by the various departments.
GRADUATE WORK IN ENGINEERING

During 1947-48 the Rice Institute will offer first-year graduate instruction to its own graduates of superior standing who hold the degree of Bachelor of Science in Chemical Engineering or Bachelor of Science in Electrical Engineering, or to similar graduates of other recognized institutions having equivalent requirements for the Bachelor of Science degree.

Satisfactory completion of the courses listed and described below will lead to the degree of Master of Science in the branch of engineering selected. Attention is invited to the requirement for a comprehensive thesis.

Courses leading to the degree of Master of Science in Civil Engineering or Master of Science in Mechanical Engineering and those leading to professional degrees in the several branches of engineering, although not offered in 1947-48, are expected to be given at an early date and will be included in the Graduate Announcements for succeeding years.

For permission to register, those interested should apply to the Registrar not later than August 15.

Requirements for the Degree of M.S. in Ch.E.

(1) Advanced Topics in Chemical Engineering (Ch.E. 505)
(2) Research and Thesis (Ch.E. 575)
(3) Elective (an advanced course in chemistry, chemical engineering, physics, or mathematics)
(4) Approved engineering elective
(5) Seminar (Ch.E. 485)

Requirements for the Degree of M.S. in E.E.

(1) Advanced Circuit Analysis (E.E. 500)
(2) Research and Thesis (E.E. 510)
(3) Advanced Electrical Power Engineering (E.E. 520), or Advanced Communications Engineering (E.E. 540)
(4) Approved elective (an advanced course in physics, mathematics, or engineering)

(5) Approved elective

**Courses in Engineering**

**Chemical Engineering 485. Seminar.** One hour weekly during the second half-year. A course for training chemical engineering students in the preparation and oral presentation of formal papers and discussions on topics of engineering interest. The papers and discussions are given by the students, using acceptable material secured from technical publications. This course is required of all chemical engineers.

**Chemical Engineering 505. Advanced Topics in Chemical Engineering.** Three lectures weekly on advanced topics in chemical engineering such as advanced unit operations and plant design, petroleum refining, pulp and paper industries, graphical methods of problem solution, plastics, water treatment, and corrosion. Prerequisite: Chemical Engineering 405. (See page 36.)

*Mr. Hartsook*

**Chemical Engineering 575. Research and Thesis.** At least nine hours of work weekly under the direction of a member of the staff on a problem of chemical engineering importance.

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**Electrical Engineering 500. Advanced Circuit Analysis.** Non-linear circuits; three- and four-winding transformer theory; transmission networks; machine and circuit transients; transient stability; Heaviside’s operational calculus. Three lectures and three hours of laboratory work weekly.

*Mr. McEnany*

**Electrical Engineering 510. Thesis.** A thorough report on an electrical engineering investigation selected and carried out by the individual student. Two copies of the accepted report will be required for deposit in the Institute library. Nine hours of research weekly.

*Mr. Waters*
Electrical Engineering 520. *Advanced Electrical Power Engineering*. Power plants and substations; transmission and distribution systems; illumination; industrial electronics. Three lectures and three hours of laboratory work weekly.

*Mr. Pfeiffer*

Electrical Engineering 540. *Advanced Communications Engineering*. Electromagnetic theory and wave propagation; microwaves; electro-acoustical systems. Three lectures and three hours of laboratory work weekly.

*Mr. Wischmeyer*
GRADUATE WORK IN ARCHITECTURE

Students who hold the degree of Bachelor of Science in Architecture and who give evidence of their qualifications to the satisfaction of the department of architecture and the Committee on Graduate Instruction may be admitted to candidacy for the degree of Master in Architecture. A minimum of one year of graduate study is required for the master’s degree when the candidate already has completed five years’ work in a recognized school of architecture, and has received his degree with a record of high scholarship. The candidate must have had at least two years of college work in a foreign language, preferably French. Candidates whose preparation has been limited to four years will be required to take two years of graduate work to reach their master’s degree.

The candidate for the master’s degree shall take the equivalent of four graduate courses which shall consist of (a) personal investigation, the results of which must be submitted as a thesis; (b) at least two advanced courses, one of which must be a graduate course in architecture. The candidate must pass a public oral examination given by the faculty. The candidate may elect as his major work Architecture 600, 610, or 630. Should he elect the field of history or the field of construction, there will be required in either course a minimum of fifteen hours of drawing and research.

Courses in Architecture

Architecture 600. Postgraduate Design. A course for students who have received the degree of Bachelor of Science in Architecture. Advanced study and research in architectural design or city planning. The subject of study for the thesis shall be chosen with the approval of the faculty, and a written thesis presenting the results of the study will be required. Three hours of conference, fifteen hours of drawing and research.

Messrs. DeZurko, Dunaway, and Watkin
Architecture 610. Postgraduate Architectural History. A course for students who have received the degree of Bachelor of Science in Architecture. An advanced course of study and research in the field of architectural history. Three hours of conference, six hours of research.

Messrs. Chillman and DeZurko

Architecture 630. Postgraduate Construction. A course for students who have received the degree of Bachelor of Science in Architecture. An advanced course of study in the field of architectural construction. Three hours of conference, nine hours of drawing and research.

Messrs. Dunaway and Morehead
### Doctors of Philosophy of the Rice Institute

<table>
<thead>
<tr>
<th>Year</th>
<th>Name</th>
<th>Department</th>
<th>Thesis/Research</th>
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</thead>
<tbody>
<tr>
<td>1918</td>
<td>Hubert Evelyn Bray</td>
<td>Mathematics</td>
<td>A Green's theorem in terms of Lebesgue integrals.</td>
</tr>
<tr>
<td>1919</td>
<td>Jacob Leighty Sherrick</td>
<td>Chemistry</td>
<td>Adsorption by precipitates.</td>
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<tr>
<td>1920</td>
<td>Norman Hurd Ricker</td>
<td>Physics</td>
<td>The luminosity of mercury vapor distilled from the arc in vacuo.</td>
</tr>
<tr>
<td>1921</td>
<td>Allen Darnaby Garrison</td>
<td>Chemistry</td>
<td>The oxidation and luminescence of phosphorus.</td>
</tr>
<tr>
<td>1922</td>
<td>Andrew Bonnell Bryan</td>
<td>Physics</td>
<td>I. Dielectric losses at radio frequencies in liquid dielectrics. II. The electrical properties of flames containing salt vapors for high frequency alternating currents. III. The conductivity of flames for rapidly alternating currents.</td>
</tr>
<tr>
<td>1924</td>
<td>Aristotle Michal</td>
<td>Mathematics</td>
<td>Integro-differential expressions invariant under Volterra's group of transformations.</td>
</tr>
<tr>
<td>1925</td>
<td>Gaylord Johnson</td>
<td>Chemistry</td>
<td>The preparation and chemical properties of the propinyl halides.</td>
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<td></td>
<td>Alfred Joseph Maria</td>
<td>Mathematics</td>
<td>Functions of plurisegments.</td>
</tr>
<tr>
<td>1926</td>
<td>Charles Frederick Roos</td>
<td>Mathematics</td>
<td>I. A mathematical theory of competition. II. Generalized Lagrange problems.</td>
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<tr>
<td>1927</td>
<td>Everett Ellis Porter</td>
<td>Chemistry</td>
<td>The physical chemistry of color lake formation.</td>
</tr>
<tr>
<td>1928</td>
<td>Paul Edward Boucher</td>
<td>Physics</td>
<td>I. The drop of potential at the cathode in flames. II. The measurement of the resonance, radiation, and ionization potentials of several gases and vapors. III. The mobility of negative ions in gasoline, hydrogen, and hydrogen-chlorine flames.</td>
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<tr>
<td></td>
<td>Geoffrey Everett Cunningham</td>
<td>Chemistry</td>
<td>Adsorption of ions and the physical character of precipitates.</td>
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<tr>
<td></td>
<td>John Jay Gergen</td>
<td>Mathematics</td>
<td>I. Quelques théorèmes sur les séries de Taylor. II. On generalized lacunae. III. On Taylor's series admitting the circle of convergence as a singular...</td>
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DOCTORS OF PHILOSOPHY

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<thead>
<tr>
<th>Year</th>
<th>Name</th>
<th>Department</th>
<th>Title</th>
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<tbody>
<tr>
<td>1929</td>
<td>Nat Edmonson, Jr.</td>
<td>Mathematics</td>
<td>Poisson's integral and plurisegments on the hypersphere.</td>
</tr>
<tr>
<td></td>
<td>Deborah May Hickey</td>
<td>Mathematics</td>
<td>A three-dimensional treatment of groups of linear transformations.</td>
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<tr>
<td></td>
<td>Edward Roy Cecil Miles</td>
<td>Mathematics</td>
<td>I. Boundary value problems for potentials of a single layer (Plane).</td>
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<td></td>
<td>II. Potentials of general masses in single and double layers.</td>
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<td></td>
<td></td>
<td></td>
<td>The relative boundary value problems.</td>
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<tr>
<td></td>
<td>Ray Nelson Haskell</td>
<td>Mathematics</td>
<td>The mixed problem for harmonic functions with discontinuous boundary conditions.</td>
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<tr>
<td></td>
<td>Clyde Roland Johnson</td>
<td>Chemistry</td>
<td>The atomic weights of chlorine and vanadium.</td>
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<td></td>
<td>Charles Hewitt Dix</td>
<td>Mathematics</td>
<td>Lattice regions and their application in dynamics.</td>
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<td></td>
<td>II. Seismic propagation paths. III. Paths of seismic waves. IV. Comparison of two methods for the interpretation of seismic time-distance graphs which are smooth curves. V. Velocity of explosion-generated longitudinal waves in a nepheline syenite.</td>
</tr>
<tr>
<td></td>
<td>Paul Duane Harwood</td>
<td>Biology</td>
<td>The helminths parasitic in the Amphibia and Reptilia of Houston, Texas, and vicinity.</td>
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<tr>
<td></td>
<td>William Monroe Rust, Jr.</td>
<td>Mathematics</td>
<td>Integral equations and the cooling problem for several media.</td>
</tr>
<tr>
<td>1932</td>
<td>Henry Eugene Banta</td>
<td>Physics</td>
<td>Some thermo- and galvanomagnetic properties of a bismuth crystal.</td>
</tr>
</tbody>
</table>
|      | Gordon Lee Locher             | Physics          | I. The compound photoelectric effect of X-rays in light elements. II. Attempts to induce radioactivity in matter. III. A photoelectric Geiger-
<table>
<thead>
<tr>
<th>Year</th>
<th>Name</th>
<th>Department</th>
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<tr>
<td>1933</td>
<td>John Henry Binney</td>
<td>Mathematics</td>
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<tr>
<td></td>
<td>Müller counter. IV. A large reciprocating C.T.R. Wilson cloud expansion apparatus. V. The time intervals between the appearance of spectral lines in the spectra of alkali and alkaline-earth metals. VI. Luminosity of flames containing sodium vapor. VII. A line-conic camera. VIII. New experiment bearing on cosmic-ray phenomena. IX. Cosmic-ray particles.</td>
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<tr>
<td>1934</td>
<td>Tom Wilkerson Bonner</td>
<td>Physics</td>
</tr>
<tr>
<td></td>
<td>I. Collisions of neutrons with atomic nuclei. II. The energy distribution of the neutrons from fluorine. III. The energy distribution of neutrons from boron. IV. Emission of neutrons from fluorine and beryllium. V. Ionization of gases by neutrons. VI. Dependence of the absorption of neutrons on their velocity. VII. Luminosity of a flame containing sodium vapor.</td>
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<td></td>
<td>George Robert Gray</td>
<td>Chemistry</td>
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<tr>
<td></td>
<td>Hydrogen ion displacement during the coagulation of arsenic trisulfide sol and sulfur sol.</td>
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<td></td>
<td>Homer Clarence Matthes</td>
<td>Biology</td>
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<tr>
<td></td>
<td>A study of the seasonal distribution of Anopheles in Houston, Texas.</td>
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<td></td>
<td>Winfred O. Milligan</td>
<td>Chemistry</td>
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<td></td>
<td>X-ray studies on the hydrous oxides.</td>
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<td></td>
<td>Frances Douglas Ward</td>
<td>Biology</td>
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<tr>
<td></td>
<td>The production of mutations in <em>Drosophila melanogaster</em> by irradiation with alpha-rays.</td>
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<tr>
<td>1935</td>
<td>Paul Livingston Burlingame</td>
<td>Biology</td>
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<tr>
<td></td>
<td>On the environmental nature of resistance in the albino rat to single and superimposed infestations with an acanthocephalan (<em>Moniliformis moniliformis</em>).</td>
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<td></td>
<td>George Alvin Garrett</td>
<td>Mathematics</td>
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<tr>
<td></td>
<td>Necessary and sufficient conditions for potentials of single and double layers</td>
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<td>John Tom Hurt</td>
<td>Mathematics</td>
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<td></td>
<td>On the uniformly bounded turning of level curves of the Green’s function.</td>
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<td>William Grosvenor Pollard</td>
<td>Physics</td>
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<tr>
<td></td>
<td>I. Theory of the beta-ray type of radioactive disintegration. II. Energy distribution in cosmic rays.</td>
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<tr>
<td>Year</td>
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<td></td>
<td>James Henry Sawyer, Jr.</td>
<td>Physics</td>
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<tr>
<td></td>
<td>I. Shower-producing cosmic rays. II. The secondary and tertiary particles produced by cosmic rays.</td>
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<td></td>
<td>Frederic Allen Scott</td>
<td>Physics</td>
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<td></td>
<td>I. Energy spectrum of the β-rays of radium E. II. Double-valued characteristic of a direct current feed-back amplifier. III. Automatic neutralization of the variable grid bias in a direct current feed-back amplifier. IV. Measurement of the energy of a β-ray of radium B.</td>
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<tr>
<td></td>
<td>Millard Seals Taggart</td>
<td>Chemistry</td>
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<tr>
<td></td>
<td>I. Synthesis of pyrrole alcohols and their derivatives. II. Constitution of the sapogenine of the sapogenin of white soaproot.</td>
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<tr>
<td>1936</td>
<td>Joseph Williams Hahn</td>
<td>Mathematics</td>
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<tr>
<td></td>
<td>Projective transformations in two complex variables.</td>
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<td></td>
<td>Hughes Mead Zenor</td>
<td>Physics</td>
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<tr>
<td></td>
<td>I. The cooling of a surface, due to photoelectric emission. II. A search for induced radioactivity produced by cosmic rays. III. A pseudo-example of the conservation of angular momentum. IV. Pascal's law in fluids in radial fields of force. V. Photoelectric emission from cadmium and mercury. VI. Photoelectric emission from cadmium films. VII. Acoustics of the fine arts auditorium of the University of Oklahoma.</td>
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<tr>
<td>1937</td>
<td>Joseph Ilott Davies</td>
<td>Biology</td>
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<tr>
<td></td>
<td>Studies on the behavior of transplanted ovaries and a suggested hypothesis as to the interrelations of the various cellular elements of the ovary.</td>
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<td></td>
<td>Frank House Hurley, Jr.</td>
<td>Chemistry</td>
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<td>The atomic weight of carbon: the ratio of benzoic chloride to silver.</td>
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<td>Ernest Carlton Kennedy</td>
<td>Mathematics</td>
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<td></td>
<td>Fuchsian groups of genus two.</td>
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<tr>
<td>1938</td>
<td>Walter Tandy Scott</td>
<td>Mathematics</td>
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<tr>
<td></td>
<td>On continued fractions and infinite products.</td>
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<td>1939</td>
<td>William Joseph Coppoc</td>
<td>Chemistry</td>
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<tr>
<td></td>
<td>The constitution of the alleged Thiessen hydrates from isothermal dehydration.</td>
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<td></td>
<td>Julian Frank Evans</td>
<td>Physics</td>
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<td></td>
<td>Examination of additively colored alkali halides for photoelectric Hall effect.</td>
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<td></td>
<td>Eby Nell McElrath</td>
<td>Chemistry</td>
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<td></td>
<td>Studies on the alkylidinoxynaphthalene-carboxylic acid derivatives.</td>
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<td></td>
<td>Edward Preble Offutt, Jr.</td>
<td>Biology</td>
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<td></td>
<td>Studies on the oligodynamic action of silver.</td>
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<td></td>
<td>Fred Terry Rogers, Jr.</td>
<td>Physics</td>
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<tr>
<td></td>
<td>An independent determination of the binding energy of the deuteron.</td>
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<td>Year</td>
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<tr>
<td>1940</td>
<td>Emmett Leroy Hudspeth</td>
<td>Physics</td>
</tr>
<tr>
<td></td>
<td>I. Anomalous scattering of neutrons by helium and the d-d neutron spectrum. II. Electroscope investigation of the anomalous scattering of neutrons by helium. III. Resonances in the disintegration of carbon by deuterons. IV. Observation of $^1H$ and $^2H$ ranges from the disintegration of deuterium by deuterons. V. Low energy neutrons from the deuteron-deuteron reaction.</td>
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<tr>
<td></td>
<td>John Purcell Nash</td>
<td>Mathematics</td>
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<tr>
<td></td>
<td>A class of continuous functions and convergence criteria for their Fourier series.</td>
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<td>Maxwell Ossian Reade</td>
<td>Mathematics</td>
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<tr>
<td></td>
<td>Generalizations to space of the Cauchy and Morera theorems.</td>
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<td></td>
<td>Marguerite Moilliet Rogers</td>
<td>Physics</td>
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<td></td>
<td>A determination of the masses and velocities of three radium B beta-particles.</td>
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<td>Vernon Truett Schuhardt</td>
<td>Biology</td>
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<tr>
<td></td>
<td>Studies of the Falls Creek (Texas) strain of relapsing fever spirochetes.</td>
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<td>1941</td>
<td>James Douglas Bankier</td>
<td>Mathematics</td>
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<tr>
<td></td>
<td>Arithmetical continued fractions.</td>
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<td></td>
<td>John Bertram Bates</td>
<td>Chemistry</td>
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<tr>
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<td>X-ray diffraction studies on heavy metal iron-cyanides.</td>
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<td></td>
<td>James Fred Denton, Jr.</td>
<td>Biology</td>
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<td></td>
<td>Studies on the morphology, taxonomy, and life histories of trematodes of the subfamily Dicrocoeliinae Looss, 1899.</td>
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<td></td>
<td>Henry Francis Dunlap</td>
<td>Physics</td>
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<tr>
<td></td>
<td>The scattering of fast neutrons by lead.</td>
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<td>Price Bush Elkin</td>
<td>Chemistry</td>
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<td></td>
<td>Adsorption studies on clays.</td>
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<td>James Holmes</td>
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<td>The constitution of silica gel.</td>
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<td>A study of the bromination of saturated organic compounds.</td>
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<td>1942</td>
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<td>A study of cracked gasoline and the reaction of bromine with primary aliphatic alcohols.</td>
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<td>Studies on the life history and development of certain Acanthocephala of the order Archiacanthocephala (Meyer, 1931).</td>
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