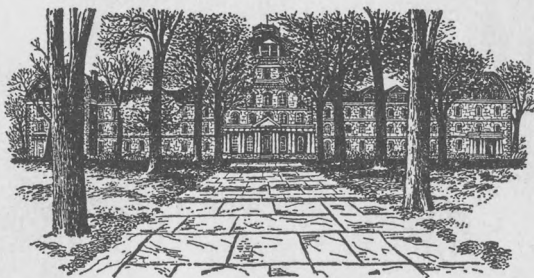


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SWARTHMORE, PENNSYLVANIA

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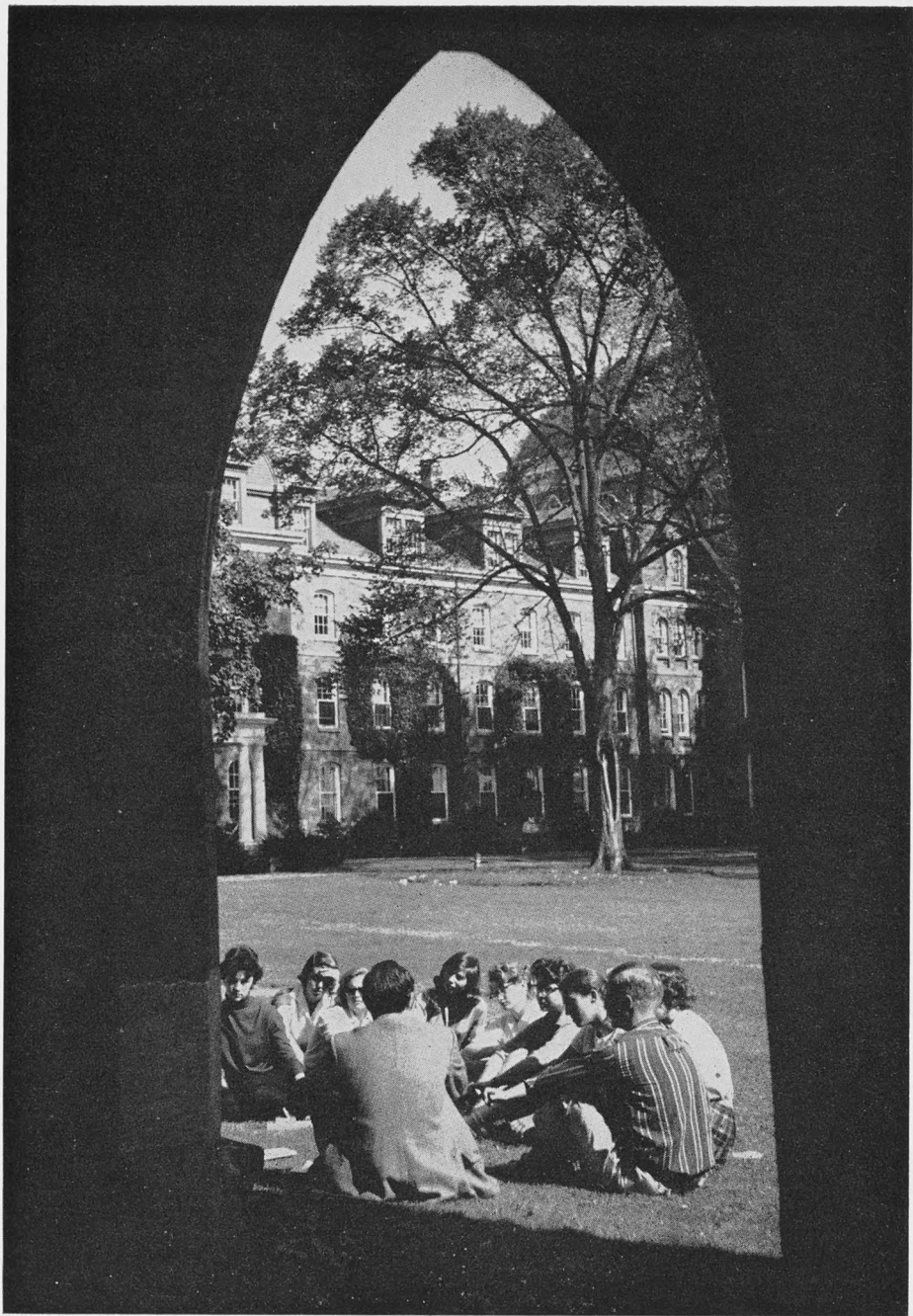
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BULLETIN

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1964-1965

SWARTHMORE, PENNSYLVANIA

Volume LXII

Number 1

September 1964

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Joseph B. Shane, *Vice-President*

GENERAL INFORMATION

Maralyn Orbison Gillespie, *Director of News Office*

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The Rhodes Scholarship Trust maintains an office in this country for the purpose of administering the selection of American Rhodes Scholars and conducting the affairs of the Rhodes Scholarships in the United States. This office was located at Swarthmore College during the presidency of Dr. Frank Aydelotte, who served as the first American Secretary. On the occasion of the appointment of Courtney Smith to the American Secretaryship this office was located in Princeton, N. J., and returned to Swarthmore when Dr. Smith took up his duties as president of the College in September 1953.

American Secretary of the Rhodes Scholarships, Courtney Smith

Deputy Secretary, Gilmore Stott

Secretary, Elsa Palmer Jenkins

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1964

OCTOBER	NOVEMBER	DECEMBER
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College Calendar

1964

Fall Semester

September 16-19	Freshman placement days
September 19	Registration
September 19	Meeting of honors students
September 21	Classes and honors seminars begin
October 6	Meeting of the Board of Managers
November 3	Executive Committee of the Board of Managers
November 26-29	Thanksgiving recess
December 1	Annual Meeting of the Board of Managers
December 19	Christmas recess begins, 12:00 noon

1965

January 4	Christmas recess ends, 8:00 a. m.
January 4-12	Reading period for course students (at the option of the instructor)
January 12	Classes and seminars end
January 13	Meeting of honors students
January 15	Registration for spring semester
January 18	Honors seminars begin for spring semester
January 18	Mid-year examinations begin
January 27	Mid-year examinations end

Spring Semester

February 1	Classes begin
February 2	Executive Committee of the Board of Managers
March 2	Executive Committee of the Board of Managers
March 20	Spring recess begins, 12:00 noon
March 29	Spring recess ends, 8:00 a. m.
April 6	Meeting of the Board of Managers
May 1	Honors seminars end
May 3-15	Reading period for course students (at the option of the instructor)
May 4	Executive Committee of the Board of Managers
May 11	Written honors examinations begin
May 15	Classes end
May 17	Enrollment in classes for fall semester
May 19	Course examinations begin
May 22	Written honors examinations end
May 27-29	Oral honors examinations
May 29	Course examinations end
May 31-June 2	Senior comprehensive examinations
June 4	Meeting of the Board of Managers
June 5	Alumni Day
June 6	Baccalaureate Day
June 7	Commencement Day

College Calendar (Tentative)

1965

Fall Semester

September 15-18	Freshman placement days
September 18	Registration
September 18	Meeting of honors students
September 20	Classes and honors seminars begin
October 5	Meeting of the Board of Managers
November 2	Executive Committee of the Board of Managers
November 25-27	Thanksgiving recess
December 7	Annual Meeting of the Board of Managers
December 18	Christmas recess begins, 12:00 noon.

1966

January 3	Christmas recess ends, 8:00 a. m.
January 3-11	Reading period for course students (at the option of the instructor)
January 11	Classes and seminars end
January 12	Meeting of honors students
January 14	Registration for spring semester
January 17	Honors seminars begin for spring semester
January 17	Mid-year examinations begin
January 26	Mid-year examinations end

Spring Semester

January 31	Classes begin
February 1	Executive Committee of the Board of Managers
March 1	Executive Committee of the Board of Managers
March 19	Spring recess begins, 12:00 noon
March 28	Spring recess ends, 8:00 a. m.
April 5	Meeting of the Board of Managers
April 30	Honors seminars end
May 3	Executive Committee of the Board of Managers
May 2-14	Reading period for course students (at the option of the instructor)
May 10	Written honors examinations begin
May 14	Classes end
May 16	Enrollment in classes for fall semester
May 18	Course examinations begin
May 21	Written honors examinations end
May 26-28	Oral honors examinations
May 28	Course examinations end
May 30-June 1	Senior comprehensive examinations
June 3	Meeting of the Board of Managers
June 4	Alumni Day
June 5	Baccalaureate Day
June 6	Commencement Day

PERSONNEL
OF
SWARTHMORE COLLEGE

The Corporation

- CLAUDE C. SMITH, *Chairman*
1617 Land Title Building, Philadelphia 10, Pa.
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Crumwald Farm, Wallingford, Pa.
- JOSEPH B. SHANE, *Assistant Secretary*
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Provident Traders Bank & Trust Co., 17th and Chestnut Streets,
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Swarthmore College, Swarthmore, Pa.

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Ex officio

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Term Expires December, 1964

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Term Expires December, 1965

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- CARROLL G. BOWEN, 16 Coolidge Ave., Cambridge 38, Mass.
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*JOHN H. LIPPINCOTT, JR., 9 South Osborne Avenue, Margate City, N. J.

Term Expires December, 1967

- CLEMENT M. BIDDLE, 230 Oak Ridge Avenue, Summit, N. J.
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*ISABEL LOGAN LYON, 70 East 90th St., New York, N. Y.

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| JOHN H. LIPPINCOTT, JR. | |

* Nominated by the Alumni Association.

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CLEMENT M. BIDDLE
WILLIAM F. LEE

ELIZABETH CARVER PRESTON
SUE THOMAS TURNER
HELEN GAWTHROP WORTH

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HELEN GAWTHROP WORTH

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1963-1965

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TERM EXPIRES

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- 1966 DOROTHY BOWERS HALLOWELL '26, 809 Montgomery Ave., Fort Washington, Pa.
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 318 Dartmouth Avenue
 B.A. and M.A., University of Cincinnati; B.A. and M.A., Oxford University; M.A. and Ph.D., Princeton University.
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 B.A., Randolph-Macon Woman's College; M.A., New York University; Ph.D., University of Chicago.
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 512 Ogden Avenue
 B.A., Park College; B.D., Union Theological Seminary; M.A., Harvard University; Ph.D., Columbia University.
- ROBERT A. BARR, JR., *Dean of Men* 109 Columbia Avenue
 B.A., Swarthmore College; M.A., University of Pennsylvania.
- BARBARA PEARSON LANGE, *Dean of Women* 1 Crum Ledge
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 317 N. Chester Road
 B.A., Haverford College.
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- FRANK B. WILLIAMS, *Associate Dean of Admissions and Director of Financial Aid*
 221 Haverford Avenue
 B.A. and M.A., Wesleyan University; Ed.D., University of Pennsylvania.

EMERITI

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 B.A., M.A., and Ph.D., Bryn Mawr College.
- LYDIA BAER, *Associate Professor Emeritus of German* Anna Maria Island, Fla.
 B.A., Oberlin College; M.A. and Ph.D., University of Pennsylvania.
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 B.S., Earlham College; M.A., Harvard University; Docteur ès Science, L'Université de Genève, Docteur honoris causa, L'Université de Montpellier; D.Sc., Earlham College.
- HENRY JERMAIN MAUDE CREIGHTON, *Edmund Allen Professor Emeritus of Chemistry*,
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 D.Sc., Das eidgenössische Polytechnikum, Zürich; D.Sc., Swarthmore College.
- ROBERT H. DUNN, *Associate Professor Emeritus of Physical Education for Men*,
 811 Westdale Avenue
 B.S., Temple University.
- DUNCAN GRAHAM FOSTER, *Professor Emeritus of Chemistry* 15 Crest Lane
 B.A. and M.A., Harvard University; Ph.D., Johns Hopkins University.
- PHILIP MARSHALL HICKS, *Alexander Griswold Cummins Professor Emeritus of English Literature* Avondale, Pa.
 B.A. and M.A., Swarthmore College; Ph.D., University of Pennsylvania.
- EVERETT L. HUNT, *Dean Emeritus and Professor Emeritus of English*.
 221 N. Princeton Avenue
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 Dr. Phil., University of Berlin; D.Sc., University of Pennsylvania, University of Chicago, Kenyon College, Swarthmore College.

HAROLD M. MARCH, *Susan W. Lippincott Professor Emeritus of French*
46 Main St., Amherst, Mass.

B.A., Princeton University; Ph.D., Yale University.

EDITH PHILIPS, *Susan W. Lippincott Professor Emeritus of French* 517 Elm Avenue
B.A., Goucher College; Docteur de l'Université de Paris.

L. R. SHERO, *Professor Emeritus of Greek* 651 North Chester Road
B.A., Haverford College; B.A.; Oxford University; M.A. and Ph.D., University
of Wisconsin.

ALFRED J. SWAN, *Professor Emeritus of Music* 773 College Avenue, Haverford, Pa.
B.A. and M.A., Oxford University.

ELIZABETH COX WRIGHT, *Professor Emeritus of English* Rose Valley, Moylan, Pa.
B.A., Wellesley College; M.A. and Ph.D., University of Pennsylvania.

PROFESSORS

SOLOMON E. ASCH, *Professor of Psychology* 513 Elm Avenue
B.S., College of the City of New York; M.A. and Ph.D., Columbia University.

MONROE C. BEARDSLEY, *Professor of Philosophy* 133 Rutgers Avenue
B.A. and Ph.D., Yale University.

GEORGE J. BECKER, *Alexander Griswold Cummins Professor of English*,
401 Walnut Lane
B.A., M.A., and Ph.D., University of Washington.

†PAUL H. BEIK, *Professor of History* 4 Whittier Place
B.A., Union College; M.A. and Ph.D., Columbia University.

HEINRICH BRINKMANN, *Edward Hicks Magill Professor of Mathematics*,
403 Walnut Lane
B.A., Stanford University; M.A. and Ph.D., Harvard University.

SAMUEL T. CARPENTER, *Isaiah V. Williamson Professor of Civil and Mechanical En-
gineering* 612 Ogden Avenue
B.C.E., C.E., and M.S., Ohio State University.

JOSEPH W. CONARD, *Professor of Economics* 217 North Swarthmore Avenue
B.A., Grinnell College; M.A. and Ph.D., University of California.

GEORGES COUTON, *Visiting Professor of French* (Université de Lyon),
521 Elm Avenue
Agrégé-ès-lettres; Docteur-ès-lettres, University of Paris.

W. C. ELMORE, *Morris L. Clothier Professor of Physics* 525 Walnut Lane
B.S., Lehigh University; Ph.D., Yale University.

ROBERT K. ENDERS, *Isaac H. Clothier, Jr. Professor of Biology* 311 Elm Avenue
B.A. and Ph.D., University of Michigan.

JAMES A. FIELD, JR., *Isaac H. Clothier Professor of History* 612 Hillborn Avenue
B.S., M.A. and Ph.D., Harvard University.

‡MILAN W. GARRETT, *Professor of Physics* 336 North Princeton Avenue
B.A. and M.A., Stanford University; B.A. and D.Phil., Oxford University.

HOWARD MALCOLM JENKINS, *Henry C. and J. Archer Turner Professor of Engineering*,
506 North Chester Road
B.A. and E.E., Swarthmore College.

WALTER B. KEIGHTON, JR., *Edmund Allen Professor of Chemistry* 311 Cedar Lane
B.A., Swarthmore College; Ph.D., Princeton University.

FREDRIC KLEES, *Professor of English* 525 Elm Avenue
B.A., Bowdoin College.

LAURENCE D. LAFORE, *Professor of History* 506 Ogden Avenue
B.A., Swarthmore College; M.A. and Ph.D., Fletcher School of Law and Di-
plomacy.

LUZERN G. LIVINGSTON, *Professor of Botany* 15 Dartmouth Circle
B.S., Lawrence College; Ph.D., University of Wisconsin.

‡FRANZ H. MAUTNER, *Professor of German* 408 Walnut Lane
Dr. Phil., Univ. of Vienna.

JOHN D. MCCRUMM, *Howard N. and Ada J. Eavenson Professor of Engineering*,
Palmer Mill Road, R. D. 1, Media, Pa.
B.S. and M.S., University of Colorado.

‡BERNARD MORRILL, *Professor of Mechanical Engineering* 21 Oberlin Avenue
B.S. in M.E., Massachusetts Institute of Technology; M.M.E., University of Dela-
ware; Ph.D., University of Michigan.

‡ Absent on leave, 1964-65.

† Absent on leave, spring semester, 1964-65.

- HELEN F. NORTH, *Professor of Classics* 302 North Chester Road
 B. A., M. A., and Ph.D., Cornell University.
- J. ROLAND PENNOCK, *Richter Professor of Political Science* 3 Whittier Place
 B.A., Swarthmore College; M.A. and Ph.D., Harvard University.
- FRANK C. PIERSON, *Professor of Economics* 740 Ogden Avenue
 B.A., Swarthmore College; Ph.D., Columbia University.
- HEDLEY H. RHYS, *Professor of Fine Arts* 512 Elm Avenue
 B.A., West Virginia University; M.A. and Ph.D., Harvard University.
- JAMES D. SORBER, *Professor of Spanish* 404 Walnut Lane
 B.A., Lehigh University; M.A., University of Nebraska.
- †FREDERICK B. TOLLES, *Howard M. and Charles F. Jenkins Professor of Quaker History
 and Research and Director of the Friends Historical Library* 606 Elm Avenue
 B.A. M.A., and Ph.D., Harvard University; D.Litt., Haverford College.
- PETER VAN DE KAMP, *Professor of Astronomy and Director of Sproul Observatory,*
 602 Elm Avenue
 Cand. and Docts., University of Utrecht; Ph.D., University of California; D.Phil.,
 University of Groningen.
- ROBERT M. WALKER, *Professor of Fine Arts* 212 Elm Avenue
 B.A. and M.F.A., Princeton University; Ph.D., Harvard University.
- HANS WALLACH, *Professor of Psychology* 604 Elm Avenue
 Dr. Phil., University of Berlin.
- KENNETH A. WALTZ, *Professor of Political Science* 11 Benjamin West Avenue
 B.A., Oberlin College; M.A. and Ph.D., Columbia University.
- NEAL A. WEBER, *Professor of Zoology* 1 Whittier Place
 B.A., M.S. and D.Sc., University of North Dakota; M.A. and Ph.D., Harvard
 University.
- CLAIR WILCOX, *Joseph Wharton Professor of Political Economy* 510 Ogden Avenue
 B.S., University of Pennsylvania; M.A., Ohio State University; Ph.D., University
 of Pennsylvania.

ASSOCIATE PROFESSORS

- CARL BARUS, *Associate Professor of Electrical Engineering* 8 Whittier Place
 B.A., Brown University; M.S. in E.E., Massachusetts Institute of Technology.
- OLEXA-MYRON BILANIUK, *Associate Professor of Physics* 915 Harvard Avenue
 Ingenieur, Université de Louvain; B.S.E., B.S., M.S., M.A., and Ph.D., University
 of Michigan.
- DAVID L. BOWLER, *Associate Professor of Electrical Engineering* 505 Yale Avenue
 B.S. in E.E., Bucknell University; M.S. in E.E., Massachusetts Institute of Tech-
 nology; M.A. and Ph.D., Princeton University.
- WILLIAM H. BROWN, JR., *Associate Professor of Economics*, Crum Creek Rd., Media, Pa.
 B.A. and Ph.D., Yale University.
- PHILIP W. CARRUTH, *Associate Professor of Mathematics* 515 Elm Avenue
 B.A., Hamilton College; M.A., Syracuse University; Ph.D., University of Illinois.
- HILDE D. COHN, *Associate Professor of German* 302 North Chester Road
 Dr. Phil., University of Heidelberg.
- DAVID COWDEN, *Associate Professor of English* 312 Ogden Avenue
 B.A., Swarthmore College; M.A. and Ph.D., Harvard University.
- JOHN R. DIXON, *Visiting Associate Professor of Mechanical Engineering*
 (Purdue University) 21 Oberlin Avenue
 B.Sc. and M.Sc., Massachusetts Institute of Technology; Ph.D., Carnegie Institute of
 Technology.
- LEWIS H. ELVERSON, *Associate Professor of Physical Education for Men,*
 6 Whittier Place
 B.S., University of Pennsylvania.
- E. J. FAULKNER, *Associate Professor of Physical Education for Men,*
 235 Dickinson Avenue
- EDWARD A. FEHNEL, *Associate Professor of Chemistry* 600 Elm Avenue
 B.S., M.S. and Ph.D., Lehigh University.

† Absent on leave, spring semester, 1964-65.

- LAUNCE J. FLEMISTER, *Associate Professor of Zoology*,
Rogers Lane and Plush Mill Road, Wallingford, Pa.
B.A., M.A. and Ph.D., Duke University.
- *CHARLES E. GILBERT, *Associate Professor of Political Science* 223 Kenyon Avenue
B.A., Haverford College; Ph.D., Northwestern University.
- ‡FRÉDÉRIC J. GROVER, *Associate Professor of French* 521 Elm Avenue
L. ès L., University of Paris; Ph.D., University of California.
- ‡GILBERT P. HAIGHT, JR., *Associate Professor of Chemistry* 409 College Avenue
B.A., Stanford University; Ph.D., Princeton University.
- MARK A. HEALD, *Associate Professor of Physics* 915 Harvard Avenue
B.A., Oberlin College; M.S. and Ph.D., Yale University.
- DANIEL G. HOFFMAN, *Associate Professor of English* 502 Cedar Lane
B.A., Columbia College; M.A. and Ph.D., Columbia University.
- JOHN HUNTER, *Visiting Associate Professor of Mathematics* (University of Glasgow)
405 Walnut Lane
M.A., University of Glasgow; Ph.D., Cambridge University.
- ‡SAMUEL L. HYNES, *Associate Professor of English* 5 Whittier Place
B.A., University of Minnesota; M.A. and Ph.D., Columbia.
- OLGA LANG, *Associate Professor of Russian* 410 Cedar Lane
Graduate, University of Moscow; Ph.D., Columbia University.
- †PAUL C. MANGELSDORF, JR., *Associate Professor of Physics* 110 Cornell Avenue
B.A., Swarthmore College; Ph.D., Harvard University.
- NORMAN A. MEINKOTH, *Associate Professor of Zoology*
431 West Woodland Avenue, Springfield, Pa.
B. of Ed., Southern Illinois Teachers College; M.S. and Ph.D. University of Illinois.
- IRENE MOLL, *Associate Professor of Physical Education for Women*
The Damsite, Wallingford, Pa.
B.S. in Ed., University of Kansas; M.A., Texas State College for Women.
- MARTIN OSTWALD, *Associate Professor of Classics* 2 Whittier Place
B.A., University of Toronto; M.A., University of Chicago; Ph.D., Columbia University.
- PHILIP C. PRAGER, *Associate Professor of Mechanical Engineering*
132 North Highland Road, Springfield, Pa.
B.S. in M.E., University of Pittsburgh; M.M.E., University of Delaware.
- VIRGINIA RATH, *Associate Professor of Physical Education for Women* . . . 735 Yale Avenue
B.A., Hollins College; M.A., Columbia University.
- DAVID ROSEN, *Associate Professor of Mathematics* . . . 115 President Avenue, Rutledge, Pa.
B.A., New York University; M.A. and Ph.D., University of Pennsylvania.
- JEROME A. SHAFFER, *Associate Professor of Philosophy* Benjamin West House
B.A., Cornell University; Ph.D., Princeton University.
- DAVID G. SMITH, *Associate Professor of Political Science* 519 Walnut Lane
B.A. and M.A., University of Oklahoma; Ph.D., Johns Hopkins University.
- CLAUDIO SPIES, *Associate Professor of Music and Director of the Orchestra*
645 North Chester Road
B.A. and M.A., Harvard University.
- WILLIS J. STETSON, *Associate Professor of Physical Education for Men and Director of Athletics* 144 North Highland Road, Springfield, Pa.
B.A., Swarthmore College; M.A., University of Pennsylvania.
- PETER GRAM SWING, *Associate Professor of Music and Director of the Chorus*
614 Hillborn Avenue
B.A. and M.A., Harvard University.
- *WILLIS D. WEATHERFORD, *Associate Professor of Economics* 319 Cedar Lane
B.A., Vanderbilt University; B.D., Yale University; M.A. and Ph.D., Harvard University.
- M. JOSEPH WILLIS, *Associate Professor of Civil Engineering*
Copples and Calendar Lanes, Wallingford, Pa.
B.C.E., University of Washington; M.S., Cornell University; Ph.D., Johns Hopkins University.
- HARRISON MORRIS WRIGHT, *Associate Professor of History* 5 Crum Ledge
B.A., M.A. and Ph.D., Harvard University.

‡ Absent on leave, 1964-65.

† Absent on leave, spring semester, 1964-65.

* Absent on leave, fall semester, 1964-65.

ASSISTANT PROFESSORS

- ELISA ASENSIO, *Assistant Professor of Spanish* 500 Oakley Road, Haverford, Pa.
M.A., Middlebury College.
- GEORGE C. AVERY, *Assistant Professor of German* 6 Crum Ledge
B.A., M.A., and Ph.D., University of Pennsylvania.
- ROBERT C. BANNISTER, *Assistant Professor of History* 301 Dartmouth Avenue
B.A. and Ph.D., Yale University; B.A. and M.A., Oxford University.
- GEORGE THOMAS BEECH, *Assistant Professor of History* 7 Crum Ledge
B.A., Michigan State University; Ph.D., Johns Hopkins University.
- THOMAS H. BLACKBURN, *Assistant Professor of English* Swarthmore College
B.A., Amherst College; B.A. and M.A., Oxford University; Ph.D., Stanford University.
- GOMER H. DAVIES, *Assistant Professor of Physical Education for Men* . . . 225 Cornell Avenue
B.S., East Stroudsburg State Teachers College; Ed.M., Temple University.
- WILLIAM C. DENISON, *Assistant Professor of Botany* 317 North Chester Road
B.A. and M.A., Oberlin College; Ph.D., Cornell University.
- JARL AVARD ELMGREN, *Assistant Professor of Physics* 8 Crum Ledge
B.S., University of New Hampshire; Ph.D., Iowa State University.
- STEVENS HECKSCHER, *Assistant Professor of Mathematics*
Pritchard Lane, Wallingford, Pa.
B.A., M.A., and Ph.D., Harvard University.
- ELEANOR K. HESS, *Assistant Professor of Physical Education for Women*
321 Davis Road, Havertown, Pa.
B.S. and M.S., University of Pennsylvania.
- DAVID A. KUHN, *Assistant Professor of French* Swarthmore College
B.A., Harvard University.
- GERALD R. LEVIN, *Assistant Professor of Psychology* 3 Crum Ledge
B.A., Antioch College; M.A. and Ph.D., Columbia University.
- JAMES H. LOEHLIN, *Assistant Professor of Chemistry* 915 Harvard Avenue
B.A., College of Wooster; Ph.D., Massachusetts Institute of Technology.
- CLARK P. MANGELSDORF, *Assistant Professor of Civil Engineering* . . . 339 Riverview Road
B.S., Swarthmore College; M.S. and D.Sc., Massachusetts Institute of Technology.
- JOHN A. NEVIN, *Assistant Professor of Psychology* 311 Yale Avenue
B.E., Yale University; M.A. and Ph.D., Columbia University.
- HAROLD PAGLIARO, *Assistant Professor of English* 61 Sproul Road, Springfield, Pa.
B.A., M.A., and Ph.D., Columbia University.
- DEAN PEABODY, *Assistant Professor of Psychology* 2 Crum Ledge
B.A., Swarthmore College; Ph.D., Harvard University.
- JEAN ASHMEAD PERKINS, *Assistant Professor of French* 414 Drew Avenue
B.A., Swarthmore College; M.A. and Ph.D., Columbia University.
- KENNETH S. RAWSON, *Assistant Professor of Zoology* 8B Whittier Place
B.A., Swarthmore College; M.S., Cornell University; Ph.D., Harvard University.
- ALBURT M. ROSENBERG, *Assistant Professor of Natural Science* 515 Elm Avenue
B.A., Harvard University; M.S., University of Florida; Ph.D., University of Pennsylvania.
- PETER T. THOMPSON, *Assistant Professor of Chemistry* 317 North Chester Road
B.A., Johns Hopkins University; Ph.D., University of Pittsburgh.
- PERCY LINWOOD URBAN, JR., *Assistant Professor of Religion* . . 20 South Princeton Avenue
B.A., Princeton University; S.T.B., S.T.M. and Th.D., General Theological Seminary.
- DAVID S. WIESEN, *Assistant Professor of Classics* Greylock Apartments
B.A., Harvard University; M.A., Ludwig-Maximilian Universitaet, Munich; Ph.D., Harvard University.
- JOHN W. WILLIAMS, *Assistant Professor of Fine Arts*
302 Avondale Road, Wallingford, Pa.
B.A., Yale University; M.A. and Ph.D., University of Michigan.

INSTRUCTORS

- ANDREW BOELCSKEYVY, *Instructor in German* 906 S. 48th St., Philadelphia 43
B.A., West Virginia University; M.A., University of Pennsylvania.

‡ Absent on leave, 1964-65.
* Absent on leave, fall semester, 1964-65.
† Absent on leave, spring semester, 1964-65.

- THOMPSON BRADLEY, *Instructor in Russian* 240 Ridley Creek Road, Moylan, Pa.
 B.A., Yale University; M.A., Columbia University.
- LEWIS R. GATY, II, *Instructor in Economics* Benjamin West House
 B.A., Swarthmore College.
- WILLIAM GUSTASON, *Instructor in Philosophy* 835 Harvard Avenue
 B.A., University of Florida.
- JAMES H. HAMMONS, *Instructor in Chemistry* Swarthmore College
 B.A., Amherst College; M.A. and Ph.D., Johns Hopkins University.
- HARRIETT B. HAWKINS, *Instructor in English* Swarthmore College
 B.A., Newcomb College, Tulane University; M.A. and Ph.D., Washington University.
- JOHN K. HAWLEY, *Instructor in Mechanical Engineering* 915 Harvard Avenue
 B.S., Swarthmore College; M.S., Columbia University.
- DONALD C. HELLMANN, *Instructor in Political Science* 317 North Chester Road
 B.A., Princeton University; M.A. University of California.
- WILLIAM C. KERR, *Instructor in Civil Engineering and Director of the Computer Center*
 915 Harvard Avenue
 B.S. and M.S., Michigan State University.
- EUGENE A. KLOTZ, *Instructor in Mathematics* 317 North Chester Road
 B.S., Antioch College.
- JEAN HERSKOVITS KOPYTOFF, *Instructor in History* 112 Rutgers Avenue
 B.A., Swarthmore College; D.Phil., Oxford University.
- ROBERT E. LEYON, *Instructor in Chemistry* 519 Walnut Lane
 B.A., Williams College; M.A. and Ph.D., Princeton University.
- ERIKA A. MARES, *Instructor in Mathematics* 1141 Muhlenberg Avenue
 B.A. and M.A., Pennsylvania State University.
- PHILIP R. MARSHALL, *Instructor in History* 915 Harvard Avenue
 B.A., Yale University; M.A., University of Pittsburgh.
- CLAIR W. NIELSON, *Instructor in Physics* 615 North Chester Road
 B.S. and Ph.D., Massachusetts Institute of Technology.
- CHARLES J. SIEGMAN, *Instructor in Economics*
 101 Conshohocken State Road, Bala-Cynwyd, Pa.
 B.A., City College of New York.
- LAWRENCE SKLAR, *Instructor in Philosophy* 4 Crum Ledge
 B.A., Oberlin College; M.A. and Ph.D., Princeton University.
- SIMONE V. SMITH, *Instructor in French* 514 East Lancaster Ave., Wynnewood, Pa.
 Licence ès Lettres, University of Grenoble.
- SUSAN BROOKE SNYDER, *Instructor in English* 302 North Chester Road
 B.A., Hunter College; M.A. and Ph.D., Columbia University.
- MARIE JOSÉ SOUTHWORTH, *Instructor in French* 146 Park Avenue
 Cand. Cours Supérieurs, Luxembourg; M.A., Western Reserve University.
- AILYN TERADA, *Instructor in Physical Education for Women*
 193 Patriot Road, King of Prussia, Pa.
 B.S., Russell Sage College; M.S., University of Wisconsin.
- GEORGE E. VON DER MUHLL, *Instructor in Political Science* 317 North Chester Rd.
 B.A., Oberlin College; M.Sc., London School of Economics.

LECTURERS AND ASSISTANTS

- MORTON S. BARATZ, *Visiting Lecturer in Economics* (Bryn Mawr)
 1516 Old Gulph Road, Villanova, Pa.
 Ph.D., Yale University.
- CARL R. BERKY, *Assistant in Music* 2209 Walnut St., Philadelphia 3, Pa.
 B.Mus. and M.Mus., Philadelphia Conservatory of Music; M.A., University of Pennsylvania.
- HARRIET SHORR BAGUSKAS, *Director of Arts and Crafts* 214 N. Jackson St., Media
 B.A., Swarthmore College.
- ALICE BRODHEAD, *Lecturer in Psychology and Education* 316 Ogden Avenue
 B.S. and M.A., University of Pennsylvania.
- JOHN A. CERASO, *Visiting Lecturer in Psychology* (Yeshiva University)
 Yeshiva University, New York 19, N. Y.
 B.A., Brooklyn College, M.A. and Ph.D., New School for Social Research.

- HENNIG COHEN, *Visiting Lecturer in English Literature* (University of Pennsylvania)
37 Amherst Avenue
B.A. and M.A., University of South Carolina; Ph.D., Tulane University.
- BROOKE P. COTTMAN, *Assistant in Physical Education for Men* 208 Dickinson Ave.
B.A., Duke University.
- GLORIA CAREY EVANS, *Consultant in Reading and Language*
205 Linden Lane, Wallingford, Pa.
B.A., Western Washington College of Education; M.S., University of Washington
Ph.D., Stanford University.
- ROBERT V. FORWOOD, *Assistant in Physical Education for Men*
911 13th St., Prospect Park, Pa.
B.S., West Chester State College; M.A., Temple University.
- MIGUEL GONZALEZ-GERTH, *Lecturer in Spanish* . . . 430 E. Lancaster Avenue, Wayne, Pa.
B.A. and M.A., University of Texas; M.A., Princeton University.
- JOSEPH J. GREENBAUM, *Visiting Lecturer in Psychology* (New School for Social Research)
910 West End Avenue, New York, N. Y.
B.S.S., City College of New York; Ph.D., University of California.
- HELEN HALL, *Consultant in Reading and Language* 407 Hillborn Avenue
B.A., Wellesley College; M.A., Swarthmore College; Ph.D., University of Pennsylvania.
- GABRIELE S. HOENIGSWALD, *Lecturer in Classics* 237 Kenyon Avenue
M.A., Bryn Mawr College; D.Litt., University of Florence.
- HELEN MANNING HUNTER, *Lecturer in Economics* Featherbed Lane, Haverford, Pa.
B.A., Smith College; Ph.D., Radcliffe College.
- ALVIN H. JOHNSON, *Visiting Lecturer in Music* (University of Pennsylvania)
340 Dickinson Avenue
B.A., University of Minnesota; Ph.D., Yale University.
- SARAH LEE LIPPINCOTT, *Lecturer and Research Associate in Astronomy* . 510 Elm Avenue
B.A., University of Pennsylvania; M.A., Swarthmore College.
- JAMES W. LUKENS, JR., *Assistant in Physical Education for Men*
1050 Baltimore Pike, Springfield, Pa.
B.S.E.E., University of Louisville; LL.B., Washington and Lee University.
- JAMES J. MCADOO, *Assistant in Physical Education for Men*
513 East Brighthurst, Germantown, Pa.
- J. HILLIS MILLER, *Visiting Lecturer in English Literature* (Johns Hopkins University)
100 Woodlawn Road, Baltimore, Md.
B.A., Oberlin College; M.A. and Ph.D., Harvard University.
- JAMES H. MILLER, *Assistant in Physical Education for Men*
834 Seventh Avenue, Prospect Park, Pa.
B.S. and M.S., University of Pennsylvania.
- ALEXANDER V. RIASANOVSKY, *Visiting Lecturer in History* (University of Pennsylvania)
462 Lynbrooke Rd., Springfield, Del. Co., Pa.
B.A., University of Oregon; B.Litt., Oxford University; Ph.D., Stanford University.
- JAMES F. ROSS, *Visiting Lecturer in Religion* (Drew University)
14 Hillcrest Road, Madison, N. J.
B.A., Doane College; B.D. and Th.D., Union Theological Seminary.
- URSULA VICTOR SANTER, *Lecturer in Biology* Featherbed Lane, Haverford, Pa.
B.A., Swarthmore College; M.S. and Ph.D., Yale University.
- ALBERT R. SCHMITT, *Visiting Lecturer in German* (University of Pennsylvania)
856 Agnes Avenue, Morton, Pa.
B.A., Colby; M.A. and Ph.D., University of Pennsylvania.
- HELEN P. SHATAGIN, *Visiting Lecturer in Russian* 307 Cornell Avenue
- ROBERT M. SMART, *College Organist* 18 Oberlin Avenue
B.A., Curtis Institute of Music; M.A., Westminster Choir College.
- CAROL THOMPSON, *Director of Dramatics* Swarthmore College
B.A., Swarthmore College; M.F.A., Yale University.
- JAMES F. WANNER, *Lecturer and Research Associate in Astronomy* 2 Crum Ledge
B.S., University of Colorado; B.A., Earlham College; M.S., University of Pennsylvania; Ph.D., Harvard University.

DIVISIONS AND DEPARTMENTS

I. Division of the Humanities—HEDLEY H. RHYS, *Chairman*

- Classics, HELEN F. NORTH, *Chairman*.
English Literature, GEORGE J. BECKER, *Chairman*.
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History, JAMES A. FIELD, JR., *Chairman*.
Mathematics, HEINRICH BRINKMANN, *Chairman*.
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Chemistry, WALTER B. KEIGHTON, JR., *Chairman*.
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- OPER FOUNDATION: Swing, *Chairman*.
Bradley, Brown, Heald, Heckscher, Pennock, Shane.
- CURRICULUM: P. Mangelsdorf, *Chairman*.
Brown, Cobbs, Hoffman, Lafore, McCrumm, Meinkoth, Moore, North, Shaffer.
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Beardsley, Cook, Davies, Jenkins, Livingston, Rhys, Rosen, Shero.
- GRANT FELLOWSHIPS: Wallach, *Chairman*.
Elmore, Jenkins, Klees, Klotz, Siegman, Spies, van de Kamp.
- GRANT FELLOWSHIPS FROM OTHER INSTITUTIONS: McCrumm, *Chairman*.
Bannister, Barr, Blackburn, Elverson, Gillespie (*Secretary*), Keighton, Lange.
- INSTRUCTION: Courtney Smith, *Chairman*.
Carpenter, Cobbs, Elmore, Field, Moore, Pierson, Rhys, D. Smith (1st semester), Waltz.
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Connor, Field, Hawley, Heckscher, Hoffman, Tolles, Walker.
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Bowie, Bradley, Elmgren, Levin, Leyon, Rosenberg, Stott.
- RESEARCH: Fehnel, *Chairman*.
Avery, Cratsley, Ostwald, Pierson, Weber.
- SCHEDULE OF CLASSES: Moore, *Chairman*.
Becker, Bowler, Hess, Nevin, Rosenberg, Sorber.
- STUDENT AFFAIRS: Barr, *Chairman*.
Cobbs, Cohn, Lange, Rosen, Wright.
- TEACHER EDUCATION PROGRAM: Cobbs, *Chairman*.
Becker, Brodhead, Carruth, Davies, Levin, Moore, Shane, Wallach, F. Williams.
- TRAVEL ALLOWANCE: Prager, *Chairman*.
Brinkman, Elmgren, Lange, Terada, Walker.
- USE OF COLLEGE FACILITIES BY OUTSIDE ORGANIZATIONS: Cook, *Chairman*.
Davisson, Hess, Klees, Lange, Shane, Stanton, Stetson.
- SECRETARY TO THE FACULTY: Jenkins.

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Administrative Assistant to the President, GILMORE STOTT, B.A. and M.A., University of Cincinnati; B.A. and M.A., Oxford University; M.A. and Ph.D., Princeton University

Secretary, MARTHA H. DECROUEZ, B.S., University of Minnesota.

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B.A., College of Wooster; M.B.A. and D.C.S., Harvard University.

Vice-President—Public Relations and Alumni Affairs, JOSEPH B. SHANE.

B.A., Swarthmore College; M.A., University of Pennsylvania.

Secretaries, PAULINE M. CARROLL, MILDRED A. SCOTT.

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Dean of Men: ROBERT A. BARR, JR., B.A., Swarthmore College; M.A., University of Pennsylvania.

Dean of Women: BARBARA PEARSON LANGE.

Dean of Admissions: FREDERICK A. HARGADON, B.A., Haverford College.

Associate Dean of Admissions: MARGARET L. MACLAREN, B.A., Swarthmore College.

Associate Dean of Admissions and Director of Financial Aid, FRANK B. WILLIAMS, B.A. and M.A., Wesleyan University; Ed.D., University of Pennsylvania.

Assistant in Admissions: Ronald E. Sutton, B.A., Swarthmore College; B.D. and S.T.M., Drew University.

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MARGARET W. MOORE, B.A., Park College; M.A., Ph.D., Columbia University.

Consultants in Reading and Language:

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HELEN HALL, B.A., Wellesley College; M.A., Swarthmore College; Ph.D., University of Pennsylvania.

Head Residents in Dormitories:

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CAROL THOMPSON, Robinson House; B.A., Swarthmore College; M.F.A., Yale University.

JUDITH ANNE COOPER, Worth Hall; B.A., University of London.

VIRGINIA VON FRANKENBERG, Parrish Hall; B.A., University of Nebraska.

MAYME R. WILLIAMS, Willets Hall.

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EMILY BONSALE.

WINIFRED J. HALL.

MILDRED IRWIN.

MYRTLE R. KEENY, B.A., Dickinson College.

FRANCES WILLS SLAUGH, B.A., Swarthmore College.

REGISTRAR'S OFFICE

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Secretaries, MARJORIE L. WEBB, B.A., University of Delaware.
ROSAMOND W. GARRETT, B.A., Wilson College.

LIBRARY STAFF

College Library

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Acting Technical Services Librarian: ELIZABETH L. HARRAR, B.A., University of Delaware; M.A., University of Pennsylvania; B.S. in L.S., Drexel Institute.

Assistant Librarians:

Cataloging: DORIS BEIK, B.A., and B.S., in L.S., State University of New York at Albany.

MILDRED HIRSCH, B.S. in L.S., Columbia University.

ELIZABETH S. SHARPLESS, B.A., Swarthmore College; B.S. in L.S., Drexel Institute.

Order: MARY C. KERBAUGH, B.A., University of Pennsylvania; M.S. in L.S., Drexel Institute.

Assistants: GAIL C. TICKNOR, B. Mus., New England Conservatory of Music; DORIS PITMAN MOIST, CONCHITA HOGAN, MARY BOWERS.

Readers Services Librarian: HOWARD H. WILLIAMS, B.A., Lake Forest College; M.A., and B.S. in L.S., Columbia University.

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GEORGE K. HUBER, B.A., University of Pennsylvania; M.S. in L.S., Drexel Institute.

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Associate Director: DOROTHY G. HARRIS, B.A., Wellesley College; B.S. in L.S., Drexel Institute; M.A., University of Pennsylvania.

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Swarthmore College Peace Collection:

Curator: ARDITH L. EMMONS, B.A., William Penn College; M.A., Mills College.

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Courtney Smith, *Chairman*; Irwin Abrams, Anna Cox Brinton, Merle Curti, Alfred Hassler, Emily Cooper Johnson, Ray Newton, Ernst Posner, Joseph B. Shane, Frederick B. Tolles, E. Raymond Wilson, Norman Whitney.

† Absent on leave, spring semester, 1964-65.

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Director, WILLIAM C. KERR, B.S. and M.S., Michigan State University.

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Postmistress, VERA B. MORRISON.

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Assistants to the House Director, JUNE CARNALL, KATHLEEN FRIEL, EDNA B. HEALE, WOLTERA HIENSCH, RACHEL WILDEBUSH, MAYME R. WILLIAMS.

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Planning Engineer, JOSEPH E. SPAFFORD, B.S., University of Missouri.

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Consulting Horticulturist, HARRY WOOD.

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Alumni Recorder, ADIS PRATT.

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Assistant Director, VIRGINIA BULLITT.

Secretary, MILDRED STRAIN.

VOCATIONAL GUIDANCE AND PLACEMENT

Acting Director, VIRGINIA BULLITT.

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KENT F. BALLS, B.A., Haverford College; M.D., Cornell University.

HAROLD C. ROXBY, B.S., Pennsylvania State University; M.D., Temple University.

Consulting Psychiatrists:

LEON J. SAUL, B.A. and M.A., Columbia University; M.D., Harvard University.

J. W. LYONS, B.A., University of Scranton; M.D., University of Pennsylvania.

Nurses:

ELIZABETH COZINE, R.N., ELIZABETH F. MCCONNELL, R.N., E. ELIZABETH MCGEARY, R.N., HELEN R. MARTIN, R.N., IDA MOORE THOMAS, R.N.

**INTRODUCTION
TO
SWARTHMORE COLLEGE**

Introduction to Swarthmore College

Swarthmore College, founded in 1864 by members of the Religious Society of Friends, is a co-educational college occupying a campus of about 300 acres of rolling wooded land in and adjacent to the borough of Swarthmore in Delaware County, Pennsylvania. It is a small college by deliberate policy. Its present enrollment is about 975 students, of whom 450 are women and 525 are men. The borough of Swarthmore is a residential suburb within half an hour's commuting distance of Philadelphia. Because of its location, Swarthmore College students are able to combine the advantages of a semi-rural setting with the opportunities offered by Philadelphia. Especially valuable is the cooperation made possible with three other nearby institutions, Bryn Mawr and Haverford Colleges and the University of Pennsylvania.

OBJECTIVES AND PURPOSES

In accordance with the traditions of its Quaker background, Swarthmore students are expected to prepare themselves for full, balanced lives as individuals and as responsible citizens through exacting intellectual study supplemented by a varied program of sports and other extra-curricular activities.

The purpose of Swarthmore College is to make its students more valuable human beings and more useful members of society. It shares this purpose with other educational institutions, for American education is a direct outgrowth of our democratic principles. While a common purpose underlies all American education, each school and college and university seeks to realize that purpose in its own way. Each must select those tasks it can do best. Only by such selection can it contribute to the diversity and richness of educational opportunity which is part of the American heritage and the American strength.

ACADEMIC COMPETENCE

Democracy demands a broad base of intelligent understanding of issues. It also necessitates a high order of excellence in those who are destined to become its leaders. Swarthmore can best serve society by the maintenance of high standards. It is peculiarly fitted by tradition and performance for this essential role, and it is precisely this readiness to do a particular job well that gives the College its value in the educational pattern of American democracy.

Education is largely an individual matter, for no two students are exactly alike. Some need detailed help, while others profit from considerable freedom. The program of Honors study, in which Swarthmore pioneered, is designed to give recognition to this fact. It is the most distinctive feature of the College's educational program. For many students, it provides an enriching and exciting intellectual experience. It has as its main ingredients freedom from ordinary classroom routine and close association with faculty members in small seminars, concentrated work in broad fields of study, and maximum latitude for the development of individual responsibility. The Honors program and the Course program are alternative systems of instruction for students during their last two years. Both are designed to evoke the maximum effort and development from

ch student, the choice of method being determined by individual need and capacity.

THE RELIGIOUS TRADITION

Swarthmore College was founded by members of the Religious Society of Friends, and it seeks to illuminate the life of its students with the spiritual principles of that Society. Although it has been non-sectarian in control since the beginning of the present century, and although the children of Friends compose a minority of the student body, the College seeks to preserve the religious traditions out of which it sprang.

The essence of Quakerism is the individual's responsibility for seeking truth and for applying whatever truth he believes he has found. As a way of life, it emphasizes hard work, simple living, and generous giving; personal integrity, social justice, and the peaceful settlement of disputes. The College does not seek to impose on its students this Quaker view of life, or any other specific set of convictions about the nature of things and the duty of man. It does, however, have the two-fold aim of encouraging conscious concern about such questions and unceasing re-examination of any view which may be held regarding them. That is the kind of ethical and religious character which Swarthmore seeks to develop.

A college is never static. Its purposes and policies are always changing to meet new demands and new conditions. The founders of Swarthmore would find in it today many features which they never contemplated when they shaped the College in the middle of the nineteenth century. Swarthmore, if it is to remain effective, must be forever changing. The goal is to achieve for each generation, by means appropriate to the times, that unique contribution and that standard of excellence which have been the guiding ideals of Swarthmore from its founding.

Admission

Inquiries concerning admission and applications should be addressed to the Dean of Admissions, Swarthmore College, Swarthmore, Pennsylvania.

GENERAL STATEMENT

In the selection of students the college seeks those qualities of character, social responsibility, and intellectual capacity which it is primarily concerned to develop. It seeks them, not in isolation, but as essential elements in the whole personality of candidates for admission.

It is also the policy of the college to have the student body represent not only different parts of the United States but many foreign countries, both public and private secondary schools, and various economic, social, religious, and racial groups. Special effort is made to attract and assist qualified students from disadvantaged minority groups.

Selection is important and difficult. No simple formula will be effective. The task is to choose those who give promise of distinction in the quality of their personal lives, in service to the community, or in leadership in their chosen fields. Swarthmore College must choose its students on the basis of their individual future worth to society and of their collective realization of the purpose of the college.

Admission to the freshman class is normally based upon the satisfactory completion of a four-year secondary school program preparatory to advanced liberal study. Under exceptional circumstances, students who have virtually completed the normal four-year program in three years will be considered for admission, provided they meet the competition of other candidates in general maturity as well as readiness for a rigorous academic program.

All applicants are selected on the following evidence:

1. Record in secondary school.
2. Recommendations from the school principal, headmaster, or guidance counselor and from three additional persons.
3. Rating in the Scholastic Aptitude Test and in three Achievement Tests of the College Entrance Examination Board.
4. Personal interview with one of the Deans or an appointed representative.
5. Reading and experience, both in school and out.

Applicants must have satisfactory standing in school, and in aptitude and achievement tests, and should show strong intellectual interests. They should also give evidence of sturdiness of character, promise of growth, initiative, seriousness of purpose, and a sense of social responsibility. As future members of the college community, they should represent varied interests and backgrounds.

In the competition for admission preference is given to the sons and daughters of Friends and alumni who can meet all the requirements.

PREPARATION

The College does not require a set plan of secondary school courses as preparation for its program. The election of specific subjects is left to the student and his school advisers. In general, preparation should include:

1. *Skills*: The following skills are essential to success in college work and should be brought to a high level by study and practice throughout the preparatory period:
 - a. The use of the English language with accuracy and effectiveness in reading, writing, and speaking.
 - b. The use of the principles of mathematics.
 - c. The use of one, or two, foreign languages to the point of reading prose of average difficulty.
2. *Subjects*: All, or almost all, of the preparatory course should be composed of the subjects listed in the following four groups. Variations of choice and emphasis are acceptable although some work should be taken in each group.

History and Social Studies: American, English, European, and ancient history; political, social, and economic problems of modern society.

Literature and Art: American, English, and foreign literature; music; art.

Natural Science and Mathematics: chemistry, physics, biology, astronomy; algebra, geometry, trigonometry. Those planning to major in engineering should present work in chemistry, physics, and four years of mathematics including algebra, geometry and trigonometry.

Languages: English, Latin, Greek, German, French, Spanish, Russian, other European or Oriental languages. Applicants who expect to major in science are strongly advised to include German and, if possible, French in their school programs.

APPLICATIONS AND EXAMINATIONS

Applications must be filed by January 15th of the year in which the candidate wishes to be admitted. Swarthmore does not have an "early decision program." An application fee of \$10.00, which is not refundable, is required of all candidates, and is submitted with the preliminary application card.

All applicants for admission are required to take the Scholastic Aptitude Test and three Achievement Tests given by the College Entrance Examination Board. The Scholastic Aptitude Test should normally be taken in December or January of the senior year.

Achievement Tests must be taken not later than January of the senior year. English Composition is required and the other two Achievement Tests should be chosen by the candidate from two different fields. Applicants for Engineering must take one achievement test in Mathematics. The Writing Sample will not be accepted as one of the three examinations.

Candidates who take Achievement Tests in May of the junior year in subjects

completed by that time may submit the results to the Admission Office, but it is strongly recommended that the English Composition and at least one other Achievement Test be taken in December or January of the senior year.

In 1964-65 these tests will be given in various centers throughout this country and abroad on December 5, January 9, March 6, May 1, and July 14. Application to take these tests should be made directly to the College Entrance Examination Board, Box 592, Princeton, New Jersey. A bulletin of information may be obtained without charge from the Board. Students who wish to be examined in any of the following western states, provinces, and Pacific areas—Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming, Alberta, British Columbia, Manitoba, Saskatchewan, Mexico, Australia, and all Pacific Islands including Formosa and Japan—should address their inquiries and send their applications to the College Entrance Examination Board, Box 27896, Los Angeles 27, California. Application should be made to the Board at least a month before the date on which the test will be taken.

No additional tests are required of candidates for scholarships. Information concerning financial aid will be found on pages 33-41.

THE INTERVIEW

An admissions interview with a representative of the College is a requirement in making application to Swarthmore. Applicants are expected to take the initiative in arranging for this interview. Those who can reach Swarthmore with no more than a half day's trip are urged to make an appointment to visit the College for this purpose.* Other applicants may request a meeting with an alumni representative in their own area. Interviews should be completed before March 1 of the senior year. Candidates are not interviewed until the latter part of the junior year. Candidates will not be able to have campus interviews from March 1 to mid-April but a tour of the campus may be arranged during this period. Appointments at the College can be made by calling or writing the Office of Admissions, KI 3-0200, Ext. 445.

ADMISSION DECISIONS

Notices of the action of the Admissions Committees will be mailed about April 15.

ADVANCED PLACEMENT

Freshmen may apply for advanced standing or placement in particular courses if they have taken college level courses and the Advanced Placement Tests of the College Entrance Examination Board. Decisions are made by the departments concerned. Every effort is made to place students in the most advanced courses for which they are qualified.

* To reach the college from the New Jersey Turnpike, motorists should leave by Exit 3, cross the Walt Whitman Bridge, take Pa. Route 291 past the airport to Route 420, turn right on 420 to Baltimore Pike, turn left and proceed to the intersection with Route 320. Turn left and follow the signs of the college. From the Pennsylvania Turnpike, take the Valley Forge exit and follow Routes 43, 23 and 320 to the campus.

APPLICATIONS FOR TRANSFER

The college accepts a very limited number of transfer students. For favorable consideration, applicants for transfer must have had a good scholastic record at the institution attended and must present full credentials for both college and preparatory work, including a statement of honorable dismissal. They must take the Scholastic Aptitude Test given by the College Entrance Examination Board if this test has not been taken previously.

As a general practice, transfer students are not admitted to advanced standing higher than the beginning of the sophomore year. Four semesters of study at Swarthmore College constitute the minimum requirement for a degree, two of which must be those of the senior year. Applications for transfer must be filed by March 15 of the year in which entrance is desired. Decisions on these applications are announced early in June. Students admitted by transfer are not eligible for financial assistance during their first year at Swarthmore.

Expenses

Charges for the academic year 1964-65 (two semesters) :

Board, room and tuition	\$2,500*
General fee	160

Total charges \$2,660

While a general charge for board, room and tuition is made, this may be divided into \$1,600 for tuition, \$370 for room and \$530 for board. The general fee of \$160 per year covers the costs of student health, library and laboratory fees, athletic fees, arts and crafts, and the support of several other extra-curricular activities.

One half of the total sum is due not later than Registration Day at the beginning of the fall semester. Bills are mailed before the opening of the current term. Payments should be made by check or draft to the order of SWARTHMORE COLLEGE. A student is not a registered student at Swarthmore College, nor on any class roll, until his bill is paid. Correspondence about financial matters should be addressed to Miss G. Caroline Shero, Assistant Controller.

Students who wish to charge Book Store purchases, laboratory breakage fees, etc., may do so by maintaining a student deposit account at the Business Office against which charge checks may be drawn. Cash withdrawals may also be made. Students will be notified when overdrafts occur and no cash withdrawals may be made unless a cash balance is maintained. A minimum deposit of \$75.00 in September is suggested and all students are urged to maintain such an account for their convenience.

No reduction or refunding of tuition can be made on account of absence, illness, voluntary withdrawal, or dismissal from college. No reduction or refund will be made for failure to occupy the room assigned for a given term, nor is the general fee refundable. In case of absence or withdrawal from the college and provided due notice has been given in advance to the Business Office, there will be a refund of two-thirds of the board charge for any time in excess of two weeks. Exceptions will be made for students who are required by the draft to leave during the course of the academic year. In these cases tuition, general fee, board and room charges will be refunded on a pro rata basis.

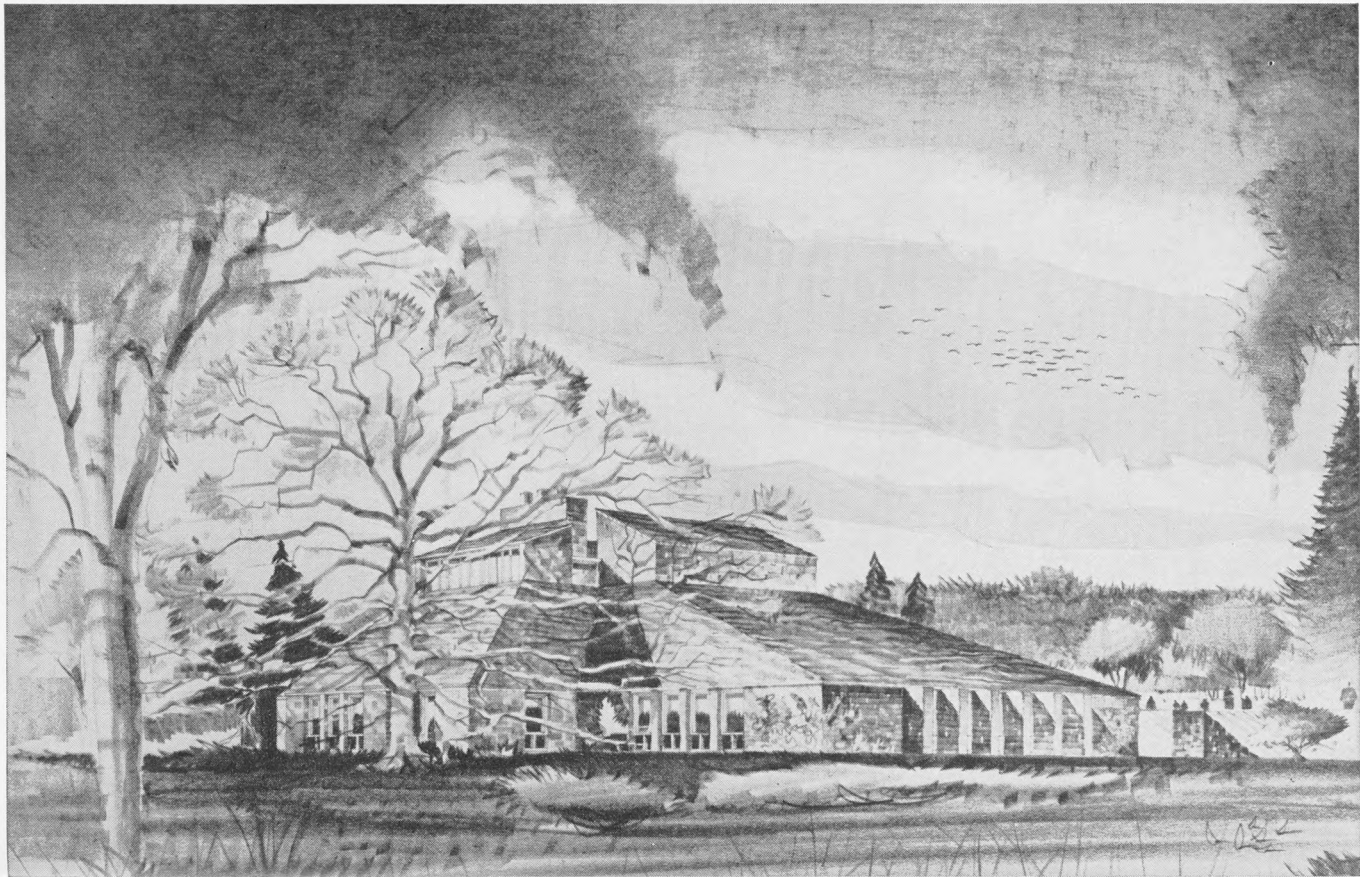
TUITION PAYMENT PLANS

Many of the parents of students may wish to pay all tuition, fees, and residence charges on a monthly basis. It is possible to arrange this under certain alternative plans. The cost is 2 $\frac{3}{4}$ % to 6% greater than when payments are made in cash in advance. Details of the plans will be furnished by the College prior to issuance of the first semester's bill in September.

* An advance deposit of \$25 is required of all new students in order to reserve a place in college for the coming year. A similar deposit of \$15 is required of returning students. These deposits are credited against the bill for tuition, board, and room.



The College Library



Philip T. Sharples Dining Hall

ACCIDENT AND SICKNESS INSURANCE

The college makes available both accident and accident and sickness insurance to students through John C. Paige & Company of Boston, Massachusetts. Accident coverage alone costs \$6.50 per year (12 months) for women, and \$12.50 for men. The combined accident and sickness policy is available at an annual cost of \$23.50 for women and \$27.50 for men. At least accident coverage is required of all students who participate in intercollegiate athletic activities and the combined accident and sickness policy is particularly recommended. Application forms are mailed to all students during the summer.

Financial Aid

The college assigns scholarships to a substantial number of students each year. These awards are normally made to entering freshman students and are renewable for four years. About eighty freshman scholarships are awarded carrying stipends varying from \$100 to \$2,300 annually. Approximately thirty per cent of the total student body are currently receiving scholarship aid from the College, with stipends averaging about \$1,050 annually. Another ten to fifteen per cent are being assisted from sources outside the College.

All grants are based upon school or college record, and upon financial need as revealed in confidential statements to the Scholarship Committee through the agency of the College Scholarship Service. The Scholarship Committee reviews the financial situation and academic progress of every scholarship holder at the end of each academic year before renewing the awards. In computing stipends, the committee takes into account normal family contribution, the student's savings and summer earnings, budgeting against a normal total expense of \$3,060 for the college year (\$2,660 for inclusive college fees, \$400 for travel and incidental expenses). The College reserves the right to adjust college stipends in the event the student receives scholarship assistance from other sources. First year transfer students are not eligible for scholarship aid.

Candidates wishing to apply for scholarships should make the usual application for admission. All applicants for admission are given the opportunity to apply for scholarship aid. The candidate's status with respect to need for scholarship is not considered to be a relevant factor in the matter of reaching decisions concerning admission to the college.

For the academic year 1964-65 the college has granted approximately \$300,000 in scholarships. About one-half of that sum was provided by special gifts and the endowed scholarships listed below. Applicants are not required to apply for specific scholarships but will be considered for all scholarship opportunities either from endowed scholarships or from general college scholarship funds.

SCHOLARSHIPS FOR MEN

OPEN SCHOLARSHIPS FOR MEN. Swarthmore College awards each year approximately five four-year Open Scholarships to men entering the freshman class. These scholarships, based on the general plan of the Rhodes Scholarships, are given to candidates who, in the opinion of the Committee of Award, rank highest in scholarship, character and personality. The amount of the

annual award varies from \$100 to \$2,300 according to the financial need of the winner.

The THOMAS B. MCCABE ACHIEVEMENT AWARDS, established by Thomas B. McCabe '15, are awarded to freshman men from the Delmarva Peninsula and Northern New England (Maine, New Hampshire, or Vermont) who give promise of leadership. In making selections, the Committee will place emphasis on ability, character, personality, and service to school and community. Two awards, providing a minimum annual grant of \$1,600 or up to \$2,300 depending on need, will be made to residents of Delaware or the Eastern Shore counties of Maryland or Virginia. One award, providing an annual grant of up to \$2,300 depending on need, will be made to a resident of Maine, New Hampshire, or Vermont.

The PHILIP T. SHARPLES SCHOLARSHIP, a four-year scholarship open to entering freshmen, is designed to honor and encourage young men in engineering or physical science. The committee, in making its selections, will have regard for candidates who rank highest in scholarship, character, personality, leadership, and physical vigor. At least one scholarship will be given each year with a maximum grant of \$2,300.

The SCOTT B. LILLY SCHOLARSHIP, endowed by Jacob T. Schless of the Class of 1914 at Swarthmore College, was offered for the first time in 1950. This scholarship is in honor of a former distinguished Professor of Engineering and, therefore, students who plan to major in engineering will be given preference. An award is made annually. The stipend provides a maximum of \$1,500 a year for four years.

The NEWTON E. TARBLE AWARD, established by Newton E. Tarble of the Class of 1913, is granted annually to a freshman man who gives promise of leadership, ranks high in scholarship, character and personality, and resides (but not necessarily attends school) in Coles or Clark County in the State of Illinois. If there are no suitable applicants from Coles or Clark Counties, the committee will consider other applicants from the State of Illinois residing in its capital or south of it. The stipend is set at a minimum of \$1,100 annually for four years, and may exceed this amount, depending on the individual's need.

The AARON B. IVINS SCHOLARSHIP is awarded annually to a young man of the graduating class of Friends Central School, Overbrook, Philadelphia. This scholarship is awarded by the faculty of Friends Central School, and is subject to the approval of Swarthmore College. The fund provides approximately \$1,100 annually.

The HOWARD COOPER JOHNSON SCHOLARSHIP, established by Howard Cooper Johnson '96, provides a stipend of approximately \$750 a year. It is awarded on the basis of all-around achievement to a male undergraduate who is a member of the Society of Friends.

The T. H. DUDLEY PERKINS MEMORIAL SCHOLARSHIP is awarded annually to an entering freshman on the basis of qualities of manhood, force of character and leadership; literary and scholastic ability; physical vigor as shown by

participation in out-of-doors sports or in other ways. It has a maximum value of \$800.

The CHRISTIAN R. AND MARY F. LINDBACK FOUNDATION SCHOLARSHIP provides \$1,500 for the year 1963-64, to be awarded to deserving students from the States of Pennsylvania, New Jersey, Delaware or Maryland.

The WILLIAM G. AND MARY N. SERRILL HONORS SCHOLARSHIP is a competitive Scholarship for Men, awarded to a candidate for admission to the college, based upon the general plan of the Rhodes Scholarships. The annual stipend is \$375. Preference will be given to men who are residents of Abington Township, including Jenkintown and Glenside, Montgomery County, Pa.

The SARAH KAIGHN COOPER SCHOLARSHIP, founded by Sallie K. Johnson in memory of her grandparents, Sarah Kaighn and Sarah Cooper, is awarded to a man in the Junior Class who is judged by the faculty to have had, since entering College, the best record for scholarship, character, and influence. The value of this scholarship is approximately \$225 annually.

The DONALD RENWICK FERGUSON SCHOLARSHIP, established by Mrs. Amy Baker Ferguson, in memory of her husband, Donald Renwick Ferguson, M.D., of the Class of 1912, is awarded to a young man who is looking forward to the study of medicine. The scholarship provides \$600 annually.

The PETER MERTZ SCHOLARSHIP carries a stipend of approximately \$500 a year for four years and is awarded to an entering freshman outstanding in mental and physical vigor, who shows promise of spending these talents for the good of the college community and of the larger community outside. The award was established in 1955 by Harold, LuEsther and Joyce Mertz in memory of Peter Mertz, who was a member of the class of 1957.

The ANTHONY BEEKMAN POOL SCHOLARSHIP. This scholarship, carrying a stipend of \$350 annually, is awarded to an incoming freshman man of promise and intellectual curiosity. It is given in memory of Tony Pool of the Class of 1959.

SCHOLARSHIPS FOR WOMEN

OPEN SCHOLARSHIPS FOR WOMEN. Mr. and Mrs. Daniel S. White, of the Class of 1875, on the occasion of the Fiftieth Reunion of that class, established three open competitive scholarships for women. These scholarships are given to candidates who, in the opinion of the Committee of Award, rank highest in scholarship, character and personality. The amount of the award varying from \$100 to \$2,300 is based upon financial need.

The ALUMNAE SCHOLARSHIP, established by the Philadelphia and New York Alumnae Clubs, is awarded on the same basis as the Open Scholarships. It is awarded for one year.

The ANNIE SHOEMAKER SCHOLARSHIP is granted annually to a young woman of the graduating class of Friends Central School, Overbrook, Philadelphia. This scholarship is awarded by the faculty of Friends Central School, and is subject to the approval of Swarthmore College. The fund earns \$1,200 annually.

The CLARA B. MARSHALL SCHOLARSHIP, established by the will of Dr. Clara B. Marshall, is awarded to a woman at Swarthmore College with preference given to descendants of her grandfathers, Abram Marshall or Mahlon Phillips. The amount of the scholarship is approximately \$800 per year.

The GEORGE K. AND SALLIE K. JOHNSON FUND provides \$750 a year, to be used in granting financial aid during the senior year for young women who are fitted to become desirable teachers.

The MARY COATES PRESTON SCHOLARSHIP FUND. A sum of money has been left by will of Elizabeth Coates, the annual interest of which provides about \$850. This amount is given as a scholarship to a young woman student in Swarthmore College. Preference is given to a relative of the donor.

The HARRIET W. PAISTE FUND provides a scholarship of approximately \$600 a year for a young woman who is a member of the Society of Friends (Philadelphia Yearly Meeting).

The MARY T. LONGSTRETH SCHOLARSHIP was founded by Rebecca C. Longstreth in memory of her mother and is to be awarded annually to assist a young woman student to pursue her studies in the College. The value of this scholarship is approximately \$375 annually.

The JESSIE STEVENSON KOVALENKO SCHOLARSHIP FUND, the gift of Michel Kovalenko in memory of his wife, provides an annual income of \$650. This sum is to be awarded to a student, preferably a woman, who is in her junior or senior year and who is a major in astronomy, or to a graduate of the college, preferably a woman, for graduate work in astronomy at Swarthmore or elsewhere.

The income of the KAPPA ALPHA THETA SCHOLARSHIP FUND, given by members and friends of the Kappa Alpha Theta Fraternity at Swarthmore, is awarded annually to a woman student. The award amounts to approximately \$275 annually.

The MARY WOOD FUND provides approximately \$100 a year and may be awarded to a young woman who is preparing to become a teacher.

SCHOLARSHIPS OPEN TO MEN AND WOMEN

The FRANK AND MARIE AYDELOTTE SCHOLARSHIP is awarded biennially to a new student who shows promise of distinguished intellectual attainment based upon sound character and effective personality. The maximum annual stipend is set at \$1,750, and is renewable for the full period of undergraduate study. The award is made in honor of Frank Aydelotte, President of the College from 1921-1940, and originator of the Honors program at Swarthmore, and of Marie Osgood Aydelotte, his wife.

The CURTIS BOK SCHOLARSHIP was established in the College's Centennial Year 1964 in honor of the late Philadelphia attorney, author and jurist, who was a Quaker and honorary alumnus of Swarthmore. The scholarship is assigned annually to a junior or senior man or woman whose qualities of mind and character indicate a potential for humanitarian service such as Curtis Bok himself rendered and would have wished to develop in young people. Students in any

field of study, and from any part of this country or from abroad, are eligible. The appointment provides a stipend of up to \$2300 annually, depending on need, and is renewable until graduation.

The EDNA POWNALL BUFFINGTON FUND was established during the College's Centennial Year of 1964. The income from this Fund is used to provide scholarships for a student or students attending Swarthmore College who are concentrating their studies in the field of the social sciences and who indicate an interest in the objects or purposes of the American Friends Service Committee and a desire following their graduation and post-graduate work to serve in those fields. Awards are made to students in any of the four classes.

The KATHERINE SCHERMAN SCHOLARSHIP, to be offered for the first time in 1964, is awarded to a student with a primary interest in the arts and the humanities, having special talents in these fields. Students with other special interests, however, will not be excluded from consideration. Awarded in honor of Katherine Scherman Rosin, of the Class of 1938, it is renewable for the full period of undergraduate study, and carries a maximum annual stipend of \$2,300.

The SCOTT AWARD AT SWARTHMORE. A scholarship established by the Scott Paper Co. of Chester, Pa., in honor of its former president, Arthur Hoyt Scott of the Class of 1895. Given for the first time in 1953, it is awarded annually to an outstanding sophomore who plans to enter business after graduation and who demonstrates the qualities of scholarship, character, personality, leadership, and physical vigor. The award provides the recipient with \$1,500 for each of his last two years in college.

The FRANCIS W. D'OLIER SCHOLARSHIP, in memory of Francis W. D'Olier of the Class of 1907, is awarded to a freshman man or woman. In making selections, the committee will place emphasis on character, personality and ability. The amount of the award depends on the applicant's need and will have a maximum value of about \$1,000 a year.

The STELLA AND CHARLES GUTTMAN FOUNDATION SCHOLARSHIPS were established in 1964 by a grant from the Foundation to provide scholarships to defray all or part of the cost of tuition and fees for students who require financial assistance. Preference is given to students of recognized ability who have completed two academic years of college and who are contemplating graduate or professional study. The scholarships are renewable for a second year.

The IDA AND DANIEL LANG SCHOLARSHIP established by their son, Eugene M. Lang of the Class of 1938, provides \$1,000 annually for a man or woman who ranks high in scholarship, character and personality and who has need for financial assistance.

The ADELE MILLS RILEY MEMORIAL SCHOLARSHIP, founded by her husband, John R. Riley, will be awarded for the first time for the academic year 1964-65. Under the provisions of this scholarship, one award carrying a stipend of up to \$1200 annually and subject to renewal will be made to a deserving student, man or woman. Selection will stress the candidate's capacity for significant development of his or her interests and talents during the college years. Quali-

ties of intellectual promise as well as potential for service will be sought in making this appointment.

The LOUIS N. ROBINSON SCHOLARSHIP was established during the College's Centennial year by the family and friends of Louis N. Robinson. Mr. Robinson was for many years a member of the Swarthmore College faculty and founder of the Economics Discussion Group. A member of the junior or senior class who has demonstrated interest and ability in the study of Economics is chosen for this award. The amount of the stipend will vary according to financial need.

The AUDREY FRIEDMAN TROY SCHOLARSHIP, established by her husband, Melvin B. Troy '48, is awarded to a freshman man or woman with preference given to residents of the town of North Hempstead, Nassau County, New York. The scholarship is renewable for four years at the discretion of the College. In awarding the scholarship, prime consideration is given to the ability of the prospective scholar to profit from a Swarthmore education, and to be a contributor to the College and ultimately to society.

The GENERAL MOTORS SCHOLARSHIP provides a stipend of up to \$2,000 depending upon need and is awarded by the Scholarship Committee to an incoming freshman man or woman who is a citizen of the United States. Selection is made on the basis of the high school academic record, participation in extracurricular activities, and evidence of leadership qualities.

The MIDWEST SCHOLARSHIPS, carrying a maximum stipend of \$2,300, are awarded each year to one man and one woman applicant who resides in Illinois, Indiana, Michigan or Wisconsin. Winners will be selected on the basis of their potential contribution to the academic and extracurricular life of the College.

The MARSHALL P. SULLIVAN SCHOLARSHIP FUND, established by Creth and Sullivan, Inc. in memory of Marshall P. Sullivan of the Class of 1897, provides \$1,000 annually for one or more scholarships. Preference will be given to graduates of George School, but if no suitable candidate applies from this school, graduates of other Friends schools or other persons will be eligible.

The RCA SCHOLARSHIP, provided by the Radio Corporation of America, is awarded to a young man or woman who is making a creditable academic record in the field of science or engineering at the undergraduate level. This scholarship provides \$800 a year and the appointment is usually made for the junior or senior year.

The E. HIBBERD LAWRENCE SCHOLARSHIP provides approximately \$700 a year for a scholarship to an incoming freshman man or woman who ranks high in scholarship, character, and personality and who has need for financial assistance.

The EDWARD S. BOWER MEMORIAL SCHOLARSHIP, established by Mr. and Mrs. Ward T. Bower in memory of their son, Class of '42, is awarded annually to a man or woman student who ranks high in scholarship, character, and personality, and who has need for financial assistance. The fund provides \$1,300 per year.

The CORNELIA CHAPMAN PITTINGER SCHOLARSHIP established by her family and friends provides approximately \$1,000 a year for a scholarship to an incoming freshman man or woman who ranks high in scholarship, character and personality and who has need for financial assistance.

The DANIEL UNDERHILL SCHOLARSHIP, given by Daniel Underhill '94, in memory of his grandfather, Daniel Underhill, member of the first Board of Managers, provides \$500 annually for a deserving student in need of financial aid.

The EDWARD CLARKSON WILSON AND ELIZABETH T. WILSON SCHOLARSHIP provides \$500 annually for a deserving student in need of financial aid.

The RACHEL W. HILLBORN SCHOLARSHIP was founded by Anne Hillborn Philips of the Class of 1892 in memory of her mother, with the stipulation that the income shall go to a student in the junior or senior class who is studying for service in the international field. Preference will be given to a Friend or to one who intends to contribute to world understanding through diplomatic service, participation in some international government agency, the American Friends Service Committee, or similar activities. The annual income amounts to approximately \$750.

The JONATHAN K. TAYLOR SCHOLARSHIP, in accordance with the donor's will, is awarded by the Board of Trustees of the Baltimore Monthly Meeting of Friends. This scholarship is first open to descendants of the late Jonathan K. Taylor. Then, while preference is to be given to members of the Baltimore Yearly Meetings of Friends, it is not to be confined to them when suitable persons in membership cannot be found. The fund provides approximately \$675 annually.

The PHEBE ANNA THORNE FUND provides an income of approximately \$3,800 for scholarships for students needing pecuniary assistance whose previous work has demonstrated their earnestness and their ability. This gift includes a clause of preference to those students who are members of the New York Monthly Meeting of Friends.

The WESTBURY QUARTERLY MEETING, N. Y., SCHOLARSHIP, is awarded annually by a committee of that Quarterly Meeting. The fund provides \$325 annually.

The SARAH ANTRIM COLE SCHOLARSHIP was founded by her parents in memory of Sarah Antrim Cole of the Class of 1934. It is awarded to a graduate of the Worthington High School, Worthington, Ohio, or of the North High School, Columbus, Ohio. The scholarship provides a maximum grant of \$500 a year.

The LAFORE SCHOLARSHIP is awarded in memory of John A. Lafore of the Class of 1895. The college in granting this scholarship will give preference to qualified candidates who show need of financial assistance and who are descendants of Amand and Margaret White Lafore. The value of the scholarship is approximately \$500 a year.

The JAMES E. MILLER SCHOLARSHIP. Under the will of Arabella M. Miller approximately \$200 is available annually for students from Delaware County (with preference for residents of Nether Providence Township).

The EDWARD CLARKSON WILSON SCHOLARSHIP. A scholarship has been established at Swarthmore by friends of Edward Clarkson Wilson, '91, formerly Principal of the Baltimore Friends School. It will be awarded each year to a former student of the Baltimore Friends School, who has been approved by the faculty of the school, on the basis of high character and high standing in scholarship.

The CHI OMEGA SCHOLARSHIP provides an award of approximately \$325 annually to a member of the freshman class who is in definite need of financial aid. Preference is given to daughters or sons of members of the fraternity.

The DELTA GAMMA SCHOLARSHIP provides an annual income of approximately \$165. This sum is to be awarded to a blind student at Swarthmore College in need of financial assistance. In any year in which there is no such candidate the fund may be awarded to a freshman woman.

The KAPPA KAPPA GAMMA SCHOLARSHIP provides an award of approximately \$350 annually to a member of the freshman class who is in need of financial aid. Preference is given to relatives of members of the fraternity.

The SAMUEL WILLETS FUND. This fund provides an annual income of approximately \$8,700 for scholarships. A portion of the fund is assigned for scholarships in the name of Mr. Willets' children, Frederick Willets, Edward Willets, Walter Willets, and Caroline W. Frame.

The I. V. WILLIAMSON SCHOLARSHIP. These scholarships provide an income of about \$2,000 annually. Preference is given to graduates of Friends Central, George School, New York Friends Seminary, Baltimore Friends School, Wilmington Friends School, Moorestown Friends School, Friends Academy at Locust Valley, Sidwell Friends School and Brooklyn Friends School.

The income from each of the following funds is awarded at the discretion of the college to students needing financial aid:

The BARCLAY G. ATKINSON SCHOLARSHIP FUND.

The REBECCA M. ATKINSON SCHOLARSHIP FUND.

The CLASS OF 1913 SCHOLARSHIP FUND.

The CLASS OF 1914 SCHOLARSHIP FUND.

The CLASS OF 1915 SCHOLARSHIP FUND.

The CLASS OF 1917 SCHOLARSHIP FUND.

The WILLIAM DORSEY SCHOLARSHIP FUND.

The GEORGE ELLSLER SCHOLARSHIP FUND.

The JOSEPH E. GILLINGHAM FUND.

The THOMAS L. LEEDOM SCHOLARSHIP FUND.

The SARAH E. LIPPINCOTT SCHOLARSHIP FUND.

The MARK E. REEVES SCHOLARSHIP FUND.

The FRANK SOLOMON MEMORIAL SCHOLARSHIP FUND.

The MARY SPROUL SCHOLARSHIP FUND.
The HELEN SQUIER SCHOLARSHIP FUND.
The FRANCIS HOLMES STROZIER MEMORIAL SCHOLARSHIP FUND.
The JOSEPH T. SULLIVAN SCHOLARSHIP FUND.
The DEBORAH F. WHARTON SCHOLARSHIP FUND.
The THOMAS WOODNUT SCHOLARSHIP FUND.

LOAN FUNDS

Swarthmore participates in the federal loan program established under the National Defense Education Act. The College also maintains special loan funds which are listed below. Students in good standing who do not receive sufficient scholarship assistance to meet financial need are encouraged to apply for loans through the financial aid officer. Repayment of College loans begins one year after the student completes his higher education and are repayable within the next eleven years. The loans bear annual interest of 3% on the unpaid balance beginning with the date on which repayment is to begin. Amounts vary according to need, although the College believes that students should avoid heavy indebtedness which might prove detrimental to their own plans. The amount of a loan may not exceed \$1,000 annually. For the year 1964-65 the College has made approximately 70 loans in amounts averaging about \$500.

SPECIAL LOAN FUNDS

The CLASS OF 1916 LOAN FUND.
The CLASS OF 1920 LOAN FUND.
The CLASS OF 1936 LOAN FUND.
The JOHN A. MILLER LOAN FUND.
The PAUL M. PEARSON LOAN FUND.
The ELLIS D. WILLIAMS FUND.
The SWARTHMORE COLLEGE STUDENT LOAN FUND.

STUDENT EMPLOYMENT affords opportunity to earn money by regular work at current wage rates in the dining room, offices, laboratories or libraries. A student may hold a college job in addition to a scholarship or a grant-in-aid. The distribution of jobs among those authorized to hold them is made by the Student Employment office. Residents of the borough of Swarthmore often send requests for services to the college, which cooperates in making these opportunities known to students. About one-third of the students enrolled in college obtain employment regularly through the office. Earnings are restricted by the time a student can spend, though many students earn as much as \$200-\$300 during the college year, and some earn up to \$500.

Educational Resources

The primary educational resources of any college are the quality of its faculty and the spirit of the institution. Second to these are the physical facilities, in particular the libraries, laboratories and equipment.

Laboratories, well equipped for undergraduate instruction and in some cases for research, exist in physics, chemistry, zoology, botany, psychology, astronomy, and in civil, mechanical and electrical engineering. The Sproul Observatory, with its 24-inch visual refracting telescope, is the center of much fundamental research in multiple star systems. The Edward Martin Biological Laboratory provides exceptional facilities for work in psychology, zoology, botany, and pre-medical studies. The Pierre S. du Pont Science Building, completed in 1960, provides superior accommodations for chemistry, mathematics, and physics. Beardsley and Hicks Halls contain the engineering laboratories. The Bartol Research Foundation of the Franklin Institute, which is also located on the campus, enjoys an international reputation for its basic research activities in physics, particularly in the fields of nuclear physics, cosmic radiation, and solid state physics.

The SWARTHMORE COLLEGE LIBRARY, in part the gift of Andrew Carnegie, contains reading rooms, offices and a collection of 232,000 volumes. Some 8,400 volumes are added annually. About 1,235 periodicals are received regularly. The general collection, including all but the scientific and technical books and journals, is housed in the library building, situated on the front campus. An addition providing storeroom for 150,000 volumes was erected in 1935. The duPont Science Library, new in 1960, houses some 21,000 books and journals in chemistry, engineering, mathematics and physics. The library is definitely a collection of books and journals for undergraduate use. The demands of Honors work, however, make necessary the provision of large quantities of source material not usually found in collections maintained for undergraduates. It is a point of library policy to try to supply, either by purchase or through inter-library loan, the books needed by students or members of the faculty for their individual research.

In addition, the library contains certain special collections—the British Americana collection, the Wells Wordsworth and Thomson collections, and a collection of the issuances of 561 private presses.

A number of special features enrich the academic background of the college. Among these are the following:

The BIDDLE MEMORIAL LIBRARY is an attractive fireproof structure of stone and steel given by Clement M. Biddle, '96, in memory of his father, Clement M. Biddle, who served for over twenty years as a member of the Board of Managers or as an officer of the Corporation of the College. This building houses the Friends Historical Library, which includes the Swarthmore College Peace Collection.

The FRIENDS HISTORICAL LIBRARY, founded in 1871 by Anson Lapham, is one of the outstanding collections in the United States of manuscripts, books, pamphlets, and pictures relating to the history of the Society of Friends. The library is a depository for records of Friends Meetings belonging to Philadelphia Yearly Meeting. More than 1,900 record books have been deposited; many of them have been reproduced on microfilm, for which three reading machines are available. The William Wade Hinshaw Index to Quaker Meeting Records indexes the material of genealogical interest in the records of 307 meetings in various parts of the United States. Notable among the other holdings are the Whittier Collection (first editions and manuscripts of John Greenleaf Whittier, the Quaker poet), the Mott Manuscripts (over 400 autograph letters of Lucretia Mott, antislavery and women's rights leader), and the Hicks Manuscripts (more than 300 letters of Elias Hicks, a famous Quaker minister). The Library's collection of books and pamphlets by and about Friends numbers approximately 20,000 volumes. About 136 Quaker periodicals are currently received. There is also an extensive collection of photographs of meeting houses and pictures of representative Friends. It is hoped that Friends and others will consider the advantages of giving to this Library any books and family papers which may throw light on the history of the Society of Friends.

The SWARTHMORE COLLEGE PEACE COLLECTION is of special interest to research students and others seeking the records of the Peace Movement. The personal papers of Jane Addams of Hull House, Chicago, (approximately 10,000 items) formed the original nucleus of the Collection, which now contains documentation on the history of the organized peace movement from its beginnings *circa* 1815, to the present time, as well as correspondence and writings of many workers for international peace and arbitration. The Collection includes files of some 750 peace periodicals published in the United States and abroad over the past 140 years; approximately 130 such periodicals in eleven languages are currently received from twenty-five countries. This collection is the official depository for the archives of the leading peace organization in the United States. A more complete description of the Collection will be found in the *Guide to the Swarthmore College Peace Collection*, published by the College and available for loan on request.

The WILLIAM J. COOPER FOUNDATION provides a varied program of lectures and concerts which enriches the academic work of the college. The Foundation was established by William J. Cooper, a devoted friend of the college, whose wife, Emma McIlvain Cooper, served as a member of the Board of Managers from 1882 to 1923. Mr. Cooper bequeathed to the college the sum of \$100,000 and provided that the income should be used "in bringing to the college from time to time eminent citizens of this and other countries who are leaders in statesmanship, education, the arts, sciences, learned professions and business, in order that the faculty, students and the college community may be broadened by a closer acquaintance with matters of world interest." Admission to all programs is without charge.

The Cooper Foundation Committee works with the departments and with student organizations in arranging single lectures and concerts, and also in

bringing to the college speakers of note who remain in residence for a long enough period to enter into the life of the community. Some of these speakers have been invited with the understanding that their lectures should be published under the auspices of the Foundation. This arrangement has so far produced sixteen volumes:

Lindsay, Alexander Dunlop. *The Essentials of Democracy*. Philadelphia, University of Pennsylvania Press, 1929.

Lowes, John Livingston. *Geoffrey Chaucer and the Development of His Genius*. New York, Houghton Mifflin Co., 1934.

Weyl, Hermann. *Mind and Nature*. Philadelphia, University of Pennsylvania Press, 1934.

America's Recovery Program, by A. A. Berle, Jr., John Dickinson, A. Heath Onthank . . . and others . . . London, New York, etc., Oxford University Press, 1934.

Salter, Arthur S., baron. *World Trade and Its Future*. Philadelphia, University of Pennsylvania Press, 1936.

Madariaga, Salvador de. *Theory and Practice in International Relations*. Philadelphia, University of Pennsylvania Press, 1937.

Streit, Clarence Kirshman. *Union Now; a Proposal for a Federal Union of the Democracies of the North Atlantic*. New York, Harper, 1939.

Krogh, August. *The Comparative Physiology of Respiratory Mechanisms*. Philadelphia, University of Pennsylvania Press, 1941.

Griffith, Ernest Stacey. *The Modern Government in Action*. New York, Columbia University Press, 1942.

Linton, Ralph. *The Cultural Background of Personality*. New York, London, D. Appleton-Century Co., 1945.

Wilcox, Clair, Editor. *Civil Liberties Under Attack*. A series of lectures given in 1950-51. Philadelphia, University of Pennsylvania Press, 1951.

Redfield, Robert. *Peasant Society and Culture; An Anthropological Approach to Civilization*. Chicago, The University of Chicago Press, 1956.

Weatherford, Willis D., Jr., Editor. *The Goals of Higher Education*. A series of lectures given in the spring of 1958. Cambridge: Harvard University Press, 1960.

Lovejoy, Arthur Oncken. *Reflections on Human Nature*. Baltimore: Johns Hopkins University Press, 1961.

Rhys, Hedley H., Editor. *Seventeenth Century Science and the Arts*, Princeton: Princeton University Press, 1962.

Brandt, Richard B., Editor. *Social Justice*. Englewood Cliffs: Prentice-Hall, 1962.

THE ARTHUR HOYT SCOTT HORTICULTURAL FOUNDATION. About three hundred acres are contained in the College property, including a large tract of woodland and the valley of Crum Creek. Much of this tract has been developed as an horticultural and botanical collection of trees, shrubs and herbaceous plants through the provisions of the Arthur Hoyt Scott Horticultural Foundation, established in 1929 by Mrs. Arthur Hoyt Scott and Owen and Margaret Moon as a memorial to Arthur Hoyt Scott of the Class of 1895. The plant collections are designed both to afford examples of the better kinds of trees, shrubs and herbaceous plants which are hardy in the climate of Eastern Pennsylvania and suitable for planting by the average gardener, and to beautify the campus. There are exceptionally fine displays of Japanese cherries, flowering crab apples and tree peonies, and a great variety of lilacs, rhododendrons, azaleas, daffodils, iris, herbaceous peonies, hemerocallis and chrysanthemums. Many donors have contributed generously to the collections. (For full information see *Bulletin of Swarthmore College*, Vol. xxxvii, No. 5.)

THE ARTS CENTER, opened in 1961, contains the Paul M. Pearson Experimental Theater, the Florence Wilcox Lobby for art exhibitions, the Dorothy Hunt Music Room, and studios for various arts and crafts. The Class of 1910 Room provides suitable quarters for student government, and other rooms are provided for student publications and other extra-curricular activities.

THE BRONSON M. CUTTING MEMORIAL COLLECTION OF RECORDED MUSIC was established at Swarthmore College in 1936 by a gift of approximately four thousand phonograph records, a radio-phonograph, books and musical scores, from the family of Bronson Murray Cutting, late Senator from New Mexico. Its object is to make the best recorded music available to the undergraduates, faculty, and friends of Swarthmore College, in cooperation with the work of the college Department of Music. The collection is kept up to date with current additions.

THE BENJAMIN WEST LECTURE, made possible by gifts from members of the class of 1905 and other friends of the College, is given annually on some phase of art. It is the outgrowth of the Benjamin West Society which built up a collection of paintings, drawings, and prints, which are exhibited, as space permits, in the college buildings. The lecture owes its name to the American artist, who was born in a house which stands on the campus and who became president of the Royal Academy.

THE POTTER COLLECTION OF RECORDED LITERATURE, established in 1950 with accumulated income from the William Plummer Potter Public Speaking Fund, includes a wide variety of recorded poetry, drama and prose. Among the 700 titles on disc and tape are contemporary writers reading from and discussing their works; full length versions of Shakespearean plays and other dramatic repertoire; the literature of earlier periods read both in modern English and in the pronunciation of the time; British and American ballads; lyrical verse in musical settings; and recordings of literary programs held at Swarthmore. These materials are used as adjuncts to the study of literature. They are made

available at regular hours to all members of the college community by a student committee which administers the Potter Room in Bond, where most of the collection and the amplifiers are housed. The Department of English Literature is in charge of the collection and selects current additions.

The BETTY DOUGHERTY SPOCK MEMORIAL FUND, established through the generosity of friends of the late member of the Class of 1952, provides income for the purchase of dramatic recordings. These are kept in the Potter Room.

College Life

HOUSING

Swarthmore is primarily a residential college, conducted on the assumption that an important element in education comes from close association of students and instructors. Most students live in dormitories. Many members of the faculty live on or near the campus.

Residence Halls

There are seven dormitories for men: Wharton Hall, named in honor of its donor, Joseph Wharton, at one time President of the Board of Managers, Palmer, Pittenger and Roberts Halls on South Chester Road, Ashton House on Elm Avenue, and two buildings on the former Mary Lyon School property.

The women's dormitories include the upper floors in the wings of Parrish Hall; Worth Hall, the gift of William P. Worth, '76, and J. Sharples Worth, '73, as a memorial to their parents; Robinson House; Woolman House; and Willets Hall, largely made possible by a bequest from Phebe Seaman, '19, and named in honor of her mother and aunts.

All freshmen are assigned to rooms by the Deans. Other students choose their rooms in an order determined by lot. Special permission must be obtained for a room outside the dormitories.

Students may occupy college rooms during vacations only by special arrangements with the Deans and payment of the required fee. Freshmen, sophomores and juniors are asked to leave college immediately after their last examination in the spring so that their rooms may be used by Commencement visitors.

The insurance program for the College is designed to provide protection for College property and does not include the property of students or others. It is therefore suggested that students and their parents should review their insurance programs in order to be sure that coverage is extended to include personal effects while at college.

Dining Rooms

All students, both men and women, have their meals in the Philip T. Sharples Dining Hall. The dining hall is closed during all vacations.

RELIGIOUS LIFE

The religious life of the college is founded on the Quaker principle that the seat of spiritual authority lies in the Inner Light of each individual. The Society of Friends is committed to the belief that religion is best expressed in the quality of everyday living. There are accordingly no compulsory religious exercises, save in so far as the brief devotional element in Collection may be considered. Students are encouraged to attend the churches of their choice.

Episcopal, Presbyterian, Methodist, and Christian Science churches are located in the borough of Swarthmore; other churches and synagogues in the nearby towns of Morton, Media, Chester, and Springfield. The Swarthmore Meeting House is located on the campus. Students are cordially invited to attend its meeting for worship on Sunday. Extracurricular groups with faculty cooperation exist for the study of the Bible and the exploration of common concerns in religion.

COLLECTION

An assembly of the college, called Collection, is held at 10:00 a.m. every Thursday in Clothier Memorial; attendance of students is required. There is regularly a period of silence according to the Friendly tradition and a reading. Lasting from one-half to three-quarters of an hour, Collection normally includes an address; but this is varied by the occasional introduction of musical, dramatic, and other programs.

STUDENT WELFARE

Health

The college physician holds daily office hours at the college, where students may consult him without charge. A student must report any illness to the college physician, but is free to go for treatment to another doctor if he prefers to do so.

At the time of admission each student must present a brief medical history and health certificate, prepared by the family physician on a form supplied by the college. Pertinent information about such matters as physical reserve, unusual medical episodes, severe allergies, or psychiatric disturbances will be especially valuable to the college Health Service. All new students must have been successfully vaccinated against smallpox within five years, in accordance with Pennsylvania State law.

The college physician gives physical examinations to all students at the beginning of each year. There is close cooperation with the Departments of Physical Education. Recommendations for limited activity are made for those students with physical handicaps. In some cases a student may be excused entirely from the requirements of the Physical Education Department.

There are two infirmaries, one for men and one for women. The infirmary for men is in Section F of Wharton Hall; the women's infirmary is in Parrish Hall. Registered nurses are on duty in each, under the direction of the college physician.

Each student is allowed ten days care in the infirmaries per term without charge unless the services of a special nurse are required. After ten days, a charge of \$3.00 per day is made. Students suffering from a communicable disease or from illness which makes it necessary for them to remain in bed must stay in the infirmary for the period of their illness. Ordinary medicines are furnished without cost, but a charge is made for special medicines, certain immunization procedures, and transportation.

The medical and infirmary facilities of the college are available to students injured in athletic activities or otherwise, but the college cannot assume addi-

tional financial responsibility for medical and surgical expenses arising from accidents. Accident insurance coverage is, therefore, required for all students participating in athletics and is recommended for all others. (For details see p. 33.)

The college psychiatric consultants hold office hours by appointment each week. The purpose of this service is to be of help in all types of emotional problems and three visits are offered without charge.

Vocational Advising

The college provides vocational information and advice to assist students in their choice of a career. Conferences and field trips are planned periodically and interviews are arranged with prospective employers. Help is offered to students in finding employment. In addition, summer work opportunities are made known to students.

Alumni Office

The Alumni Office keeps records of the addresses of all living graduates and alumni of the college. It helps edit the Swarthmore alumni magazine, and acts as liaison for the college with all alumni and alumni groups, interpreting to them the present plans and policies of the college.

News Office

The News Office does a two-fold job. It helps prepare the several publications put out by the college known as Swarthmore College Bulletins. These include the alumni magazine, the President's Report, the Catalogue, the Student Handbook, and other miscellaneous issues. In addition to this, the News Office, through the largely student operated News Bureau, works with the press and other communications media in publicizing news that is of interest to the general public.

Student Advising

The Deans and their assistants hold the primary responsibility for advising all students. However, there are many other advisers available.

Each freshman is assigned to a faculty member who acts as his course adviser until this responsibility falls to the chairman of the student's major department at the end of his sophomore year. Faculty members have also been appointed as advisers for each of the men's varsity athletic teams. They work closely with the team, attending practices and many of the scheduled contests.

Each women's dormitory has a head resident. In Parrish and Willets, the head resident is assisted by two student residents who are members of the senior class.

A group of upperclass women, under the direction of the Women's Student Government Association, serve as counselors for all freshman women, several

counselors being assigned to each hall. There are also student proctors in each of the men's dormitory sections. A group of students cooperate with proctors and counselors in helping the Deans with the orientation program conducted during the freshman week.

THE STUDENT COMMUNITY

Student Conduct

The Society of Friends has historically been conservative in social matters, and its influence within the College community is one of the important factors in making Swarthmore what it is. Students who choose Swarthmore as their college should recognize that they are selecting a set of social and academic standards that are intrinsic to the history and point of view of this institution. In general, the life of students is to be governed by good taste and accepted practice rather than by elaborate rules. Certain rules, however, are of sufficient importance to deserve attention here:

1. The men's and women's dormitories are not to be visited by members of the opposite sex except under the following conditions: Visiting is permitted in the public parlors between certain specified hours; open houses on certain Saturday or Sunday afternoons may be scheduled according to the rules established by the Student Affairs Committee.

2. The possession and use of alcoholic beverages on the campus is forbidden, as is disorderly conduct.

3. The use or possession of firearms or other dangerous weapons is not permitted. Firecrackers or other explosives are prohibited. Tampering with fire alarm or prevention equipment is a serious offense.

4. No undergraduate may maintain an automobile while enrolled at the College without the permission of the Dean of Men. This permission is not extended to freshmen. The administration of this rule is in the hands of a Student-Faculty committee which authorizes cars for the use of student organizations and in some cases for special needs such as jobs dependent upon cars. Day students may use cars for commuting to College, but special arrangements for stickers must be made for campus parking. More detailed information may be had from the office of the Deans.

5. At evening concerts or dramatic performances or public lectures men will wear coats and ties and women dresses or skirts. At the evening meal and Sunday noon dinner in the dining room the same standards will apply except that it is recommended that the men wear coats and ties but not required so long as the dress is in other respects consistent with the spirit of these regulations.

6. It is a college policy to discourage premature marriages by ruling that if two undergraduates marry, only one may remain in college. Some exceptions have been provided in the case of upperclass students and information about them may be obtained from the Office of the Deans.

College rules which affect the entire student community are discussed and formulated for the approval of the Administration by the Student Affairs Com-

mittee, which is composed of Deans and Faculty members appointed by the President and students appointed by the Student Council. This Committee delegates to student government agencies as much authority in the administration of rules as they responsibly accept.

Student Council

The semi-annually elected Student Council represents the entire undergraduate community and is the chief body of student government. Its efforts are directed toward coordination of student activities and the expression of student opinion.

Committees of the Council include the Budget Committee, which regulates distribution of funds to student groups; the Elections Committee, which supervises procedure in campus elections; and the Social Committee, see below. The Curriculum Committee cooperates with a similar committee of the faculty in the discussion of matters relating to the academic program of the college. In addition to these, there are several joint Faculty-Student Committees, whose student membership is appointed by the Council: Collection, Cooper Foundation, Men's Athletics, Admissions Policy, and Student-Faculty Relations.

Judicial Bodies

Where infractions of college rules have occurred, decisions about responsibility and about penalties are made by elected committees. Four such committees have different jurisdictions. The *Women's Judiciary Committee* is a branch of WSGA and is elected by the women of the student body. It sits in all cases of violations of WSGA rules or of violations by women of general campus regulations except as they fall in the sphere of the Student Judiciary Committee (see below). The *Men's Judiciary Committee* is elected by the male students and sits in all cases of violations of college rules by male students except in the kinds of cases indicated below as coming under the jurisdiction of the Student Judiciary Committee. The *Student Judiciary Committee*, elected by the entire student body, acts on cases involving the car rule, dress rule, on cases involving both men and women, and on others that may require joint action. The *College Judiciary Committee* is composed of student and faculty members and the Deans. It deals with cases referred or appealed from the other Committees or with any violations that involve penalties of suspension or expulsion.

Women's Student Government

All women students are members of the Women's Student Government Association, headed by an Executive Board elected to promote a great variety of women's interests. This board includes the officers of the Association, the hall presidents and the chairman of the Women's Judiciary Committee, which maintains social regulations.

Social Committee

An extensive program of social activities is managed by the Social Committee appointed by the Student Council. The program is designed to appeal to a wide variety of interests, and is open to all students. At no time is there any charge for college social functions.

Extra-Curricular Activities

In addition to the foregoing organizations, Swarthmore students have an opportunity to participate in a program of extra-curricular activities wide enough to meet every kind of interest. There are more than thirty-five organized activities, not including departmental clubs or political organizations. They vary as greatly as the interests of the students vary, from the Flying Club to the Chess Club, from the Creative Writing Group to the Co-ed Dance Group. No credit is given for work in such varied fields as sculpture, acting, publishing the college newspaper or playing in the orchestra. The College, however, encourages a student to participate in whatever activity best fits his personal talents and inclinations, believing that satisfactory avocations are a necessary part of life.

The Director of Arts and Crafts, Mrs. Harriet Baguskus, arranges for classes in applied arts and for exhibits in the Arts Center, and acts as an adviser to other organizations. Miss Carol Thompson, Director of Dramatics, guides the activities of the Little Theater Club, which include at least two major performances, a one-act play contest, and student directed programs of an experimental nature. Many other student groups for the discussion of public affairs, the integration of the sciences, and the editing of college publications conduct their own programs with occasional advice from the faculty.

Extra-curricular musical activities at Swarthmore are numerous and well-supported. The college chorus is led by Professor Swing, and the college orchestra by Professor Spies. There are chamber music groups, madrigal groups, and public performances of the musical works of students in composition. There are facilities for private practice, and an excellent college record collection. The Cooper Foundation presents a distinguished group of concerts each year on the campus, and student tickets are available for concerts of the Philadelphia Orchestra in the Academy of Music.

Athletics

Swarthmore's athletic policy is based on the premise that any intercollegiate program must be justified by the contribution which it can make to the educational development of the individual student who chooses to participate. In keeping with this fundamental policy, Swarthmore's athletic program is varied and extensive, offering every student a chance to take part in a wide range of sports. The College feels that it is a good thing to have as many students as possible competing on its intercollegiate teams.

Fraternities

There are five fraternities at Swarthmore; Delta Upsilon and Phi Sigma Kappa are affiliated with national organizations while Kappa Sigma Pi, Tau Alpha Omicron and Phi Beta Psi are local associations. Fraternities are adjuncts to the college social program and maintain separate lodges on the campus. The lodges do not contain dormitory accommodations or eating facilities. New members are pledged during the late fall of their first year at the college. In recent years about

40% of the freshman men have decided to affiliate with one of the five fraternities.

Student Activities Bulletin

A booklet describing more fully all these activities and many others can be had upon request from the Office of Admissions.



**THE
EDUCATIONAL PROGRAM
OF
SWARTHMORE COLLEGE**

General Statement

Swarthmore College offers the degree of Bachelor of Arts and the degree of Bachelor of Science. The latter is given only in the Division of Engineering; the former, in the Divisions of the Humanities, the Social Sciences, and the Natural Sciences.* Eight semesters of resident study, which are normally completed in four years, lead to a Bachelor's degree.

The selection of a program will depend upon the student's interests and vocational plans. Programs in engineering, pre-medical courses, and chemistry, for example, are the usual preparation for professional work in these fields. Students planning a career in law, business, or government service find majors in the humanities or social sciences of great value.

The purpose of a liberal education, however, is not primarily to provide vocational instruction, even though it provides the best foundation for one's future vocation. Its purpose is to help students fulfill their responsibilities as citizens and grow into cultivated and versatile individuals. A liberal education is concerned with our cultural inheritance, the world of thought, and the development of aesthetic, moral, and spiritual values.

It is necessary for most students to concern themselves with the problem of making a living. But this concern should not lead them to a specialization that is too early and too narrow. They still have need of broadening the scope of their experience. Particular skills may afford readier access to routine employment, but positions of greater responsibility will be occupied by those who are equipped to think their way through new problems and to conceive of their functions in a larger context of time and place. Liberal education and vocational training may be the joint products of a common process, and the courses here offered should be selected with this large purpose in view.

All students during the first half of their college program are expected to complete the general college requirements, to choose their major and minor subjects, and to prepare for advanced work in these subjects by taking certain prerequisites. The normal program consists of five courses each semester during the freshman and sophomore years, chosen by the student in consultation with his course adviser. A student is permitted to take four instead of five courses, however, during two of the four semesters, or to withdraw from one course before the middle of the semester (if he is taking five) with the approval of his course adviser. He will therefore complete from eighteen to twenty half courses (semester courses) during his first two years.

The program for upper class students affords a choice between two methods of study: Honors Work, leading to a degree *with Honors*, and General Courses. An Honors student concentrates on three related subjects which he normally studies by the seminar method. At the end of his senior year he must take a

* For groupings of departments, see page 20.

battery of eight examinations on the work of his seminars, set by outside examiners. (The system will be explained more fully below.)

A student in general courses has a somewhat wider freedom of election and takes four full courses or their equivalent in each of the last two years. At the end of his senior year he is required to pass a comprehensive examination given by his major department.

The program for engineering students follows a similar basic plan, with certain variations which are explained on page 86. Courses outside the technical fields are spread over all four years.

In addition to scholastic requirements for graduation, all students must meet certain standards of participation in Physical Education as set forth in the statement of those departments (see pp. 131-133) and must attend the Collection exercises of the college (see p. 48).

The course advisers of freshmen and sophomores are members of the faculty appointed by the Dean. For juniors and seniors the advisers are the chairmen of their major departments or their representatives.

Program for Freshmen and Sophomores

The curriculum of the first two years introduces a student to the methods and content of a variety of fields important to a liberal education. To this end the student chooses a part of his program in each of four groups of courses and in addition meets a specified standard in a foreign language.

I. From the four groups listed below the student chooses work in at least six departments while meeting the specific requirements in each group. No more than two half courses in any department may be counted toward fulfillment of this distribution requirement.

1. Two half-courses (or one year course) from the following: Astronomy 1-2; Biology 1-2; Chemistry 1,2; Physics 1,2; Chemistry-Physics 7-8 (Concepts and Theories in Physical Science). See note below.
2. Two half-courses from the following: English Literature 1; English Literature 3-4; all literature courses numbered 11, 12 in classical or modern foreign languages; Fine Arts 1,2; Music 1,2.
3. Three half-courses from the following: History 1-2; History 4,5; Philosophy 1 which may be followed by another course in Philosophy or Religion; Psychology 1,2.
4. Two half courses (one year course) from the following: Economics 1-2; Political Science 1-2.

II. Languages. All students except those majoring in Engineering must include in their programs sufficient work in a modern or classical language to

Note: Full courses the numbers of which are joined by a hyphen (e.g., 1-2) must be continued for the entire year; credit is not given for the first semester's work only. Those whose numbers are separated by a comma (e.g., 1,2) may be divided; credit is given separately for each half of the course.

complete course 4 or its equivalent. The language requirement may be met in whole or in part by secondary school preparation as measured by the appropriate achievement test of the College Entrance Examination Board, or by a placement examination given at the college by the appropriate department. The desired standard is normally met on the basis of four years work in high school, or of three or two years work in high school followed by one or two semesters in college.

At the discretion of the department concerned, a student may be permitted to substitute an advanced course for the introductory course in meeting one of the distribution requirements. Students entering college with special preparation in any of the subjects included in the distribution requirements may apply to the Committee on Academic Requirements for exemption from that requirement.

A student who majors in the Natural Sciences, Mathematics, or Engineering will take an appropriate mathematics course in the freshman year. He may omit one half-course from the distribution requirements.

No student may take more than four half-courses (or two year-courses) in any one department during the first two years. Applications for exceptions in unusual cases may be made to the Committee on Academic Requirements.

In addition to the requirements listed above, prerequisites must be completed for the work of the last two years in major and minor subjects, and sufficient additional electives must be taken to make up a full program.

It is expected that, after satisfying the requirements in the general program of the first two years, the student will devote the remainder of his sophomore year to preparing himself for more advanced study of those subjects which have most interested him and to other courses which will increase the range of his knowledge. He should decide, as early in his sophomore year as possible, upon two or three subjects in which he might like to major and should consult the statements of the departments concerned as to required and recommended courses and supporting subjects.

Physical education is required of all students (except veterans) in the first two years. The requirements are stated in full on p. 66 and in the statements of the departments of Physical Education.

Program for Juniors and Seniors

WORK IN COURSE

The work of juniors and seniors in Course includes some intensive, specialized study within a general area of interest. This comprises enough work in a single department (designated as a "major") to make an equivalent of four full courses. Work taken during the first two years may be counted toward fulfillment of the major requirements but not more than six full courses or twelve half courses may be taken in the major field. Before graduation the student must pass a comprehensive examination in his major subject.

A student must choose his major subject at the end of the sophomore year, and apply formally through the Registrar to be accepted by the division concerned. The decision will be based on an estimate of his ability in his major subject as well as on his record. If a student does not secure divisional approval, he cannot be admitted to the junior class.

A student's course adviser during his junior and senior years is the chairman of his major department (or a member of the department designated by the chairman) whose approval he must secure for his choice of courses each semester.

In addition to major and recommended supporting subjects, juniors and seniors usually have room for at least one elective a year.

The faculty may award the bachelor's degree with Distinction to students who have done distinguished work in the course program.

READING FOR HONORS

The Honors Program, initiated in 1922 by President Frank Aydelotte, is a distinctive part of Swarthmore's educational life. It seeks to free from the limitations of classroom routine those students whose maturity, interest, and capacity suit them for independent work. While the program is designedly flexible and responsive to new needs, it has been characterized from the beginning by three basic elements, which taken together may be said to be the essence of the system.

(1) Honors work involves a concentration of the student's attention during his last two years upon a limited and integrated field of studies. He pursues only two subjects during a semester, thereby avoiding the fragmentation of interest that may result from a program of four or more courses with their daily assignments and frequent examinations. The content of the subject matter field is correspondingly broader, permitting a wide range of reading and investigation and demanding of the student correlations of an independent and searching nature.

(2) Honors work frees the student from periodic examinations, since his thinking is under continual scrutiny by his classmates and instructors. By this program he undertakes to subject himself at the end of two years of Honors work to examinations in all of the eight fields studied. In these he is expected to demonstrate his competence in a field of knowledge rather than simply his mastery of those facts and interpretations which his instructor has seen fit to present. These examinations, consisting of a three-hour paper in each field, are set by examiners from other institutions who read the papers and then come to the campus to conduct an oral examination of each student, in order to clarify and enlarge the basis of their judgment of his command of his material.

(3) Honors work is customarily carried on in seminars of seven students or less or in independent projects leading to a thesis. Seminars meet once a week, in many cases in the home of the instructor, for sessions lasting three hours or more. The exact technique of the seminar varies with the subject matter, but its essence is a cooperative search for truth, whether it be by papers, discussion, or laboratory experiment. Each student has an equal responsibility for

the assimilation of the whole of the material and is correspondingly searching in his scrutiny of ideas presented by his fellows or by his instructor. The student is expected to devote half of his working time during a semester to each of his fields of study.

In practice three avenues toward an Honors degree are open:

(1) The standard program consists of eight subjects studied during the last four semesters leading to examinations by the visiting examiners. In the Division of the Natural Sciences where there is a heavy burden of prerequisite courses, the student may offer as few as six fields for examination, subject to the approval of the division. The Divisions of the Humanities and of the Social Sciences allow seven examinations instead of eight only in cases of clear hardship (as in the case of some transfer students); they do not allow such remission in order to permit the student to pursue work of elementary or intermediate level in Course or to accommodate some unrelated subject in his program.

(2) Students who have a special reason to study for one or two semesters abroad or in another American institution must take the normal number of examinations prescribed by their divisions. Such programs must be worked out in advance, since it may not be possible to provide visiting examiners for work offered elsewhere and since instruction in some fields of the student's choice may not be available in the other institution. In general the student following this avenue to an Honors degree must weigh carefully the advantage of working independently or under tutorial guidance against the loss he incurs by missing both the stimulus and the criticism provided by his fellows in seminar.

(3) Students who at the end of the sophomore year did not elect or were not permitted to read for Honors, but whose work has subsequently shown distinction may be encouraged to take the regular Honors examinations so that they may receive the degree of Honors recommended by the visiting examiners. They shall receive no remission of the number of examinations by reason of their preparation in Course but shall be subject to the regulations governing Honors programs of the division concerned. Such students must before the end of the seventh semester petition the division for permission to take the Honors examinations and must submit an acceptable list of examinations which they are prepared to take.

The normal pattern in Honors programs is four seminars (or examinations) in the major department and two in each of two minor departments. No student is allowed more than four seminars in his major; in those cases where he offers three seminars in each of two fields, one must be designated as his major. While there is a general belief that two seminars in a minor field are desirable because of the mutual reinforcement they provide, there are by custom certain seminars which are allowed to stand alone. Thus there is a considerable flexibility in Honors programs, each being subject to the scrutiny of the departments and divisions in which the work is done.

A candidate for admission to Honors should consult the chairmen of his prospective major and minor departments during the second semester of his sophomore year and work out a program for the junior and senior years. This proposed program must be filed in the office of the Registrar who will forward it to the divisions concerned. The acceptance of the candidate by the divisions depends in part upon the quality of his previous work as indicated by the grades he has received but mainly upon his apparent capacity for assuming the responsibility of Honors work. The names of the accepted candidates are announced later in the spring. The major department is responsible for the original plan of work and for keeping in touch with the candidate's progress from semester to semester. The division is responsible for approval of the original program and of any later changes in that program.

At the end of the junior year Honors students are required to take the Honors examinations set at that time for the fields they have studied. These trial papers, however, are read by their instructors, not by the visiting examiners. On the basis of the showing made in these examinations, the student may be advised or even required to return to Course, or he may be warned that he continues in Honors at his own risk. Those students who return to Course under these circumstances or for other reasons will receive grades for the work they have done while reading for Honors, but in no case without taking examinations over the field covered.

At the end of the senior year the reading of the examinations and the decision of the degree of Honors to be awarded the candidates is entirely in the hands of the visiting examiners. Upon their recommendation, successful candidates are awarded the Bachelor's Degree with Honors, with High Honors, or with Highest Honors. When the work of a candidate does not in the opinion of the examiners merit Honors of any grade, his papers are returned to his instructors, who decide, under rules of the Faculty, whether he shall be given a degree in course.

PRE-MEDICAL PROGRAM

Students who are considering the possibility of attending medical (or dental) school after graduation from Swarthmore should plan their academic programs carefully to meet the pre-medical requirements, listed below, as well as the general College requirements. Specific requirements of the various medical schools, as well as basic information on other aspects of pre-medical and medical training, can be found in "Admission Requirements of American Medical Colleges" published by the Association of American Medical Colleges. Recent editions of this book are available in the various libraries on the campus. All students planning a medical career should be familiar with this book.

Sophomores, juniors, and seniors will be in contact with the Faculty Committee on the Pre-Medical Program for special advising. It is the function of this committee to prepare a statement of evaluation and its recommendation to each medical school to which the student may apply, basing this statement on all information available to it, including the student's record and faculty evaluations.

In conference with the student, the course adviser maps out a program based on requirements listed below, the college's general requirements, and the particular needs and interests of the student. Beyond these considerations the need for understanding basic social problems, the cultivation of sensitiveness to cultural values, and the value of intensive work in at least one field is kept in mind in mapping an individual program.

The following courses are among the minimum requirements of most medical schools: Biology 1-2, Chemistry 1-2, Chemistry 28-29, Mathematics 1-2 or 3-4, Physics 1-2, English (two semester courses; literature courses in foreign languages do not meet medical school requirements). The foreign language requirements of medical schools are automatically met when the student has satisfied the college language requirement, which includes language course 4 or its equivalent. In addition, some medical schools require quantitative analysis (Chemistry 26) or comparative anatomy (Zoology 11). Advanced work in biology, chemistry and mathematics is recommended where the student's program and interests permit. The student is urged to familiarize himself with the specific requirements of those medical schools in which he is interested in planning his program.

The work of the junior and senior year may be done either in the honors program or in course. Intensive work of the major may be carried out in any department of the student's choice, or major requirements may be met by completing three full courses in each of two related departments in the Division of the Natural Sciences. In the latter case the comprehensive examination will be jointly arranged by the departments concerned.

Although some students have been admitted to medical schools upon the completion of three years of college work, most medical schools strongly advise completion of four years of college, and in practice admit very few with less.

WRITING AND SPEAKING

Students deficient in the mechanics of composition will be required to take tutorial work before entering the junior year. Expert assistance is also available to increase efficiency in reading.

A special course in English for foreign students is provided when necessary.

COOPERATION WITH NEIGHBORING INSTITUTIONS

With the approval of their course adviser and the Dean, students may take courses offered by Bryn Mawr or Haverford Colleges or the University of Pennsylvania without the payment of extra tuition. This arrangement does not apply to the summer session of the University of Pennsylvania.

EDUCATION ABROAD

The College recognizes the general educational value of travel and study abroad and cooperates as far as possible in enabling interested students to take advantage of such opportunities. It distinguishes, however, between those foreign study plans which may be taken for credit as part of a Swarthmore

educational program, and those which must be regarded as supplementary. To be acceptable for credit, foreign study must meet Swarthmore academic standards, and must form a coherent part of the student's four-year plan of study. The Honors Program in particular demands a concentration of study which is not easily adapted to the very different educational systems of foreign universities. Therefore, while some of the approved programs listed below may normally be taken as substitutes for a semester or a year of work at Swarthmore, each case is judged individually, and the college may withhold its approval of a particular program, or may insist that the program be carried out as an extra college year.

Plans for study abroad must be approved in advance by the Dean and by the Chairmen of departments concerned, if credit is to be given for courses taken, and students may be asked to take examinations upon their return to the College.

1. *Established Programs.* Students who wish to study abroad under formal academic conditions may apply to one of the programs administered by other American colleges and universities; for example, those of Hamilton College, Smith College, or Sweet Briar College. These are full-year programs of study at foreign universities, under the supervision of American college personnel. Interested students should consult the Dean for details.

2. *Direct Enrollment.* Application may also be made directly to foreign institutions for admission as a special student. This should be done only after consultation with the Dean and the appropriate department head, and care must be taken to assure in advance that courses taken abroad will be acceptable for Swarthmore credit. Most foreign universities severely limit the number of students they accept for short periods, however, and anyone who applies for admission directly must be prepared to be refused.

3. *University of Keele.* For a number of years Swarthmore College and the University of Keele, Staffordshire, England, have had a student exchange each year. A student from Swarthmore is selected for study at Keele by a committee which interviews the applicants. The year at Keele may take the place of the junior year at Swarthmore, though it is often taken as an extra year.

4. *Peaslee Scholarships.* These scholarships, the gifts of Amos Peaslee (Class of '07) were instituted in 1953 and are normally awarded each year, preferably to sophomores and juniors, for language study abroad. The scholarships are for a minimum of one semester plus a summer; course credit is given for the work done upon approval of the department concerned.

5. *International Association for the Exchange of Students for Technical Experience.* This program, administered by the Engineers' Joint Council, provides opportunities for engineering and science students to work for engineering firms and laboratories in Europe during summer vacations. Students are paid living expenses by the employing firm in the currency of the country in which they work; they pay their own travel costs. Applications must be made by January 1 for work the following summer, and students are notified of the Asso-

ciation's decision by March 31. For further information, students should consult the chairman of the Department of Engineering.

6. *European Summer Research Program Abroad.* The Carnegie Corporation is supporting for a limited period of time an opportunity for summer research abroad for approximately fifteen students from cooperating institutions. A student must have completed his junior year and must include a thesis on the topic of his research in the work of his senior year. The program is administered by an advisory committee composed of representatives from Colgate, Columbia, Princeton, Rutgers and Swarthmore, and is directed at Princeton through the Woodrow Wilson School of Public and International Affairs. For detailed information, students should consult the Dean.

Faculty Regulations

ATTENDANCE AT CLASSES AND COLLECTION

Members of the faculty will hold students responsible for regular attendance at classes and will report to the Deans the name of any student whose repeated absence is in their opinion impairing the student's work. The number of cuts allowed in a given course is not specified, a fact which places a heavy responsibility on all students to make sure that their work is not suffering as a result of absences. Since freshmen must exercise particular care in this respect and since the faculty recognizes its greater responsibility toward freshmen in the matter of class attendance, it is expected that freshmen, especially, will attend *all* their classes.

When illness necessitates absence from classes the student should report at once to the nurses or to the college physician.

The last meeting before vacation and the first meeting after vacation in each course must be attended. The minimum penalty for violation of this rule is probation.

Absences from Collection are acted upon by the Deans as instructed by the faculty. All students are allowed four absences from Collection each term.

GRADES

Instructors report to the Deans' office at intervals during the year upon the work of students in courses. Informal reports during the semester take the form of comments on unsatisfactory work. At the end of each semester formal grades are given in each course under the letter system, by which *A* means excellent work, *B* good work, *C* satisfactory work, *D* passing but below the average required for graduation, and *E* failure. *W* signifies that the student has been permitted to withdraw from the course by the Committee on Academic Requirements. *X* designates a condition; this means that a student has done unsatisfactory work in the first half of a year course, but by creditable work during the second half may earn a passing grade for the full course and thereby remove his condition. *R* is used to designate an auditor or in cases when the work of a foreign student cannot be evaluated because of deficiencies in English.



Wharton Hall, a Dormitory for Men



Willets Hall, a Dormitory for Women



Pierre S. duPont Science Building

Inc. means that a student's work is incomplete with respect to specific assignments or examinations. The Faculty has voted that the grade given in a course should incorporate a zero for any part of the course not complete by the date of the final examination. The grade *Incomplete* should be given only after consultation with the Registrar and only in cases in which it can be shown that illness, military service, or the like made it impossible for the student to complete his work before the deadline, or in cases in which the instructor wishes to insist on the completion of the work before giving a grade with penalties. If an *Inc.* is received, it must normally be made up in the term immediately following that in which it was incurred. A date is set at the end of the first six weeks of each term when make-up examinations must be taken and late papers submitted. Under special circumstances involving the use of laboratories or attendance at courses not immediately available, a student must secure permission to extend the time for making up an incomplete until the second term following. This permission must be given in writing and filed in the Office of the Registrar. Any not made up within a year from the time it was imposed shall be recorded as *E*, a failure which cannot be made up.

Reports are sent to parents and to students at the end of each semester.

For graduation in general courses, a *C* average is required; for graduation in honors work, the recommendation of the visiting examiners.

REGISTRATION

All students are required to register at the time specified in official announcements and to file programs of courses or seminars approved by their course advisers. Fines are imposed for late or incomplete registration.

A regular student is expected to take the prescribed number of courses in each semester. If more or fewer courses seem desirable, he should consult his course adviser and file a petition with the Committee on Academic Requirements. A student who wishes to take fewer than the normal number of courses should register for the regular program and file a petition to drop one or more courses.

Applications involving late entrance into a course must be received within the first two weeks of the semester. Applications involving withdrawal from a course must be received not later than the middle of the semester.

EXAMINATIONS

Any student who is absent from an examination, announcement of which was made in advance, shall be given an examination at another hour only by special arrangement with the instructor in charge of the course.

No examination *in absentia* shall be permitted. This rule shall be interpreted to mean that instructors shall give examinations only at the college and under direct departmental supervision.

SUMMER SCHOOL WORK

Students desiring to transfer credit from a summer school are required to obtain the endorsement of the chairman of the department concerned before

entering upon the work, and after completing the work are required to pass an examination set by the Swarthmore department.

PHYSICAL EDUCATION

Physical education is required of all women and non-veteran men in the freshman and sophomore years, unless an excuse is granted by the college physician. A minimum of three periods per week shall be required. If any semester's work of the first two years is failed, it shall be repeated in the junior year. No student shall be permitted to enter his senior year with a deficiency in physical education.

EXCLUSION FROM COLLEGE

The college reserves the right to exclude at any time students whose conduct or academic standing it regards as undesirable, and without assigning any further reason therefor; in such cases fees will not be refunded or remitted, in whole or in part, and neither the college nor any of its officers shall be under any liability whatsoever for such exclusion.

Requirements for Graduation

BACHELOR OF ARTS AND BACHELOR OF SCIENCE

The degree of Bachelor of Arts and Bachelor of Science are conferred upon students who have met the following requirements for graduation:

1. The candidate must have completed eighteen to twenty half courses in the first two years and sixteen half courses or eight seminars in the last two years.
2. He must have an average grade of C on the courses counted for graduation.
3. He must have complied with the course requirements for the first two years.
4. He must have met the requirements in the major and supporting fields during the last two years.
5. He must have passed satisfactorily the comprehensive examinations in his major field or met the standards set by visiting examiners for a degree with honors.
6. He must have completed four terms of study at Swarthmore College, two of which have been those of the senior year.
7. He must have completed the physical education requirements set forth on page 66 and in statements of the Physical Education Departments.
8. He must have paid all outstanding bills and returned all equipment and library books.

Advanced Degrees

MASTER OF ARTS AND MASTER OF SCIENCE

The degree of Master of Arts or Master of Science may be conferred subject to the following requirements:

Only students who have completed the work for the Bachelor's degree with some distinction, either at Swarthmore or at another institution of satisfactory standing, shall be admitted as candidates for the Master's degree at Swarthmore.

The candidate's record and a detailed program setting forth the aim of the work to be pursued shall be submitted, with a recommendation from the department or departments concerned, to the Committee on the Master's Degree. If accepted by the Committee, the candidate's name shall be reported to the faculty at or before the first faculty meeting of the year in which the candidate is to begin his work.

The requirements for the Master's degree shall include the equivalent of a full year's work of graduate character. This work may be done in courses, seminars, reading courses, regular conferences with members of the faculty, or research. The work may be done in one department or in two related departments. The catalogue statements of departments which offer graduate work indicate the courses or seminars which may be taken for this purpose.

A candidate for the Master's degree shall be required to pass an examination conducted by the department or departments in which his work was done. He shall be examined by outside examiners, provided that, where this procedure is not practicable, exceptions may be made by the Committee on the Master's Degree. The department or departments concerned, on the basis of the reports of the outside examiners, together with the reports of the student's resident instructors, shall make recommendations to the faculty for the award of the degree.

At the option of the department or departments concerned, a thesis may be required as part of the work for the degree.

A candidate for the Master's degree will be expected to show before admission to candidacy a competence in those languages deemed by his department or departments most essential for his field of research. Detailed language requirements will be indicated in the announcements of departments which admit candidates for the degree.

The tuition fee for graduate students who are candidates for the Master's degree is \$1,600 per year, and the general fee for these students is \$25 per semester.

ADVANCED ENGINEERING DEGREES

The advanced degrees of Mechanical Engineer (M.E.), Electrical Engineer (E.E.), and Civil Engineer (C.E.), may be obtained by graduates who have received their Bachelor's degree in Engineering upon fulfilling the requirements given below:

1. The candidate must have been engaged in engineering work for five years since receiving his first degree.
2. He must have had charge of engineering work and must be in a position of responsibility and trust at the time of application.
3. He must make application and submit an outline of the thesis he expects to present, one full year before the advanced degree is to be conferred.

4. The thesis must be submitted for approval one calendar month before the time of granting the degree.
5. Every candidate shall pay a registration fee of \$5 and an additional fee of \$20 when the degree is conferred.

Awards and Prizes

The JOHN W. NASON AWARD, a gift of a friend of the College in honor of the Eighth President, is presented, normally at Commencement, to one or more members of the total staff of the College, or to members of their families, who have made a distinctive contribution, beyond the scope of their normal duties, to the life of the College community. The Award is made by the Instruction and Libraries Committee of the Board of Managers upon the advice of the President of the College and consists of a formal citation and a monetary award of \$1,000.

The IVY AWARD FUND was created by a gift from Owen Moon, '94. The income of the fund is placed in the hands of the faculty for award on Commencement Day to a male member of the graduating class. The qualifications for the Ivy Award are similar to those for the Rhodes Scholarships and include (a) qualities of manhood, force of character, and leadership; (b) literary and scholastic ability and attainments. These have been phrased by the donor in the words "leadership based upon character and scholarship."

The OAK LEAF AWARD was established by David Dwight Rowlands of the Class of 1909. It was later permanently endowed in memory of him by Hazel C. Rowlands, '07, and Caroline A. Lukens, '98. The award is made by the faculty each year to the woman member of the Senior Class who is outstanding for loyalty, scholarship and service.

The MCCABE ENGINEERING AWARD, founded by Thomas B. McCabe, 1915, is to be presented each year to the outstanding engineering student in the Senior Class. The recipient is chosen by a committee of the faculty of the division of Engineering.

The PHI BETA KAPPA PRIZE is awarded by the Swarthmore Chapter to the member of the junior class who had the best academic record for the first two years. The value of the prize is \$40.

The BRAND BLANSHARD PRIZE, honoring Brand Blanshard, professor of philosophy at Swarthmore from 1925 to 1945, has been established by David H. Scull, of the Class of 1936. The award of \$50 is presented annually to the student who, in the opinion of the department, submits the best essay on any philosophical topic.

The A. EDWARD NEWTON LIBRARY PRIZE of \$50, endowed by A. Edward Newton, to make permanent the Library Prize first established by W. W. Thayer, is awarded annually to that undergraduate who, in the opinion of the Committee of Award, shows the best and most intelligently chosen collection of books upon any subject. Particular emphasis is laid in the award not merely upon

the size of the collection but also upon the skill with which the books are selected and upon the owner's knowledge of their subject-matter.

The **KATHERINE B. SICARD PRIZE** of \$5, endowed by the Delta Gamma Fraternity in memory of Katherine B. Sicard, '34, is awarded annually to the freshman woman who, in the opinion of the department, shows greatest proficiency in English.

PUBLIC SPEAKING CONTESTS. Prizes for contests in public speaking are provided as follows: The **ELLA FRANCES BUNTING EXTEMPORARY SPEAKING FUND** awards prizes for the best extemporaneous short speeches. The **OWEN MOON FUND** provides the Delta Upsilon Speaking Contest awards for the best prepared speeches on topics of current interest. The **WILLIAM PLUMER POTTER PUBLIC SPEAKING FUND**, established in 1927, sponsors a contest in the reading of poetry as well as providing funds for other contests described below and for the collection of recorded literature described on page 45.

Three prizes for the best student-written one-act plays are provided by the **WILLIAM PLUMER POTTER FUND**. The winning plays are usually produced during the fall semester by the Little Theater Club.

Prizes for the best student short stories are also awarded from the **WILLIAM PLUMER POTTER FUND**.

The **LOIS MORRELL POETRY AWARD**, given by her parents in memory of Lois Morrell of the Class of 1946, goes to that student who, in the opinion of the faculty, submits the best original poem in the annual competition for the award. The award, consisting of \$100, is made in the spring of the year. All entries should be submitted by April 1.

The **JOHN RUSSELL HAYES POETRY PRIZES**, of approximately \$25 for a first prize and \$15 for a second prize, are offered for the best original poem or for a translation from any language. Manuscripts should be ready by April 1 of each year.

The **MAY E. PARRY MEMORIAL AWARD**, given by the Class of 1925 of which she was a member, is presented each year to the senior woman who by her loyalty, sportsmanship, and skill in athletics has made a valuable contribution to Swarthmore College. The recipient is chosen by the faculty of the Department of Physical Education for Women.

Fellowships

Three fellowships are awarded annually by the faculty, on recommendation of the Committee on Fellowships, to seniors or graduates of the college for the pursuit of advanced work. The proposed program of study must have the approval of the faculty. Applications for fellowships must be in the hands of the committee by April 15. Applicants for any one of these fellowships will be considered for the others as well.

These three fellowships are:

The HANNAH A. LEEDOM FELLOWSHIP of \$900, founded by the bequest of Hannah A. Leedom.

The JOSHUA LIPPINCOTT FELLOWSHIP of \$1,100, founded by Howard W. Lippincott, of the Class of 1875, in memory of his father.

The JOHN LOCKWOOD MEMORIAL FELLOWSHIP of \$1,100, founded by the bequest of Lydia A. Lockwood, New York, in memory of her brother, John Lockwood. It was the wish of the donor that the fellowship be awarded to a member of the Society of Friends.

Four other fellowships are open to graduates of Swarthmore College under the conditions described below:

The LUCRETIA MOTT FELLOWSHIP, founded by the Somerville Literary Society and sustained by the contribution of its life members, has yielded an annual income since its foundation of \$525. It is awarded each year by a committee of the faculty (selected by the society), with the concurrence of the life members of the society, to a young woman graduate of that year who is to pursue advanced study at some other institution approved by this committee.

The MARTHA E. TYSON FELLOWSHIP, founded by the Somerville Literary Society in 1913, is sustained by the contributions of life members of the society and yields an income of \$500 or more. It is awarded biennially by a joint committee of the faculty and the society (elected by the society) with the concurrence of the life members of the society to a woman graduate of Swarthmore College who has entered or plans to enter elementary or secondary school work. The recipient of the award is to pursue a course of study fitting her for more efficient work in an institution approved by the Committee of Award.

SIGMA XI RESEARCH FELLOWSHIP. The Swarthmore Chapter of Sigma Xi appoints, from time to time, as funds are available, Fellows with research grants with a maximum value of \$1,000. The holders of this fellowship are usually associates of the chapter who have shown conspicuous ability in graduate studies. The purpose of the chapter in awarding these fellowships is to relieve worthy students from teaching and other distracting duties so that they may concentrate as much as possible upon their research. Applications for these fellowships should be made to the secretary of the chapter not later than the middle of March. Appointments will be announced about the middle of April.

The PHI BETA KAPPA FELLOWSHIP of \$250, founded by the Swarthmore Chapter of the national honor fraternity, is awarded each year at the discretion of the Committee on Fellowships on the basis of intellectual distinction to a member of the senior class who has been elected to Phi Beta Kappa and who proposes to pursue graduate study and scholarly work.

COURSES OF INSTRUCTION

NUMBERING OF COURSES AND SEMINARS

A system of uniform numbering is used in all departments. Courses are numbered as follows:

- 1 to 9—introductory courses
- 11 to 49—other courses open to students of all classes
- 51 to 69—advanced courses limited to Juniors and Seniors
- 101 to 199—seminars for honors students and graduate students

Full courses the numbers of which are joined by a hyphen (e.g., 1-2) must be continued for the entire year; credit is not given for the first semester's work only.

Astronomy

PROFESSOR: PETER VAN DE KAMP, *Chairman and Director of Sproul Observatory*

RESEARCH ASSOCIATES AND LECTURERS: SARAH LEE LIPPINCOTT
JAMES F. WANNER

RESEARCH ASSISTANT: CHAO-YUAN YANG

Astronomy deals with the nature of the universe about us and the methods employed to discover the laws underlying the observed phenomena. The elementary courses present the problems in broad outlines and trace the growth of our knowledge of the facts and development of theories. The advanced courses consider some of these problems in detail. The seminars deal primarily with the techniques, methods and problems of the Sproul Observatory research program.

The principal instrument of the Sproul Observatory is the twenty-four-inch visual refractor of thirty-six foot focal length, used almost exclusively for photography. The instrument has been in continuous operation since 1912 and provides a valuable and steadily expanding collection of photographs. Measuring and calculating machines are available for the measurement and reduction of the photographs. The principal program of the Observatory is an accurate study of the distances, motions and masses of the nearer stellar systems.

The Sproul Observatory is open to visitors on the second Tuesday night of each month during the college year—October through May. With clear weather, visitors have the opportunity of seeing many celestial objects of various types in the course of a year. The visiting hours are from 7:00 to 8:30 p.m. in the fall and winter, but are set later during the spring.

REQUIREMENTS FOR MAJORS

Prerequisites for an Astronomy major, in course, are Astronomy 1-2, advanced courses and seminars (taken as double courses) in Astronomy, combined with work in mathematics and physics.

Prerequisites for admission to the honors program in Astronomy, either as a major or a minor, are Mathematics 11-12, Astronomy 1-2, Physics 1-2, and a reading knowledge of French, German or Russian.

COURSES

- 1-2. DESCRIPTIVE ASTRONOMY. Mr. van de Kamp and Mr. Wanner. *Full course*
These courses provide an introduction to the methods and results of astronomy. Fundamental notions of physics are studied as they are needed to provide an adequate scientific basis for the course. These courses are prerequisite for all further work in astronomy. Three class periods each week, practical work to be arranged.
13. INTRODUCTION TO MATHEMATICAL ASTRONOMY. Mr. van de Kamp.
Spherical astronomy; celestial navigation; the two body problem; energy concepts.
14. PROBLEMS OF GALACTIC STRUCTURE. Miss Lippincott.
Stellar motions, magnitudes and spectra. Unstable stars. Stellar populations. Star clusters and associations.

HONORS SEMINARS

101. **DOUBLE STARS.** Mr. van de Kamp and Miss Lippincott.
The two body problem. Theory and observational technique of visual, spectroscopic and eclipsing binaries. Special attention is given to the photographic study of both resolved and unresolved astrometric binaries. The masses of binary components and of unseen companions.
102. **PHOTOGRAPHIC ASTROMETRY.** Mr. van de Kamp and Miss Lippincott.
The long-focus refractor. Photographic technique, measurement and reduction of photographic plates. Choice of reference stars. Attainable accuracy. Application to the problems of parallax, proper motion, mass-ratio, and perturbations. Resolved and unresolved astrometric binaries; orbital analyses.
103. **COSMIC MATTER, RADIATION, AND FIELDS.**
Phenomena in the upper atmosphere. Solar-terrestrial relationships. Cosmic rays. Radiation belts. Radio astronomy. Meteors and meteorites. Studies with rockets, artificial satellites and space probes.
Not offered in 1964-65.
110. **RESEARCH PROJECT.** Staff.
Participation in a research project of Sproul Observatory, related to seminars 101 or 102.

GRADUATE WORK

In conformity with the general regulations for work leading to the Master's degree (see page 66), this department offers the possibility for graduate work.

Candidates for the Master's degree will normally take four honors seminars, selected from those listed in astronomy, mathematics or physics, in consultation with the faculty member under whose direction the work is to be done. A thesis may be substituted for one of the seminars.

Candidates for the Master's degree must have a good reading knowledge of two modern languages.

Biology

PROFESSORS: ROBERT K. ENDERS, *Chairman*

LUZERN G. LIVINGSTON

NEAL A. WEBER

ASSOCIATE PROFESSORS: LAUNCE J. FLEMISTER

NORMAN A. MEINKOTH

ASSISTANT PROFESSORS: WILLIAM C. DENISON*

KENNETH S. RAWSON

ALBURT M. ROSENBERG

LECTURER: URSULA VICTOR SANTER

Through its elementary course, the Department of Biology introduces the student to a comprehensive view of those principles, problems and phenomena common to all organisms, with animals and plants interpreted on a comparative basis. The advanced courses in the Biological Sciences (except Genetics) deal specifically with plant biology (botany), or animal biology (zoology) and are listed under these respective headings.

Following the broad review of the plant and animal kingdoms as given in the course in general biology, advanced work is taken up in two different ways: first, specific aspects of the broad subjects are treated in a comparative manner as in anatomy and physiology; second, broader aspects of a specific subject are treated as in entomology, parasitology, embryology, genetics and developmental plant anatomy. The structural and functional consideration is extended to include problems of interdependence of organisms in the structure and function of plant and animal societies and the influence of physical, chemical and biological factors in the survival of those societies.

REQUIREMENTS FOR MAJORS IN COURSE

A student may major in biology, botany, or zoology. Students in course should include the following supporting subjects in their programs, in addition to the four full courses in their major subject: chemistry, including one semester in organic chemistry, one course in physics, one course in mathematics, and a modern language (German or Russian preferred) through course 4. These courses are required for majors in botany or zoology, and should be completed by the end of the junior year. The program for biology majors may be modified, but any program must be approved in advance by the department.

Biology

1-2. GENERAL BIOLOGY. Staff

Full course

An introduction to the study of living things. A consideration of the properties of protoplasm and the structure of the cell; a brief survey of living forms, both plant and animal. The methods by which animals and plants maintain themselves, grow and reproduce, and a discussion of the mechanism of heredity. Some time will be devoted to the interrelationships of plants and animals in communities, and the place of man in the whole structure.

Three lectures and one three-hour laboratory per week.

Credit is not given for a single semester of this course.

* Absent on leave, fall semester, 1964-65.

20. GENETICS. Mrs. Santer.

Fall semester

A study of the fundamental principles of inheritance as they apply to living organisms generally. The course includes a detailed consideration of the principles of Mendelian inheritance, an analysis of the underlying chromosomal mechanisms, the gene theory, and the relationship of the principles of genetics to evolution, to plant and animal improvement, and to man.

Three lectures per week, with assigned problems and laboratory and/or library projects in lieu of formally organized laboratory work.

Prerequisite: Biology 1-2.

Botany

15. TAXONOMY OF SEED PLANTS. Mr. Denison.

Spring semester

An introduction to the classification of the major groups of flowering plants and gymnosperms, stressing those of biological, cultural, or economic interest. The emphasis is upon a world wide flora and upon cultivated as well as wild plants. Modern concepts of phylogeny, biosystematics, and biogeography are included. Suggested as an early course for biology majors and as a cultural course for non-majors.

Three lectures and one field trip and/or laboratory period per week.

16. DEVELOPMENTAL PLANT ANATOMY. Mr. Livingston. *Alternate years, fall semester*

The fundamentals of anatomy of seed plants approached from a developmental standpoint. The structure and behavior of meristems, problems and processes of differentiation, and a detailed analysis of cellular, tissue and organ structure in higher plants.

Two lectures and two three-hour laboratory periods per week.

Prerequisite: Biology 1-2.

18. BIOLOGY OF LOWER PLANTS. Mr. Denison and Mr. Livingston

Alternate years, fall semester

An introduction to the algae, fungi, mosses, and ferns, including aspects of their classification, phylogeny, structure, physiology, and ecology. The laboratories are in part exploratory and experimental. Their content depends in part upon the current interests of staff and students.

Three lectures and one field trip and/or laboratory period per week.

67. PLANT PHYSIOLOGY. Mr. Livingston.

Alternate years, spring semester

An integrated study of the physiological processes of higher plants, including general cellular physiology, water relations, mineral nutrition, enzyme action, photosynthesis, metabolic processes, translocation, the physiology of growth and development, and related topics.

Two lectures, one discussion period, and one laboratory period per week.

Prerequisites: Biology 1-2, Chemistry 1-2, Organic Chemistry desirable.

68. BIOLOGY OF BACTERIA. Mr. Livingston.

Alternate years, fall semester

An approach to the study of bacteriology with principal emphasis on the consideration of bacteria as organisms, rather than as causative agents of disease, etc. The morphology, physiology and biochemistry, ecology, genetics, and classification of bacteria.

Three lectures and two laboratory periods per week.

Prerequisites: Biology 1-2, Chemistry 1-2, Organic Chemistry desirable.

70. PLANT ECOLOGY. Mr. Denison.

Alternate years, fall semester

A study of the structure, distribution, and dynamics of plant communities. Background material in physical geography is included. The impact of plant communities upon man through agriculture and land use practices is mentioned but not stressed. Laboratory work emphasizes the accumulation and analysis of field data.

Three lectures and one field trip or laboratory period per week.

71-72. SPECIAL TOPICS. Staff.

With the permission of the department, qualified students may elect to pursue a research or reading program not included in the regular course program.

HONORS WORK

The seminars given each year vary according to the choices of the students and the convenience of the department.

111. **PLANT PHYSIOLOGY.** Mr. Livingston.
An extension of the area covered in course 67, with particular emphasis on a critical study of original sources, both classical and current. The seminar discussion is accompanied by a full day of laboratory work each week.
112. **PROBLEMS OF PLANT GROWTH AND DEVELOPMENT.** Mr. Livingston.
A correlated anatomical and physiological approach to developmental plant anatomy and morphogenesis. The seminar discussion is accompanied by a full day of laboratory work each week.
113. **GENETICS.** Staff.
An extension of the area covered in course 20, with particular emphasis on current research in the field of inheritance in all its aspects. The seminar discussion is accompanied by a full day of laboratory work each week.
114. **EXPERIMENTAL EVOLUTION.** Mr. Denison
A study of the mechanism of evolution. Discussion traces the development of the concept of evolution and the modifications imposed by paleontology, morphology, cytology, genetics, and ecology. The problems involved in the development of a stable classification are discussed as are the implications of evolutionary thought for disciplines other than Biology. Field studies of natural populations are supplemented by laboratory work with experimental populations.
115. **MICROBIOLOGY.** Mr. Livingston.
An extension of the area covered in Course 68. Particular emphasis is placed on physiological and biochemical aspects of the subject. Some work on fungi and viruses is included.
118. **PLANT ECOLOGY.** Mr. Denison and Mr. Livingston.
A study of the interrelationships between plants and their environment. Discussion periods are devoted to the development of basic principles. Field and laboratory work applies these concepts to specific organisms and habitats. Laboratory work is used to isolate problems encountered in the field. Both higher plants and microorganisms are used as experimental materials. Comparisons are made between aquatic and terrestrial habitats.
120. **SPECIAL TOPICS.** Staff.
With the permission of the department, qualified students may elect to pursue a research problem or reading program not included in the regular offerings in honors.

Zoology

11. **COMPARATIVE VERTEBRATE ANATOMY.** Mr. Enders. *Fall semester*
This course normally follows General Biology. It deals with the comparative and unique aspects of the anatomy of the integument, skeleton, muscular, digestive, respiratory, circulatory, excretory, reproductive and nervous systems of the various vertebrate types. Classification, phylogeny and adaptive radiation are considered with stress placed on anatomical adaptations to the various habitats. The protochordates, lamprey, dogfish and cat are studied as representative forms in the laboratory. The course has three lecture and two laboratory meetings per week.
12. **VERTEBRATE PHYSIOLOGY.** Mr. Flemister. *Spring semester*
A general consideration of the functional process in animals with emphasis placed on mammals and other vertebrates. The aspects of adaptation of the animal to environmental stress are treated in such a way as to serve the individual student's area of concentration. In preparation the introductory course in Biology is desirable. Two lectures, one conference and one laboratory period per week.

51. HISTOLOGY. Mr. Weber. *Fall semester*

This course consists of a detailed study of the microscopic structure of vertebrate tissues, together with the functions of such tissues. In the laboratory the student examines both prepared and living material, and becomes familiar with the principles of microtechniques. Three lectures and two laboratory periods per week.

Prerequisites: 1-2, 11.

52. EMBRYOLOGY. Mr. Enders or Mr. Weber. *Spring semester*

A study of development of vertebrate anatomy. The lectures are concerned with an investigation of the events which precede development, an analysis of the development processes, and a brief survey of the contributions of the field of experimental embryology. Laboratory periods are devoted to the embryology of the frog, chick and pig. Three lectures and two laboratory periods per week.

53. ENTOMOLOGY. Mr. Weber. *Spring semester*

The study of insects and their relatives, their morphological and physiological adaptations and their effect on man. Laboratory work will include the study of living material and current research will be considered. Each student will prepare a study collection from field trips.

54. BIOLOGY OF PARASITISM. Mr. Meinkoth. *Alternate years, spring semester*

A consideration of parasitology with reference to evolution and adaptation to the parasitic habit. Surveys are made of parasites in native animals. Classification, life cycles and epidemiology are reviewed.

Prerequisite: 11 Comparative Vertebrate Anatomy.

55. FIELD ZOOLOGY. Mr. Weber. *Spring semester*

Emphasis is on the living animals as they occur in nature, their systematics, relationships to the environment, habits and distribution. Regional and world faunas will be discussed. Much of the work will be done in the field.

56. INVERTEBRATE ZOOLOGY. Mr. Meinkoth. *Alternate years, fall semester*

A course designed to acquaint the student with the fundamental morphology, classification, phylogeny and special problems of the invertebrate phyla.

Three lectures and one laboratory period per week. Occasional field trips.

Prerequisite: 11 Comparative Vertebrate Anatomy.

57. COMPARATIVE PHYSIOLOGY. Mr. Flemister or Mr. Rawson. *Fall semester*

A course of lectures and laboratory experiments treating functional processes from the standpoint of adaptation of the animal to its environment. These processes in representative animals are compared in order to follow their elaboration from the more general to the more specialized.

Two lectures and two laboratory periods per week.

Prerequisites: Comparative Anatomy and Organic Chemistry.

58. PHYSIOLOGICAL ECOLOGY. Mr. Flemister. *Spring semester*

A course of lectures, discussions and experiments concerning the physiological adaptations of representative animals to environmental stress. Requirements and availability of optimum conditions of temperature, oxygen, food-stuffs and the maintenance of ionic independence are appraised.

Two lectures and two laboratory periods per week.

Prerequisite: 57 Comparative Physiology.

59. CYTOLOGY. Mr. Rosenberg. *Alternate years, fall semester*

A study of the structure and function of cells as units of biological organization, and relationships within tissues and organs. In the laboratory the student learns

some of the techniques by which information about cells is arrived at, and observes the characteristics of cells as units, and as parts of organized tissues.

Three lectures and two laboratory periods per week.

Prerequisites: Biology 1-2, Biology 11 or 20, Chemistry 1-2.

60. BIOLOGY OF ANIMAL COMMUNITIES. Mr. Rawson. *Spring semester*

The study of animals at the emergent level of populations. Problems of animal behavior as related to the growth and maintenance of populations will be considered with particular reference to communication and social interaction within animal groups. Both field and laboratory study techniques will be used.

Two lectures per week and the equivalent of two laboratory meetings per week.

Prerequisite: Genetics or Comparative Anatomy.

61. BIOLOGY FOR SENIORS. Mr. Enders. *Spring semester*

A course, patterned on the seminar plan, designed to broaden and integrate the student's knowledge of biology. Each student must present three topics and lead the discussion. A weekly summary of reading is required.

- 63, 64. SPECIAL TOPICS. Staff. *Full or half course*

For advanced students. Open to those who, on account of fitness, have arranged a program of special work in the department.

HONORS WORK

Honors students majoring in Zoology must take four seminars in the department and a minor of two seminars in another department within the division. Some freedom is offered in the selection of the two seminars, or four half courses, which normally would fulfill a second minor.

Students anticipating an honors program in Zoology must complete in the first two and a half years the following: Biology 1-2 and Zoology 11, Chemistry 1-2, Mathematics 3-4, and Physics 1-2. In addition, to qualify for minor seminars in the departments indicated, Chemistry requires Chemistry 28-29, Mathematics and Physics require Mathematics 11-12, and Psychology requires Psychology 1, and another half course.

Prerequisites for students in the Honors Program with a minor in Zoology consist of three half courses in Biology and Zoology (including 1-2). In addition, 104 requires a full course in Physics and a half course in Organic Chemistry.

Seminars: The following seminars prepare students for examinations for a degree with Honors.

102. CYTOLOGY. Mr. Rosenberg.

A study of the structure and function of the cell. Living material will be examined and the modern microscopical techniques employed in the laboratory.

103. EMBRYOLOGY. Mr. Weber.

An analysis of reproduction and development. The laboratory work includes individual projects by the students, a study of developmental anatomy of the chick, pig and frog, and the observation of living material under normal and experimental conditions.

104. COMPARATIVE PHYSIOLOGY. Mr. Flemister or Mr. Rawson.

An intensive consideration of the physical and chemical phenomena underlying the function of animals. A comparative approach is maintained in order to consider the progression from more general to the most specialized adjustments, acclimatizations and adaptations of animals to physical, chemical and biological stresses in the environment. The terminal portion of the laboratory program is devoted to the pursuit

of original, independent work by the student. Prerequisites for this seminar are courses in Comparative Anatomy and Organic Chemistry.

Offered in the fall term.

106. ENTOMOLOGY. Mr. Weber.

Following a survey of insects in general, a detailed study of one aspect of the field will be undertaken. This will involve use of a scientific library, independent work on one topic, and discussions of current research.

107. INVERTEBRATE ZOOLOGY. Mr. Meinkoth.

A study of the morphology, taxonomy, natural history, distribution and adaptation of invertebrate phyla with a special emphasis on evolutionary trends, ecological relations, and problems peculiar to each group.

108. SENSORY PHYSIOLOGY. Mr. Rawson.

The functional specializations of sense organs for the transfer of information in biological systems are considered in relation to the adaptations of vertebrate and invertebrate animals to their environments. Electrophysiological and behavioral approaches are used in laboratory studies.

110. SPECIAL TOPICS. Staff.

Open to students who, having satisfied all requirements, desire further work in the department. Frequently this will include acting as junior assistants in the research of staff members.

Chemistry

PROFESSOR: WALTER B. KEIGHTON, JR., *Chairman*

ASSOCIATE PROFESSORS: EDWARD A. FEHNEL
GILBERT P. HAIGHT, JR. ‡

ASSISTANT PROFESSORS: JAMES H. LOEHLIN
PETER T. THOMPSON

INSTRUCTORS: JAMES H. HAMMONS
ROBERT E. LEYON

The aim of the Department of Chemistry is to provide a sound training in the fundamental principles and basic techniques of the science rather than to deal with specialized branches of the subject.

The various courses and seminar offerings are designed to meet the needs of three classes of students:

1. Students with a primary interest in the humanities or social sciences, who turn to chemistry as a scientific study of general educational value. Chemistry 1, 2 offers training in the scientific approach to problems, experience with the laboratory method of investigation, and a presentation of some of the major intellectual achievements of chemistry.
 2. Students who seek training in chemistry as a supplement to their study of astronomy, botany, engineering, mathematics, medicine, physics, or zoology. These students should consult with their major department and with the Chemistry department concerning the chemistry courses most suitable to their needs.
 3. Students who consider chemistry their major interest. These students should take Chemistry 1, 2 and Mathematics 3-4 in their freshman year; Chemistry 28-29, Mathematics 11, 12 and Physics 1, 2 in their sophomore year; Chemistry 26, 27 and Chemistry 61, 62 in their junior year. Some students interested in Chemistry as a scientific study of general educational value, but with no intention of pursuing chemistry as a profession, will find these basic courses sufficient for their needs. The minimum requirements of the American Chemical Society for professional training in chemistry are satisfied by these courses together with Chemistry 66 and an additional semester of advanced chemistry. Mathematics 51, 52 and Physics 11, 12 are strongly recommended. Major students are expected to have a reading knowledge of German before graduation.*
- 1, 2. INTRODUCTION TO CHEMISTRY. Mr. Keighton and Staff.

A study of the central concepts and basic principles of chemistry, including atomic theory, kinetic-molecular theory, atomic structure, the kinds of chemical change and the laws governing them. The chemistry of the elements and their compounds is related to the periodic classification of the elements and to the structure of elements and molecules. In the laboratory in the first semester a number of quantitative experiments are worked, in the second semester the principles of chemical equilibria are applied to qualitative analysis.

Students who enter college with advanced training in chemistry are encouraged to take a placement examination during freshman orientation week. If sufficiently well prepared they may omit all or part of the introductory course.

Prerequisite for all other courses in Chemistry.

Two lectures, a recitation, and one laboratory period weekly.

2B. QUALITATIVE ANALYSIS AND EQUILIBRIUM.

Spring semester

A course designed for students with exceptional high school training in physical science and mathematics and demonstrated ability in chemistry.

Admission by invitation of the staff.

* Students who have completed the foreign language requirement in another language may satisfy this requirement by taking German 7-8.

‡ Absent on leave, 1964-65.

26. **QUANTITATIVE CHEMISTRY.** Mr. Leyon *Fall semester*
 Reactions and equilibria in acid-base and oxidation-reduction systems are studied, with emphasis on their applications in chemical analysis. The principles of volumetric and gravimetric analysis, the formation and properties of analytical precipitates, and the basic concepts of spectrophotometry are introduced and discussed. The laboratory work is intended to give the student practical experience with theories, techniques, and instruments of analytical chemistry. This course satisfies medical school requirements.
 Prerequisite: Chemistry 2 or 2B.
 Two lectures and two laboratory periods weekly.
27. **CHEMICAL ANALYSIS.** Mr. Leyon *Spring semester*
 A continuation of course 26 on a slightly more advanced level. The use of complexes and complex-forming reagents, spectrophotometry, electrolysis, and polarography are considered in some detail. Roughly the last half of the course is concerned with physical and chemical methods of separation. Laboratory experiments are designed to illustrate the lecture material, making liberal use of modern analytical instruments.
 Prerequisite: Chemistry 26.
 Two lectures and two laboratory periods weekly.
- 28-29. **ORGANIC CHEMISTRY.** Mr. Hammons and Mr. Fehnel. *Full course*
 An introduction to the chemistry of the more important classes of organic compounds, with emphasis on nomenclature, structure, reactions, and methods of synthesis. Current theoretical concepts of structure and mechanism are applied throughout the course to the interpretation of the properties and reactions of a wide variety of organic compounds. The laboratory work illustrates some of the principles and reactions discussed in the classroom and provides practical experience in the techniques involved in synthesizing, isolating, purifying, and characterizing organic compounds.
 Prerequisite: Chemistry 2 or 2B.
 Three lectures and one laboratory period weekly.
- 61, 62. **THEORETICAL CHEMISTRY.** Mr. Loehlin and Mr. Keighton.
 The principles of physical chemistry are studied and a number of numerical exercises are worked; the gaseous, liquid and solid states, solutions, colloids, elementary thermodynamics, chemical equilibria, electrochemistry, the kinetics of chemical reactions.
 Prerequisites: Calculus, and general physics.
 Three lectures and one laboratory period weekly.
63. **QUANTUM CHEMISTRY.** Mr. Thompson. *Spring semester*
 An extension of course 61, 62 in breadth and depth. Quantum mechanics is introduced and applied to a variety of problems in valence theory and molecular structure determination. Such topics as atomic structure, chemical bonding theory, molecular spectroscopy, dielectric and magnetic phenomena, molecular symmetry, and statistical mechanics are considered.
 Prerequisite: Chemistry 62.
 Three hours of discussion weekly.
65. **ADVANCED INORGANIC CHEMISTRY.** Mr. Loehlin. *Spring semester*
 The periodic classification of elements is studied from the point of view of correlation of structure and properties. Consideration is given to such topics as atomic and molecular structure, coordination complexes, metal carbonyls, intermetallic and interstitial compounds, modern concepts of acids and bases, chemistry of the transition metals and rare earths, solvent systems, inorganic reaction mechanisms, and other phases of inorganic chemistry.
 Prerequisite: Chemistry 61.
 Three lectures or conferences and one laboratory period weekly.

66. QUALITATIVE ORGANIC ANALYSIS. Mr. Fehnel. *Fall semester*
 Classroom and laboratory study of the characterization and systematic identification of organic compounds. Emphasis is placed on the correlation of structure and properties of organic molecules and on the theoretical principles underlying various chemical and physical methods of isolation and identification. A reading knowledge of German is desirable.
 Prerequisite: Chemistry 28-29.
 Two lectures and two laboratory periods weekly.
67. ADVANCED ORGANIC CHEMISTRY. Mr. Fehnel or Mr. Hammons. *Spring semester*
 Selected topics in organic chemistry, including resonance and molecular orbital concepts, reaction mechanisms, molecular rearrangements, stereochemistry, free radicals, and other topics of current interest. A familiarity with physical chemistry is desirable.
 Prerequisite: Chemistry 28-29.
 Three hours of discussion weekly.
69. SPECIAL TOPICS. Staff. *Fall and spring semester*
 An elective half-course, which provides an opportunity for qualified advanced students to undertake original investigations or to make detailed literature studies of selected topics in the fields of inorganic, organic, analytical, and physical chemistry. The course is designed to give the student practical experience in the solution of a research problem, to develop facility in the use of the chemical literature and in the interpretation and communication of experimental results, and to stimulate interest in current developments in chemical research. Students who propose to take this course must secure the approval of the instructor under whose supervision the work is to be done.
 One conference and approximately ten hours of laboratory and/or library work weekly.

HONORS WORK

Before admission to honors work the chemistry major will have completed Chemistry 1, 2 or 2B, 28, 29, Mathematics 3, 4, 11, 12, and Physics 1, 2. The honors program includes Chemistry 101, 105 in the junior year and Chemistry 106 and 108 in the senior year, with four other seminars usually in biology, mathematics, or physics.

101. THEORETICAL CHEMISTRY. Mr. Thompson. *Fall semester*
 The gaseous, liquid, and solid states, solutions, colloids, elementary thermodynamics, chemical equilibria, electrochemistry, the kinetics of chemical reactions.
 Prerequisites: Calculus and general physics.
 One seminar and seven hours of laboratory weekly.
105. CHEMICAL ANALYSIS. Mr. Leyon. *Spring semester*
 The material covered is essentially the same as in courses 26 and 27: the principles and practice of volumetric and gravimetric analysis, optical and electrical methods of analysis, separation techniques, and the analysis of organic compounds. The analytical chemistry of the common elements is studied to illustrate the application of analytical methods.
 Prerequisite: Chemistry 2 or 2B, and 101.
 One seminar and twelve hours of laboratory weekly.
106. ADVANCED ORGANIC CHEMISTRY. Mr. Fehnel. *Fall semester*
 An intensive study of essentially the same subject matter as is covered in courses 66 and 67. A reading knowledge of German and a familiarity with physical chemistry are desirable.
 Prerequisites: Chemistry 28-29 and senior standing.
 One seminar and seven hours of laboratory weekly.

108. VALENCE AND MOLECULAR STRUCTURE. Mr. Thompson and Mr. Loehlin.

Spring semester

Topics such as the periodic table and atomic structure, types and properties of bonds, the chemistry of transition metals, coordination compounds, acid-base and oxidation-reduction mechanisms, etc., are studied. Quantum theory is developed and applied throughout to these topics and the use of dielectric and magnetic phenomena, spectroscopy, and molecular symmetry in determining structure is discussed. Laboratory: study of reaction kinetics and equilibria in inorganic systems.

Prerequisite: Chemistry 62 or 101.

One seminar and six hours of laboratory weekly.

Classics

PROFESSORS: SUSAN P. COBBS
HELEN F. NORTH, *Chairman*

ASSOCIATE PROFESSOR: MARTIN OSTWALD

ASSISTANT PROFESSOR: DAVID S. WIESEN

LECTURER: GABRIELE S. HOENIGSWALD

The Department of Classics offers instruction in the various fields which constitute the study of Greek and Roman culture. Courses numbered from 1 to 20 are devoted to the Greek and Latin languages and literatures. Courses numbered from 31 onwards presuppose no knowledge of the Greek or Latin languages and are open without prerequisite to all students; they deal with the history, mythology, religion, archaeology, and other aspects of the ancient world and include the study of classical literature in translation.

REQUIREMENTS AND RECOMMENDATIONS FOR MAJORS

Greek or Latin may be offered as the major subject either in course or in honors work. Major students in course are normally required to complete during the first two years either Intermediate Greek (course 11-12) or Introduction to Latin Literature (course 11-12). Both of these courses are prerequisite for honors seminars for a major student and one of them for honors seminars for a minor student.

Students reading for Honors in Greek may offer Latin as one of their minors, and vice versa. Students majoring in Greek may substitute a Latin seminar for one of their seminars in Greek, and vice versa. In addition, majors in both Honors and course are strongly advised to take for at least one semester a course in prose composition (Greek 9, 10 or Latin 9, 10).

Greek

- 1-2. ELEMENTARY GREEK. Mr. Ostwald. *Full course*
The essentials of Greek grammar are covered and selections from masterpieces of Greek literature are read.
- 9, 10. GREEK PROSE COMPOSITION. Staff. *Each semester*
A non-credit course, meeting one hour a week. This course is recommended in conjunction with courses at the intermediate level or above, to provide the student with grammatical and stylistic exercise.
- 11, 12. INTERMEDIATE GREEK. Miss North and Mr. Ostwald.
Plato's Apology, a play of Euripides, and selections from Homer are read.
- 13, 14. GREEK PROSE AUTHORS. Miss North.
The works read are determined by the interests and needs of the members of the class. These readings are supplemented by a survey of the history of Greek Literature. Credit is given for each semester.
- 15, 16. GREEK POETS. Miss North, Mr. Ostwald.
The works read are determined by the interests and needs of the members of the class. Credit is given for each semester. The course is offered only when required.
20. SPECIAL TOPICS. Staff.
Readings selected to fit the needs of individual seniors in preparation for their comprehensive examinations.

Latin

2. ELEMENTARY LATIN. Mr. Wiesen. *Full course*
The course is designed for students who begin Latin in college or who are not prepared to enter Intermediate Latin, and it normally covers the equivalent of two years' work in secondary school. The course is offered only when required.
4. INTERMEDIATE LATIN. Mrs. Hoenigswald. *Fall semester*
The study of Virgil's *Aeneid* and a review of the principles of Latin Grammar.
10. LATIN PROSE COMPOSITION. Staff. *Each semester*
A non-credit course, meeting one hour a week. This course is recommended in conjunction with courses at the intermediate level or above, to provide the student with grammatical and stylistic exercise.
- 11, 12. INTRODUCTION TO LATIN LITERATURE. Miss Cobbs.
The course aims to give some conception of the scope and characteristic qualities of Latin literature. The reading includes a comedy and the *Cena Trimalchionis* from Petronius' *Satyricon* in the first semester and the *Odes* of Horace in the second. Credit is given for each semester. It is open to students who have had four years of preparatory Latin or who have completed Intermediate Latin.
13. CATULLUS AND ELEGY. Mr. Wiesen. *Fall semester*
A study of the poems of Catullus and the elegiac poets.
14. MEDIAEVAL LATIN. Staff. *Spring semester*
The works studied in this course are chosen from the principal types of mediaeval Latin literature (including religious and secular poetry, history and chronicles, saints' lives, satire, philosophy, and romance). Some attention is paid to their origins in late antiquity and their influence on the early Renaissance. Not given in 1964-1965.
16. LITERATURE OF THE EMPIRE. Staff.
Readings in the prose and poetry of the Silver Age of Latin literature.
20. SPECIAL TOPICS. Staff.
Readings selected to fit the needs of individual seniors in preparation for their comprehensive examinations.

Ancient History and Civilization

31. HISTORY OF GREECE. Mr. Ostwald. *Fall semester*
The course is devoted to the study of the political and social history of the Greek states to the time of the Hellenistic kingdoms. This is preceded by a brief survey of the Oriental civilizations by which the Greeks were influenced. Special attention is given to the 6th and 5th centuries B. C. Considerable reading is done in the primary sources in translation.
32. HISTORY OF ROME. Mr. Wiesen. *Spring semester*
The course is devoted to the study of the political and social history of Rome to the time of Constantine. Special attention is given to the last century of the Republic and the first century of the Empire. Considerable reading is done in the primary sources in translation.
33. GREEK LITERATURE IN TRANSLATION. Miss North. *Fall semester*
The works read in this course include the *Iliad*, Hesiod's *Theogony* and *Works and Days*, much of Greek tragedy and comedy, selections from the historians, the lyric and elegiac poets, and the pre-Socratic philosophers, and several dialogues of Plato.
34. LATIN LITERATURE IN TRANSLATION—CLASSICAL AND MEDIAEVAL. Miss North. *Spring semester*
The works studied in this course range in time from the age of the Roman Republic to the twelfth century after Christ. They include, from the classical period, such major authors as Cicero, Lucretius, Virgil, Livy, Ovid, and Seneca; from the Latin Fathers, St. Jerome and St. Augustine; and from the Middle Ages, Boethius, Prudentius, Bede, the chief figures of the Carolingian Renaissance, and the writers of

Mediaeval Latin hymns and secular poetry. The course is normally given in alternate years.

36. CLASSICAL MYTHOLOGY IN LITERATURE AND ART. Miss North. *Spring semester*
The course is designed to give familiarity with those myths and legends that have served as material for writers and artists from ancient times to the present. Plays, both ancient and modern, based on the more influential myths are read, and a study is made of the manner in which the themes have been handled in painting and sculpture of various periods. Special attention is given to the use made of stories from mythology by recent writers. The course is normally given in alternate years.
42. GREECE IN THE FIFTH CENTURY B.C. Mr. Ostwald. *Spring semester*
An intensive study, chiefly on the basis of primary sources, of Athens and the Greek world from the reforms of Cleisthenes to the end of the Peloponnesian War. Special emphasis will be placed on the political, social, and economic institutions of the Athenian democracy and to the problems of the Delian League, both internal and in its relation to the Greek and non-Greek world.
Prerequisite: Classics 31 or its equivalent.

HONORS SEMINARS

102. ROMAN HISTORIANS. Mr. Wiesen.
This seminar combines a survey of Latin historical writing to the end of the Silver Age with intensive study of selected books of Livy and Tacitus, both as examples of Roman historiography and as sources for Roman history. The seminar is given in the spring semester.
103. LATIN EPIC. Miss North.
This seminar traces the development of Roman epic poetry, with particular emphasis on the *De Rerum Natura* of Lucretius and the *Aeneid* of Virgil. Some attention is also given to early Roman epic, as represented by the *Annales* of Ennius, and to the later epic, typified by Lucan's *Pharsalia*. The seminar is given in the fall semester.
104. LATIN COMEDY AND SATIRE. Mr. Wiesen.
Representative comedies of Plautus and Terence are read, and a study of the *Satires* and *Epistles* of Horace and the *Satires* of Juvenal is supplemented by a general survey of the development of Roman satire. The seminar is given in the fall semester.
107. ROMAN RHETORIC AND ORATORY. Miss North.
This seminar combines the study of Greek and Roman rhetorical theory and literary criticism with the reading of representative speeches of Cicero. It also considers the influence of rhetorical education on Latin literature, particularly that of the Empire. The seminar is given in the fall semester.
111. GREEK PHILOSOPHERS. Mr. Ostwald.
This seminar is primarily devoted to the study of Plato, which is supplemented by study of the pre-Socratic philosophers and of Aristotle and the Hellenistic schools. The orientation of the seminar is primarily philosophical, although the literary merits of the Greek philosophers receive consideration. The seminar is given in the fall semester.
112. GREEK EPIC. Miss North.
The study of Homer's *Odyssey* constitutes the chief work of this seminar. Some attention is also paid to Hesiod's *Theogony* and to the *Argonautica* of Apollonius of Rhodes. The seminar is given in the spring semester.
113. GREEK HISTORIANS. Mr. Ostwald.
The greater part of the work of this seminar is devoted to Herodotus and Thucydides, but portions of Xenophon's *Hellenica* and of Polybius are also studied, both as examples of Greek historiography and as sources for Greek history. The seminar is given in the fall semester.
114. GREEK DRAMA. Miss North.
The whole body of extant Greek tragedies and comedies is studied, with a careful reading in the original language of one play by each of the major dramatists. The seminar is given in the spring semester.

Economics

PROFESSORS: JOSEPH W. CONARD
EDWARD K. CRATSLEY
FRANK C. PIERSON
CLAIR WILCOX, *Chairman*

ASSOCIATE PROFESSORS: WILLIAM H. BROWN, JR.
WILLIS D. WEATHERFORD*

INSTRUCTORS: LEWIS R. GATY
CHARLES J. SIEGMAN

LECTURERS: MORTON S. BARATZ
HELEN M. HUNTER

The courses in economics are designed: first, to acquaint the student with the institutions and processes through which the business of producing, exchanging, and distributing goods and services is organized and carried on; second, to train him in the methods by which these institutions and processes may be analyzed; and third, to enable him to arrive at informed judgments concerning relevant issues of public policy.

Course 1-2 is prerequisite to all other work in the department except courses 3 and 4. Students intending to major in economics are advised to take Political Science 1-2 and courses in accounting, statistics or mathematics. Majors in course are required to take courses 50 and 51 in the junior year. Majors in honors are advised to take seminars 103 and either 101 or 102.

1-2. INTRODUCTION TO ECONOMICS. Messrs. Brown, Gaty, Pierson, Siegman, Weatherford, Wilcox and Mrs. Hunter. *Full course*

This course is designed both to afford the general student a comprehensive survey and to provide students doing further work with a foundation on which to build. It describes the organization of the economic system and analyzes the allocation of resources, the distribution of income, the maintenance of economic stability, and international economic relations.

One or two special sections of Economics 2 will be offered for students with special interest in a mathematical approach. Attention will be given to the application of mathematical techniques in addition to the regular work of the course.

3. ACCOUNTING. Mr. Cratsley. *Fall semester*

The purpose of this course is to equip the student with the rudiments of accounting that he will need to employ in his advanced work in business finance, banking, taxation, and public regulation.
Not offered in 1964-65.

4. STATISTICS. Mrs. Hunter. *Fall semester*

The purpose of this course is to make the student a critical user of statistics. Topics covered include frequency distributions, sampling, index numbers, and economic time series.

11. ECONOMIC DEVELOPMENT. Mr. Wilcox. *Spring semester*

Requisites for the economic development of underdeveloped countries. Obstacles to development. Strategy and tactics of development. Aid for development.

50. ECONOMIC THEORY. Mr. Gaty. *Fall semester*

Determination of prices in theory and in practice. Distribution of income. Determination of the level of income and employment.

* Absent on leave, fall semester, 1964-65.

51. MONEY AND BANKING. *Spring semester*
 Organization and operation of commercial banking in the United States. Central banking; the Federal Reserve system. Monetary policy.
52. PUBLIC FINANCE. Mr. Brown. *Fall semester*
 Revenues and expenditures of Federal, state, and local governments. Principles of taxation. Borrowing and debt management. Fiscal policy.
54. BUSINESS FINANCE. Mr. Brown *Fall semester*
 Corporate finance, investment banking, and the securities markets.
 Not offered in 1964-65.
55. LABOR PROBLEMS. Mr. Pierson. *Fall semester*
 The structure and functions of labor unions. Employer approaches to labor relations. Analysis of wage policies. Governmental control of labor relations.
56. SOCIAL ECONOMICS. Mr. Weatherford. *Fall semester*
 The extent, consequences, and causes of poverty, inequality, and insecurity. An appraisal of reforms: social insurance, medical care, public housing, rural development. The economics of discrimination and of educational opportunity.
 Not offered in 1964-65.
57. MANAGERIAL ECONOMICS. Mr. Gaty. *Spring semester*
 Analysis of business decision; economic theory and management control; market structure, pricing, and output; the budgetary process and business planning; business behavior and social welfare.
58. PUBLIC CONTROL OF BUSINESS. Mr. Wilcox. *Fall semester*
 Maintenance of competition in American industry; moderation of competition in agriculture, extractive industries, and distributive trades. Regulation of public utilities, transport, and communications. Public ownership and operation of industry.
59. BUSINESS CYCLES. Mr. Pierson. *Spring semester*
 Analysis of business fluctuations and long-term economic change. Public policies for stabilization and growth.
60. INTERNATIONAL ECONOMICS. Mr. Siegman. *Spring semester*
 Theory and practice of international trade. Balance of payments, foreign exchange, national commercial policies, international investment, and foreign aid.
61. COMPARATIVE ECONOMIC SYSTEMS. Mr. Weatherford *Fall semester*
 A comparative study of the economic systems of the Soviet Union, China, India, the United Kingdom, and the United States.
 Not offered in 1964-65.
62. AN INTRODUCTION TO INDIA AND PAKISTAN. Mr. Weatherford. *Fall semester*
 An introduction to the civilization of the subcontinent including a brief survey of its history, social and religious institutions, the movement for independence, and its economic development.
 Not offered in 1964-65.

HONORS WORK

101. FINANCE. Mr. Brown. *Fall semester*
 Revenues and expenditures of Federal, state and local governments. The principles of taxation. Problems of the Federal debt. Corporation finance, investment banking, and the securities markets. Public regulation of financial practices.
102. ECONOMIC STABILITY AND GROWTH. Mr. Pierson. *Spring semester*
 The theory of cyclical fluctuations and secular growth. Money and banking. Monetary and fiscal policy. Wage-price pressures and the control of inflation.

103. ECONOMIC THEORY. Mr. Conard. *Fall semester*
 Contemporary theory: price determination, the functional distribution of income, the level of employment. Evaluation of theory in the light of simplifying assumptions and empirical evidence. The relevance of theory to socio-economic problems.
104. PUBLIC CONTROL OF BUSINESS. Mr. Wilcox. *Fall semester*
 The maintenance of competition in American industry. The moderation of competition in agriculture, the extractive industries, and the distributive trades. The regulation of public utilities, transport, and communications. Public ownership and operation of industry.
105. INTERNATIONAL ECONOMICS. Messrs. Siegman and Wilcox. *Both semesters*
 Theory and practice in international economic relations. The pure theory of international trade. The balance of payments and the mechanism of international exchange. Restrictionism and discrimination. Regionalism. Relations with controlled economies. International investment and foreign aid.
106. COMPARATIVE ECONOMIC SYSTEMS. Messrs. Weatherford and Wilcox. *Spring semester*
 Economic organization, resource allocation, and growth in an advanced planned economy: the USSR. Economic development in a backward planned economy: China. Economic development in a backward mixed economy: India. An advanced socialist-welfare economy: the United Kingdom. The changing economy of the United States.
107. LABOR AND SOCIAL ECONOMICS. Messrs. Pierson and Weatherford. *Fall semester*
 The organization of labor. Analysis of wage policies. Government control of labor relations. Poverty, inequality, and insecurity. Social insurance, medical care, public housing, and rural development.
108. MATHEMATICAL ECONOMICS. Mr. Brown. *Spring semester*
 Econometrics, difference and differential equations, and other applications of mathematics to economics.
 Prerequisites: Mathematics 12 and Economics 103.

Engineering

SAMUEL T. CARPENTER, *Chairman*

*(The staff members of the Department of Engineering
are listed under their respective areas)*

The professional practice of engineering requires skill and resourcefulness in applying scientific knowledge and methods to the solution of problems of ever growing technical complexity. The successful engineer will, in addition, possess an understanding of the socio-economic forces which bear upon his work, an appreciation of the cultural and humanistic aspects of the society in which he lives, and a sound working knowledge of human relations. Our program meets these objectives by providing the student with technical knowledge in a setting of scientific rigor, together with the foundation of a liberal education. The student is educated in the professional disciplines of the engineer, and in humanistic studies and the communication of ideas, within the framework of a basic training in the natural and engineering sciences.

Three educational plans are open to engineering students at Swarthmore.

- (1) The Course program with a major in Civil, Electrical, or Mechanical Engineering.
- (2) The Honors program in Engineering Sciences.
- (3) A special sequence to meet unusual needs or interests of certain students:
 - (a) a five-year program leading to both a B.S. and a B.A. degree, or
 - (b) a four-year program integrating engineering with other areas of study.

A candidate for a degree in Engineering must meet the general requirements of the College as specified for the Division of Engineering (pp. 56-58) and the requirements of the particular discipline or program in which he is a major. Thus curricular plans for the first two years must take two objectives into consideration: (1) the basic engineering science courses must provide a foundation and meet the prerequisite requirements for advanced work at the upper-class level, and (2) the general College requirements should be essentially fulfilled prior to junior standing. Experience has shown that the suggested "Basic Engineering Curriculum of the First Two Years" (page 91) will meet the needs of the usual engineering student in any one of the three plans and will clear the way for the advanced work of the junior and senior years. Modifications of the basic program, as well as those of the major disciplines, are possible in individual cases but such changes must be justified and approved by the student's course adviser. At the end of the sophomore year, the student will enter the Course program in a major field of Civil, Electrical, or Mechanical Engineering, or he may apply for Honors.

(1) The Course Program

This program leads to the degree of Bachelor of Science in Civil, Electrical, or Mechanical Engineering; these curricula are accredited by the Engineers' Council for Professional Development. Over the four years, the student will take about one-quarter of his work in the Divisions of the Humanities and Social Sciences, one-quarter in the Departments of Chemistry, Mathematics, and Physics, and the remainder in the Department of Engineering. All students devote their last two years: (1) to certain basic courses required of all engineers; (2) to fulfilling the major requirements of one of the disciplines of Engineering; (3) to developing their special interests. After completing the basic program of the first two years, the student follows the curriculum outlined on the following pages under the particular area in which he is a major.

(2) The Honors Program in Engineering Sciences

The Division on Engineering offers an Honors program accredited in Engineering Sciences in addition to the above programs in Civil, Electrical, and Mechanical Engineering. A general statement describing Honors work at Swarthmore may be found on page 59. The program is open, by application, to qualified students upon completion of the sophomore year. Successful participants will receive the degree of Bachelor of Science with Honors, High Honors, or Highest Honors in Engineering Sciences. Details of the program are given on page 92 following.

(3) Special Programs

There is growing recognition of the value of an engineering training fortified by a strong background of work in the humanities and social sciences or in the natural sciences. It is possible, with early planning of a five-year program, for a student to obtain both an engineering degree and a Bachelor of Arts degree in another field of interest. It is also possible to effect a four-year engineering plan with a minor in another field.

These special curricula are tailored to individual cases; in any event, planning early in the freshman year is essential. Requests for additional information should be directed to the Chairman of the Engineering Department.

BASIC ENGINEERING CURRICULUM OF THE FIRST TWO YEARS

First Semester

Mathematics 3 (or 5)
Physics
Chemistry**
Engineering Graphics
Elective

Second Semester

Freshman Year

Mathematics 4 (or 6)
Physics
Chemistry
Mechanics I
Elective

Sophomore Year

Mathematics 11 (or 15)
Mechanics II
Materials Science
Elective
Elective

Mathematics 12 (or 16)
Engineering Measurements
Electrical Engineering Science
Elective
Elective

GENERAL COURSES*

GE1. ENGINEERING GRAPHICS. Staff.

Fall semester

Three dimensional space problems are discussed via descriptive geometry. Problems of greater than three dimensional space are introduced via vector and matrix representations. The course also serves as an introduction to numerical analysis with emphasis on linear algebra and digital computer applications.

Three class periods and one three-hour drawing room period per week.

GE11. MATERIALS SCIENCE. Mr. Mangelsdorf.

Fall semester

Study of the structure of matter on an atomic and microscopic level and the relation of structure to engineering properties and bulk characteristics. Metals, ceramics and organic materials are examined with emphasis upon those properties common to each group rather than upon particular materials. The laboratory period includes standard testing techniques, operation and function of shop processes and machine tools in materials processing, and individual research. Laboratory period each week.

* Except as noted, the following courses are open to all students in the College.

** Chemistry may be deferred until the sophomore year.

GE12. ENGINEERING MEASUREMENTS. Staff.

Spring semester

A study of the basic procedures and mathematical principles required in making, interpreting and using measurements for engineering purposes, including linear and angular measurements, leveling, traversing, and triangulation, as well as the measurement of thermodynamic, fluid and electrical quantities.

Three recitations and one three-hour laboratory each week.

GE57. OPERATIONS RESEARCH AND ENGINEERING ECONOMY. Mr. Carpenter.

Spring semester

The principles of engineering economy and operations research as applied to defining optimal economic solutions of industrial problems. Annual cost methods, present worth, discounted costs, inventory control, probability principles with random number solutions, queuing theory, linear programming, scheduling, transportation and allocation theory.

Open to all juniors and seniors.

Three class periods each week.

HONORS PROGRAM IN ENGINEERING SCIENCES

The program has been established to meet the new and challenging demands placed upon the engineering profession by the rapid advances in science. The eight seminars in which the student participates cover a wide range of fundamental knowledge in the fields of mathematics, modern physics, and engineering sciences. The program is characterized by its orientation to basic scientific and mathematical principles in lieu of specialized subject matter. The program is unique and suited for those planning a future career in professional engineering, research and development, or college teaching.

Two seminars are normally taken each semester of the junior and senior year, for a total of eight. The final evaluation of the students in the program occurs at the end of the senior year by means of eight examinations, one for each seminar, given by outside examiners.

Students applying for the Honors program are required to submit their proposed seminar programs to the Division of Engineering, accompanied by a letter setting forth their defense of the program. The proposed program must include seminars in Mathematics, Physics, and the Engineering Sciences. The Mathematics and Physics seminars are described in the departmental listings and the Engineering Science seminars are described in the following section. It is advisable for students interested in this program to consult with the Chairman of the Department of Engineering.

All Engineering Science seminars include from one-half to a full day of laboratory each week.

ENGINEERING SCIENCE SEMINARS

ES101. MECHANICS OF SOLIDS.

Mechanics and analysis of deformable bodies treating elastic and plastic stresses and strains due to general and specific force systems. General equations of equilibrium and compatibility. Failure theories, stability. Experimental analysis based on strains, photoelasticity, and membrane analogy. Elementary vibrations. Lagrange and Hamilton equations.

Prerequisite: Mechanics I and II; Mathematics 11, 12, or equivalent.

ES102. ELECTRODYNAMICS.

Electromagnetic field theory and linear circuit theory. Static and dynamic field theory through Maxwell's Equations, using the applicable vector analysis. Electromagnetic fields in magnetic and dielectric materials; electromagnetic energy and forces. The circuit theory includes transient and steady state analysis of linear networks. The relation of circuit behavior to pole and zero locations in the s -plane is emphasized.

ES103. THERMODYNAMICS.

Fundamental concepts, properties of substances, equations of state, first and second laws of thermodynamics and their applications, entropy, gas and vapor cycles, Maxwell equations, heat transfer.

ES104. FLUID MECHANICS.

Fluid statics and dynamics, continuity, dimensional analysis, incompressible flow, generalized equations of motion, Navier-Stokes equation, boundary layer theory, convective heat transfer, mass transfer, compressibility phenomena.

ES105. LINEAR SYSTEMS.

Analysis and synthesis of electrical and electromechanical linear systems such as electric networks and servomechanisms. The following analytical methods are emphasized: differential equations, the Laplace transformation, Fourier methods, poles and zeroes, superposition integral, complex loci, analog simulation, transforms.

Prerequisite: ES102—Electrodynamics.

ES106. STRUCTURAL MECHANICS.

Theory, analysis, and design of structural systems. Basic theory of determinate and indeterminate structures, fundamentals of theoretical applied mechanics, including beams on elastic foundation, stability, plates and shells, with applicable vector and tensor approaches, and series solution. Ground motion and structural dynamics. Model analysis. Matrix methods.

Prerequisite: ES101—Mechanics of Solids.

ES107. MECHANICAL DESIGN.

Analysis and synthesis of the elements of a machine. Vibrational study of both lumped and distributed mass systems. Dynamic systems are studied from a Newtonian and Lagrangian point of view.

ES108. EARTH SCIENCE.

Principles of soil mechanics, hydrology, hydraulics, sedimentation, ground water flow and clay mineralogy, using the basic concepts of physical geology as a unifying framework. Theory of consolidation of soils, stresses in earth masses, Laplace equation of seepage, precipitation runoff relationships, are introduced for the analysis of engineering problems.

ES109. THESIS. Elective, upon approval of the Engineering Division of an acceptable field of original investigation.

ES111. CIRCUIT THEORY.

Theory of linear time invariant electric circuits with brief extensions to nonlinear networks and methods of synthesis. Network topology and equilibrium equations. Pole-zero concepts, transient and steady state response, impedance, resonance and the complex s-plane. Superposition techniques, signal flow graphs, one- and two-port networks, filter theory and power networks. Analytic properties of network functions. Treatment of electromechanical energy transfer of devices having linear network equivalents.

Offered in combination with ES112 Electromagnetic Theory, when demand so warrants, as an expanded version of ES102 Electrodynamics.

ES112. ELECTROMAGNETIC THEORY.

Development and application of Maxwell's equations. Fields in bounded space and in dielectric, magnetic and conducting materials. Wave propagation and reflection. Radiation. Electromagnetic energy storage and electromechanical energy conversion. Offered in combination with ES111 Circuit Theory, when demand so warrants, as an expanded version of ES102 Electrodynamics.

EE102. ELECTRONICS. (See Electrical Engineering.)

Civil Engineering

PROFESSOR: SAMUEL T. CARPENTER, *Director of Curriculum*

ASSOCIATE PROFESSOR: M. JOSEPH WILLIS

ASSISTANT PROFESSOR: CLARK P. MANGELSDORF

INSTRUCTOR: WILLIAM C. KERR

The work of the Civil Engineer involves design, research, management, and construction, in the following fields: buildings, bridges, aircraft, soils and foundations, hydraulics and hydroelectric power, city and regional planning, sanitation and public health, highways, airports, railways, and other projects of a public or private nature, with their economic justification. The basic curriculum also provides a foundation for those interested in aeronautical structures, architectural engineering, naval architecture, engineering mechanics, industrial management and sales.

Emphasis is placed on the broad scientific and humanistic education required for an understanding of fundamental principles, based on the conviction that those possessing such a background will contribute most to future progress.

Students electing the Honors Program in Engineering Sciences may prepare for graduate work in Civil Engineering by electing ES106 Structural Mechanics and ES108 Earth Science.

STANDARD PROGRAM FOR COURSE STUDENTS

Fall Semester

CE51 Mechanics III
EE63 Electronic Circuits
ME51 General Thermodynamics
EE55 Engineering Analysis

Spring Semester

CE52 Structural Theory
CE54 Soil Mechanics and Foundations
ME54 Fluid Mechanics
EL10 Writing and Speaking

Junior Year

CE53 Structural Mechanics
CE55 Civil Engineering Design I
CE57 Water Resources
Physics 51 Atomic and Nuclear Physics
(or Elective)

CE58 Special Topics
CE56 Civil Engineering Design II
CE57 Operation Research and Engineering Economy
Elective

Senior Year

CE11 MECHANICS I. Mr. Carpenter, Mr. Kerr.

Spring semester

Concept and definition of force, scalar, and vector quantities, combination and resolution of forces; principle of moments and couples; graphical and analytical conditions for equilibrium; stress diagrams, cables; centroids of areas, volumes, and masses; area and volume theorems. Open to students who have taken or are taking Mathematics 3-4, or equivalent. (3 recitations and 1 3-hour laboratory per week.)

CE12 MECHANICS II. Mr. Willis, Mr. Kerr.

Fall semester

Principles of dynamics, motion of a particle, Newton's laws, general equation of motion, rectilinear motion, displacement, velocity, speed, and acceleration; simple harmonic motion, free and forced vibration; inertia forces, work and energy, momentum and impulse; curvilinear motion; kinetic energy of rotation; relative motion, angular momentum; combined translation and rotation.

Prerequisite: CE11 and Mathematics 11, or equivalent; Mathematics 11 may be studied concurrently. (3 recitations and 1 3-hour laboratory per week.)

CE51 MECHANICS III. Mr. Kerr. *Fall semester*
This course deals with the internal stresses and changes of form which always occur when forces act upon solid bodies. The mechanics involved in the design of simple engineering structures is presented so that the student may realize the problems which must be solved in order to secure the required strength and stiffness in such structures. The laboratory work of this course is planned to clarify the theoretical considerations of beams, columns, combined stress, torsion and methods of strain measurement.
Prerequisite: CE11 Mechanics I, and Mathematics 12, or equivalent. (3 recitations and 1 3-hour laboratory per week.)

CE52 STRUCTURAL THEORY. Mr. Mangelsdorf. *Spring semester*
Analysis of determinate and indeterminate structures. A study of stress in truss and rigid frame systems, influence lines.
Prerequisite: CE51 Mechanics III. (3 recitations and 1 3-hour laboratory per week.)

CE53 STRUCTURAL MECHANICS. Mr. Carpenter. *Fall semester*
A study of indeterminate structural systems and advanced structural theory. Structural models.
Prerequisite: CE52 Structural Theory. (3 recitations and 1 3-hour laboratory per week.)

CE54 SOIL MECHANICS AND FOUNDATIONS. Mr. Kerr. *Spring semester*
The properties of soils, including the fundamentals of the structure of clays, flow through porous media, consolidation, compaction and shear strength. These fundamentals, combined with engineering geology and the principles of mechanics are applied to slope stability, settlement analysis, foundation design and analysis of loads on retaining walls and bulkheads.
Prerequisite: CE51 or equivalent. (3 recitations and 1 3-hour laboratory per week.)

CE55 CIVIL ENGINEERING DESIGN—I. Mr. Mangelsdorf. *Fall semester*
An introduction to the design of structures. Fundamental stress analysis, considerations of structural members and connections for metallic, concrete, and timber structures, including buildings, bridges, and aircraft.
Prerequisite: CE52 Structural Theory or equivalent. (3 recitations and 1 3-hour laboratory per week.)

CE56 CIVIL ENGINEERING DESIGN—II. Mr. Mangelsdorf. *Spring semester*
A continuation of Civil Engineering Design I. Planning, analysis, and design of engineering structures and foundations. Additional topics in concrete with ordinary and pre-stressed reinforcement. Ultimate design theory.
Prerequisite: CE55 Civil Engineering Design—I. (3 recitations and 1 3-hour laboratory each week.)

CE57 WATER RESOURCES. Mr. Willis. *Fall semester*
An introduction to the fundamentals of hydrology, including precipitation—run-off relationships, ground water flow, the routing and hydraulics of surface flow through channels and reservoirs. Fundamentals are related to Civil Engineering activities, especially river basin development, water supply, and drainage. An introduction to the principles of water and sewage treatment is included.
Prerequisite: ME54, Fluid Mechanics. (3 recitations and 1 3-hour laboratory per week.)

CE58 SPECIAL TOPICS. Staff.
Required course with subject matter dependent on a group need or interest. The laboratory period is devoted to the principles and practice of civil engineering measurements through a study of photogrammetry, map projections, curves and earth work, celestial observations, field layout, and related topics of importance to the professional civil engineer.

CE59 CIVIL ENGINEERING THESIS. Staff.

Electrical Engineering

PROFESSORS: HOWARD M. JENKINS, *Director of Curriculum*
JOHN D. MCCRUMM

ASSOCIATE PROFESSORS: CARL BARUS
DAVID L. BOWLER

Electrical Engineering deals with the development and application of precise notions of electricity and allied physical sciences in the broad fields of conversion, transmission, control, and utilization of electrical energy for the purposes of transmitting power and communicating intelligence.

The courses in Electrical Engineering are each a series of inquiries dealing with the fundamental concepts of electrical phenomena and are designed to inculcate in the student confidence in analytical methods and competence to apply basic principles to new engineering situations. The students are encouraged to examine problems critically and to make such simplifying assumptions as are appropriate without destroying the significance of the results. The importance of the presentation of work is also stressed, a student being required to gain some proficiency in communicating the results of his work clearly, completely and in a well-organized form.

Students applying for a major in Electrical Engineering will normally have followed the basic engineering program outlined on page 91 during their first two years. Satisfactory completion of this program will fulfill the curricular prerequisites of the discipline. In special cases, the Department will consider applications from students who have pursued a different program but who will have completed at least the following courses or their equivalents: Math 3, 4 and 11, 12; Physics 1, 2; Chemistry 1, 2; CE11, 12 or Physics 11, 12; and EE12. Majors must maintain a "C" average or better in the required electrical courses.

STANDARD PROGRAM FOR COURSE STUDENTS

Fall Semester

Spring Semester

Junior Year

EE53 Circuit Theory I
EE55 Engineering Analysis
EE59 Electronics
ME51 General Thermodynamics

EE54 Circuit Theory II
EE56 Field Theory
EE60 Electronics
EL10 Writing and Speaking

Senior Year

EE57 Electrical Machinery I
EE61 Waves and Transmission Lines
Ph51 Atomic and Nuclear Physics
Elective

EE58 Electrical Machinery II
Electrical Engineering Elective
Technical Elective
Non-technical Elective

EE12 ELECTRICAL ENGINEERING SCIENCE

Spring semester

The experimental and theoretical basis of electricity and magnetism; elementary electrostatics and magnetostatics; foundations of circuit theory, principles of energy conversion, and transient analysis of linear networks.

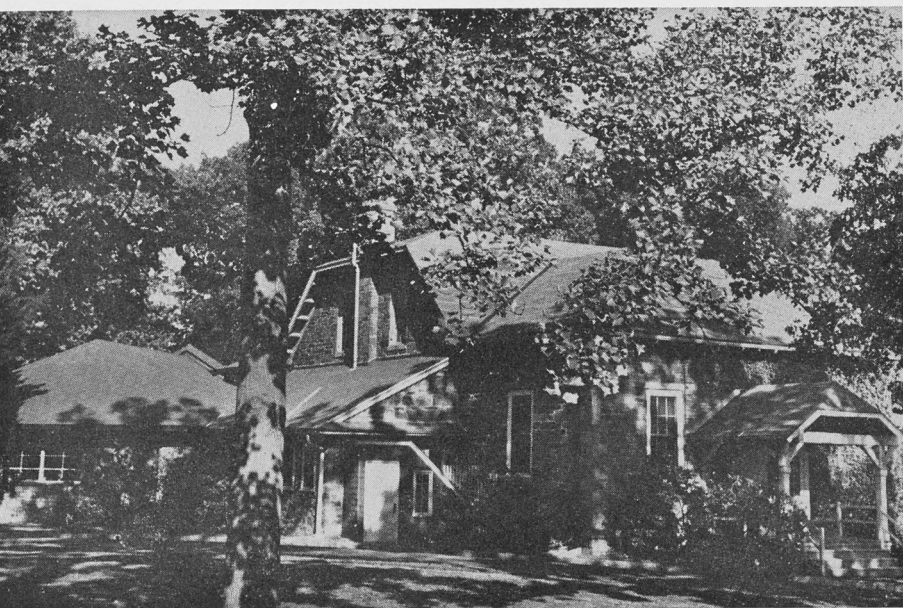
Three class periods per week; one laboratory each week.

Prerequisites: Physics 1 and 2, and to be preceded or accompanied by Integral Calculus.

EE53 CIRCUIT THEORY I.

Fall semester

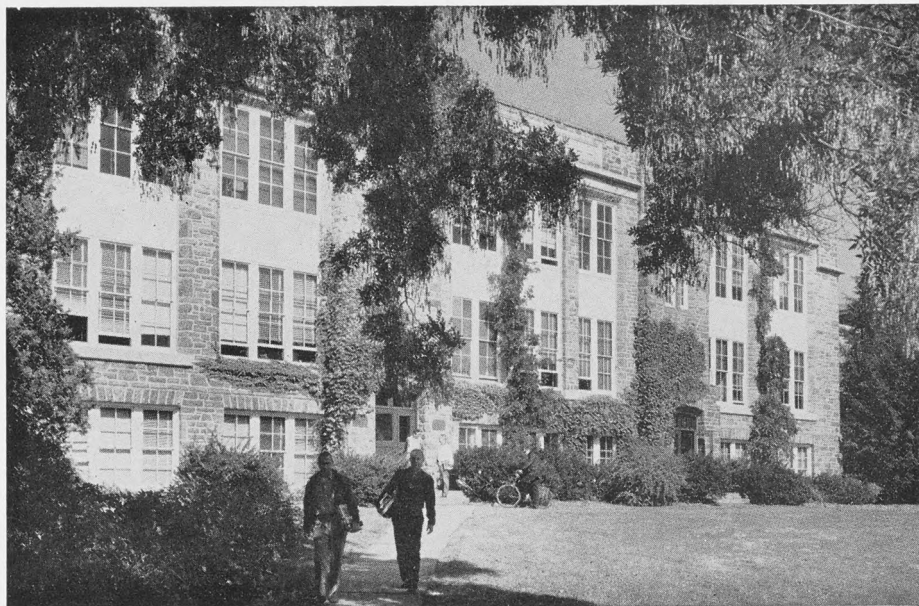
Transient and steady state analysis of electric circuits based upon the differential equations of the circuit arising from Kirchhoff's Laws. Classical treatment is followed by Laplace transform analysis giving system response as a function of complex fre-



Friends Meeting House



Magill Walk



Hicks Hall, an Engineering Building



Commencement in the Arthur Hoyt Scott Auditorium

quency. Pole-zero concepts are introduced. Extensive study is made of linear network analysis by the superposition integral, convolution, the Fourier integral, etc. Three phase systems and symmetrical components.

Three class periods per week; one laboratory each week.

Prerequisite: EE12 Electrical Engineering Science, or equivalent.

EE54 CIRCUIT THEORY II.

Spring semester

Further study of electric networks based extensively upon pole-zero concepts. AC bridges, tuned coupled circuits, driving point and transfer functions, one- and two-port networks, Cauer and Foster representation and conventional filter theory. Analog computer methods.

Three class periods per week; one laboratory each week.

Prerequisites: EE53 Circuit Theory I, and EE55 Engineering Analysis, or equivalents.

EE55 ENGINEERING ANALYSIS.

Fall semester

Formulation and application of the method of engineering analysis based upon fundamental physical laws, mathematics, and practical engineering considerations. Emphasis is placed on the professional approach to the analysis of bona fide engineering problems. A study is made of the common physical and mathematical aspects shared by different systems such as mechanical, thermal, and electrical. The theory and application of ordinary differential equations is systematically covered. The Laplace transformation is developed and applied. Partial differential equations and Fourier methods are introduced.

Three class periods per week; one computation period each week.

Prerequisites: EE12 Electrical Engineering Science, and Integral Calculus.

EE56 FIELD THEORY.

Spring semester

An analytical study of electromagnetism. Maxwell's equations are developed and applied, with greatest attention given to the static and quasi-static cases. Considerable emphasis is given to the following topics: solutions of Laplace's equation, fields in dielectric and magnetic materials, energy and forces, and the relationship of field theory to circuit theory.

Three class periods per week; one laboratory each week.

Prerequisites: EE53 Circuit Theory I, and EE55 Engineering Analysis, or equivalent.

EE57-58 ELECTRICAL MACHINERY.

Full course

Principles and physical aspects of electromechanical energy conversion; basic concepts of rotating machine performance and the analysis of ideal rotating electrical machinery and transformers. D-C machines, analysis of performance and applications, synchronous machines, performance, effects of saturation and saliency; poly-phase induction machines; fractional horsepower motors; rotating control devices; self-synchronous machines; electrical transients and the dynamics of coupled systems. Three class periods per week; one laboratory each week.

Prerequisite: EE53 Circuit Theory I.

EE59-60 ELECTRONICS.

Full course

Electronic circuit analysis and signal theory. Transistors, vacuum tubes, and other devices are treated by the use of linear and piecewise-linear models and by graphical analysis. Transient and steady-state circuit theory, normally studied concurrently, is extensively applied. Topics in signal theory include Fourier transform analysis, noise, modulation, sampling, and information theory.

Credit for the first semester alone will be given by special arrangement.

Three class periods per week; one laboratory each week.

Prerequisite: EE53 Circuit Theory I, preceding or concurrent.

EE61 WAVES AND TRANSMISSION LINES.

Fall semester

Application of Maxwell's equations to electromagnetic wave problems. Transmission lines are treated from both field and circuit viewpoints. Other topics include wave

propagation and reflection, waves in lossy media, wave guides, cavity resonators, antennas and radiation.

Three class periods per week; one laboratory each week.

Prerequisite: EE56 Field Theory.

EE62 PHYSICAL ELECTRONICS.

Spring semester

A study of the physical principles underlying the operation of electronic devices. The basic material covered includes: motion of charged particles in electric and magnetic fields, emission, space-charge-limited vacuum tube conduction, semiconductor junctions and transistors, gaseous conduction. If time and interest permit, additional topics such as dielectric and magnetic materials and photoelectric phenomena will be included.

Three class periods per week; one laboratory each week.

Prerequisite: Physics 51 Atomic and Nuclear Physics.

EE63 ELECTRONIC CIRCUITS.

Fall semester

Further study of electrical engineering subjects, primarily for non-electrical engineering students. Conventional analysis of single phase a-c circuits and a study of the fundamentals of electronic circuits will lead to consideration of the problems of processing signals from transducers such as strain gages, magnetic pickups, etc. The use of the analog computer will be covered in the laboratory work.

This course meets the requirements for entrance into EE64 Automatic Control.

Three class periods and one laboratory per week.

Prerequisite: EE12 Electrical Engineering Science.

EE64 AUTOMATIC CONTROL.

Spring semester

An introduction to automatic control systems using the Laplace transform and signal flow graphs. System design is studied by means of the Nyquist diagram, frequency response methods, and the root locus method. Other topics include compensation networks, multiple input systems and system optimization. Advanced topics are introduced: nonlinear and sample data systems, adaptive control, etc.

Three class periods per week; one laboratory each week.

Open to senior Electrical or Mechanical Engineering majors, or others with equivalent background.

EE71 ELECTRICAL ENGINEERING THESIS.

An engineering thesis may be substituted for a course by special arrangement with the staff.

HONORS SEMINAR

EE102. ELECTRONICS.

A study of electronic devices and circuits. Subject matter includes physical theory of electron tubes, semiconductor devices, and other electronic circuit elements; design of electronic circuits applicable to communications, instrumentation, information processing systems, etc.; transient and steady-state analysis of electronic circuits and systems; introductory topics in the theory of communication and information. The seminar is accompanied by a full-day laboratory.

Prerequisite: ES102 or Physics 102.

Mechanical Engineering

PROFESSOR: BERNARD MORRILL‡

ASSOCIATE PROFESSOR: PHILIP C. PRAGER, *Director of Curriculum*

VISITING ASSOCIATE PROFESSOR: JOHN R. DIXON

INSTRUCTOR: JOHN K. HAWLEY

The curriculum in Mechanical Engineering is designed to develop the student through education in the engineering sciences so that he may continue his education either in industry or in graduate school. The courses offered are intended to give the student a broad enough base in the science of mechanical engineering so that many avenues of professional growth are opened to him. Students are encouraged to go on to graduate school for further development not only in mechanical engineering but also in such fields as business administration, industrial management, economics, and other areas which may be naturally coupled with an education in mechanical engineering.

Coincident with the need for a broad and fundamental technical training, all of the engineering profession should be conscious of the impact upon society resulting from their efforts. To stimulate this awareness, students are encouraged to choose electives in the Humanities and Social Sciences throughout their undergraduate careers.

STANDARD PROGRAM FOR COURSE STUDENTS

Fall Semester

CE51 Mechanics III
ME51 General Thermodynamics
EE55 Engineering Analysis
Non-technical Elective

Junior Year

ME52 Advanced Thermodynamics
ME54 Fluid Mechanics
ME62 Advanced Strength of Materials
Non-technical Elective

Spring Semester

Senior Year

ME53 Heat and Mass Transfer
ME55 Advanced Fluid Mechanics
ME63 Engineering Design I
EE63 Electronic Circuits

ME64 Engineering Design II
ME66 Mechanical Engineering Problems
EE64 Automatic Control
Non-technical Elective

ME51 GENERAL THERMODYNAMICS.

An introduction to thermodynamics using the information theory approach to statistical mechanics. The thermodynamic systems discussed are sufficiently broad to include the solid, liquid, vapor, or gaseous state of the matter contained therein.

Three class periods and one three-hour laboratory each week.

Prerequisite: Mathematics 11, or equivalent.

ME52 ADVANCED THERMODYNAMICS.

An extension of the General Thermodynamics course given especially for Mechanical Engineering majors. The fundamental laws of thermodynamics are applied to cyclic processes, theory of combustion, real engine systems and gas mixtures.

Four class periods per week.

Prerequisite: ME51. General Thermodynamics.

ME53 HEAT AND MASS TRANSFER.

A course presenting a basic introduction to physical phenomena involved in transport processes of heat and mass. Work is done in the areas of conduction, radiation and convection in both steady state and transient conditions. Both the analytical and the empirical approach are covered.

Four class periods per week.

Prerequisites: ME51 General Thermodynamics, and EE55 Engineering Analysis.

‡ Absent on leave, 1964-65.

ME54 FLUID MECHANICS.

This course presents the fundamentals of fluid mechanics; the basic definitions, assumptions, and mathematical techniques whereby static and dynamic problems involving fluids are analyzed. The physical phenomena underlying mathematical formulations are stressed; included are: continuum and field concepts; stress, scalar and vector fields; Euler, Bernoulli and momentum equations; continuity, irrotational incompressible flow, complex variable techniques, similarity and dimensional analysis. Three class periods and one three-hour laboratory each week.

Prerequisites: Differential and Integral Calculus (Math 11, 12) and EE55 Engineering Analysis, or equivalent.

ME55 ADVANCED FLUID MECHANICS.

This course builds upon the material in ME54. To round out the students' knowledge of the fundamentals, the Navier-Stokes equations are derived and their reduction for particular types of flow are studied. The more specialized areas of fluid mechanics are presented in terms of their occurrence in mechanical engineering problems. In particular, compressible flow, laminar boundary layers, lubrication, and elements of turbulent flow are studied.

Four class periods per week.

Prerequisites: ME51 General Thermodynamics, and ME54 Fluid Mechanics.

ME62 ADVANCED STRENGTH OF MATERIALS.

This course provides a transition between mechanics of materials and the general three-dimensional analysis of elastic stress and strain. The fundamental concepts and the equilibrium and compatibility equations are introduced on a completely general basis. Several technologically important problems are studied. The subject matter is such as to be directly applicable to the problems encountered in the course in mechanical engineering design. Plane stress, plane strain, elastic torsion, strain energy methods, disks and cylinders, and strength theories are studied.

Four class periods per week.

Prerequisites: Differential and Integral Calculus (Math 11, 12) and CE51 Mechanics III and EE55 Engineering Analysis, or equivalent.

ME63 ENGINEERING DESIGN I.

A study of the analysis and synthesis of the elements of a machine. Machine vibrations from a lumped parameter point of view are studied.

Three class periods and one three-hour laboratory each week.

Prerequisite: ME62 Advanced Strength of Materials.

ME64 ENGINEERING DESIGN II.

Rigid body dynamics leading to a discussion of the gyroscope are developed in vector form. Formulation of dynamic problems is developed by means of Lagrange Equations and Hamilton's Principle. A study of the vibration of distributed systems for both free and forced systems completes the course.

Three class periods and one three-hour laboratory each week.

Prerequisite: ME63 Engineering Design I.

ME66 MECHANICAL ENGINEERING PROBLEMS.

The study of a group of problems in mechanical engineering by analytical and experimental means. Problems are selected which cross the conventional boundaries of previous study programs in engineering class work. Emphasis is placed on integrating analytical work with experimental laboratory work.

Two three-hour class periods per week.

Prerequisite: ME63 Engineering Design I.

ME71 MECHANICAL ENGINEERING THESIS.

With approval, an undergraduate may undertake a thesis project as a portion of the program in the senior year.

English Literature

PROFESSORS: GEORGE J. BECKER, *Chairman*
FREDRIC KLEES

ASSOCIATE PROFESSORS: DAVID COWDEN
DANIEL G. HOFFMAN
SAMUEL L. HYNES‡

ASSISTANT PROFESSORS: THOMAS H. BLACKBURN
HAROLD E. PAGLIARO

INSTRUCTORS: SUSAN B. SNYDER
HARRIETT B. HAWKINS

This department might more properly be called the Department of Literature in English, since it offers a study both of literature originally written in the English language and of works translated from other tongues. Literature is considered as a fine art, as a cultural record, and as a guide to the student's interpretation of his own experience in life. The program of courses and seminars comprises four approaches to the subject: the intensive study of the work of major writers, examination of the literature produced in certain limited periods, the historical development of the major literary types, and the grouping of various types or forms on the basis of their subject matter or point of view. The general purposes of this study are the broadening of the student's understanding and enjoyment of literature, the development of a basis for intelligent criticism, and the provision of a foundation for further study in the field. Stress is also laid upon accurate reading and writing through critical explication of texts and criticism of student papers.

REQUIREMENTS FOR MAJORS IN COURSE

The work of the major in course consists of at least eight semester courses in the department. It is recommended that majors take The Development of English Literature (3-4) in the freshman year, one of the type courses (21-30) during the sophomore year, Chaucer or Milton in the Junior year, and Shakespeare and Problems of Literary Study in the final year. The comprehensive examination at the end of the senior year is based on this body of work, but also includes questions on other courses offered by the department for those prepared in those fields.

COURSES

1. INTRODUCTION TO LITERARY STUDY. Staff. *Each semester*

An examination of the principal types of literature based on a comparison of modern and traditional works.

This course is not open to students who elect 3-4. Either 1 or 3-4 is prerequisite to all other literature courses offered by the department.

3-4. THE DEVELOPMENT OF ENGLISH LITERATURE. Staff. *Full course*

An introduction to literary study by means of the traditional materials of English literature from the Renaissance to the twentieth century.

Recommended for English majors; not open to students taking course 1.

5, 6. ENGLISH FOR FOREIGN STUDENTS.

Individual and group work on an advanced level for students from non-English backgrounds.

‡ Absent on leave, 1964-65.

10. WRITING AND SPEAKING. Staff. *Spring semester*
 Analysis, organization, and effective presentation of complex subject matter in both speech and writing. Open only to students for whom the course is a requirement or for whom it is recommended by their advisers.
22. RENAISSANCE POETRY. Miss Snyder. *Spring semester*
 The development of forms and ideas in English non-dramatic poetry from the beginning of the sixteenth century to the death of Milton. Primarily for sophomores.
24. NINETEENTH-CENTURY POETRY. Mr. Pagliaro. *Fall semester*
 A study of ideas and language in the English Romantic and Victorian poets.
25. THE ENGLISH NOVEL. Mr. Cowden. *Fall semester*
 A study of the beginnings of the novel, concentrating on works of the eighteenth century and romantic period. Primarily for sophomores.
26. THE ENGLISH NOVEL. Mr. Cowden. *Spring semester*
 A study of the chief Victorian and Edwardian novelists. Primarily for sophomores.
27. ENGLISH DRAMA TO 1700. Miss Hawkins. *Spring semester*
 The larger part of the plays read are drawn from the Elizabethan and Jacobean periods, but included are a few Greek tragedies at the start of the course and some Restoration comedies at the end. Primarily for sophomores.
28. MODERN DRAMA (Ibsen and after). Mr. Klees. *Fall semester*
 The main emphasis is on Ibsen, Chekhov, Shaw, and O'Neill; but there is a wide range of plays by European, English, and American dramatists of the modern period. Primarily for sophomores.
29. THE LITERATURE OF THE MIDDLE AGES. Miss Snyder. *Fall semester*
 The emergence of vernacular literature in English in its relation to English and classical sources. Primarily for sophomores.
30. ENGLISH LITERATURE OF THE EIGHTEENTH CENTURY. Mr. Pagliaro. *Spring semester*
 The developing sensibility and literary forms of the period. Primarily for sophomores.
42. SHAKESPEARE. Staff. *Each semester*
 A study of the major plays. Not open to freshmen or to majors in course.
- 51, 52. LITERATURE IN AMERICA. Mr. Hoffman.
 A study of the major American writers from Puritan times to the early 20th century. Open to juniors and seniors.
53. RENAISSANCE COMPARATIVE LITERATURE. *Fall semester*
 Emphasis on the assimilation of the classical tradition by English and other European literatures during the Renaissance. Open to juniors and seniors.
54. MODERN COMPARATIVE LITERATURE. Mr. Becker. *Fall semester*
 The rise and decline of the realistic movement as seen through the study of European and American works since Flaubert. Open to junior and seniors.
55. CHAUCER. Mr. Klees. *Fall semester*
 Reading of *Troilus and Criseyde*, *The Canterbury Tales*, and some of the minor poems in the original Middle English, with greater attention to the literary than to the linguistic aspects. Open to juniors and seniors.

56. MILTON. Mr. Blackburn. *Spring semester*
Study of the main body of Milton's works with particular emphasis on *Paradise Lost*. Open to juniors and seniors.
57. MODERN POETRY. Mr. Hynes. *Fall semester*
Poetry in English since the end of the nineteenth century. Open to juniors and seniors.
58. MODERN FICTION. Mr. Cowden. *Spring semester*
A study of the technical innovations in the forms of fiction, beginning with Joyce. Open to juniors and seniors.
60. SPECIAL TOPICS. Staff.
From time to time intensive courses will be offered in fields not covered by the regular program. Open only to juniors and seniors.
- 1-62. SHAKESPEARE. Staff. *Fall semester*
A study of the complete works of Shakespeare, tracing the development of his craftsmanship and ideas. Required of majors in the department, who meet weekly in small groups during the first semester of the senior year. Students should read through the plays before taking the course.
- 3-64. PROBLEMS OF LITERARY STUDY. Staff. *Spring semester*
Group meetings of departmental majors in the second semester of the senior year to review, integrate, and supplement their major programs. Under exceptional circumstances a student who has made application by May 15 of his junior year may be allowed to substitute a thesis.

HONORS WORK

Prerequisites: The course requirements for a major in Honors are the same as for a major in course, either The Development of English Literature (3-4) or Introduction to Literary Study (1) and one of the courses for sophomores (22, 24, 25, 26, 27, 28).

The election of one or two additional courses in the sophomore year is highly recommended.

For acceptance as a minor in the department, two semester courses are required.

Program: Majors in Honors must take four seminars in the department, one of which must be Chaucer, Shakespeare, or Milton. Minors in Honors may enroll in any two or three seminars which seem best suited to the purposes of their whole program. No student may take more than two seminars in Group II.

Seminars: The following seminars prepare for examination for a degree with Honors:

Group I

01. SHAKESPEARE. Staff. *Each semester*
A study of Shakespeare as dramatist and poet. The emphasis is on the major plays, with a more rapid reading of the remainder of the canon. Students are advised to read through all the plays before entering the seminar.
03. CHAUCER. Mr. Klees. *Fall semester*
A reading of Chaucer's poems in the original Middle English, with particular attention to *Troilus and Criseyde* and *The Canterbury Tales*.
04. MILTON. Mr. Blackburn. *Spring semester*
An examination of the poetic achievement of John Milton.
06. DRAMA. Mr. Klees. *Spring semester*
A study of comedy and tragedy in the Greek, Elizabethan, and modern periods with a consideration of the various forms these types take from one age to another.

108. RENAISSANCE POETRY. Miss Snyder. *Spring semester*
The basic elements of poetic expression, thought, imagery, and sound, are studied in poems from the Spenserian and Metaphysical strains.

109. THE ENGLISH AUGUSTANS. *Fall semester*
The interests, sensibility, and literary practice of such figures as Dryden, Swift, Pope, Fielding, Johnson.

110. THE ROMANTIC POETS. Mr. Pagliaro. *Fall semester*
An examination of the poetry of Blake, Wordsworth, Coleridge, Byron, Shelley, and Keats.

Group II

113. THE NOVEL. Mr. Cowden. *Each semester*
Studies in Four Novelists: James, Conrad, Joyce, and Woolf.

115. MODERN COMPARATIVE LITERATURE. Mr. Becker. *Fall semester*
Using the realistic movement as a starting point, this seminar considers some of the major themes and philosophic attitudes embodied in recent literature. The chief figures studied are Flaubert and Zola, Tolstoy and Dostoevsky, Kafka and Mann, Joyce and Faulkner.

116. AMERICAN LITERATURE. Mr. Hoffman. *Fall semester*
A study of the themes, forms and aesthetic premises of selected writings, and their relations to the cultural situations in which they were created.

118. MODERN POETRY. Mr. Hoffman and Mr. Hynes. *Spring semester*
A study of the modern tradition in English and American poetry from Yeats to the present. The seminar will concentrate on the work of a few major poets.

119. SPECIAL TOPICS IN LITERATURE. Staff.
Occasional seminars will be given in special fields not part of the regular program.

120. THESIS.
A major in Honors may elect to write a thesis as a substitute for one seminar. He must select his topic and submit his plan of work for departmental approval by the end of the junior year. Then during one semester of the senior year he writes his thesis under the direction of a member of the department, with whom he has periodic consultations.

Fine Arts

PROFESSORS: ROBERT M. WALKER, *Chairman*
HEDLEY H. RHYS

ASSISTANT PROFESSOR: JOHN W. WILLIAMS

The aim of the Department is to study the historical-cultural significance and aesthetic value of architecture, sculpture, painting and graphic art (prints and drawings). Methods and problems of criticism are considered: observation, analysis, interpretation and evaluation. Instruction is given by means of original works of art as well as by the usual visual aids. Field trips are made to public and private collections in New York, Philadelphia, Baltimore and Washington and to significant examples of architecture in those areas.

Since it is the objective of the Department to foster an intelligent comprehension of the visual arts rather than to develop technical skills, no courses in drawing, painting and sculpture are offered for credit. However, instruction in such work is available under the extracurricular Arts and Crafts Program.

REQUIREMENTS AND RECOMMENDATIONS

Prerequisites: Majors in course and minors in honors must take the two half-courses, Fine Arts 1 and 2, Introduction to Art History. This requirement must be fulfilled before the Junior year. For other students the prerequisite for all other courses is Fine Arts 1 and 2, Introduction to Art History, with the exception of Fine Arts 58, Modern Architecture, which is open to Engineers without any prerequisite. Fine Arts 2 may be taken independently of Fine Arts 1, but if taken alone does not serve as a prerequisite for any other Fine Arts course. Fine Arts 11, Design in Drawing and Painting, while not a prerequisite, is recommended as a foundation for other Fine Arts courses and seminars.

Majors in Course: The program of a major consists of at least eight half courses (including Fine Arts 1 and 2) in the Department. The courses supporting this program depend on the needs of the individual student and may be found in both the Division of the Humanities and the Division of the Social Sciences.

Majors and Minors in Honors: Majors in honors take four seminars in the Department. In special cases the seminar in Aesthetics may be substituted for one in Fine Arts. A minor in honors usually consists of two seminars. The seminars offered in any one semester vary according to the requirements of the students and the convenience of the Department.

Language Requirements for Graduate Schools: Students are advised that graduate work in Fine Arts requires a knowledge of French and German.

COURSES

1. INTRODUCTION TO ART HISTORY. Mr. Walker and Mr. Williams *Fall semester*

Consideration is given in the first four weeks to the basic problems of the nature of the work of art, the factors of influence upon its conception, formation, and development (geographic, social, economic, etc.) the principles of value judgments, and methods of analysis. A limited number of representative examples of architecture, sculpture, and painting are studied within the historical context of the civilizations and cultural epochs which produced them: Ancient Egypt, Greece and Rome, and Medieval France.

Three hours of lecture a week and one bi-weekly conference hour.

2. INTRODUCTION TO ART HISTORY. Mr. Rhys and Mr. Williams *Spring semester*
 European and American architecture, sculpture, and painting from the fifteenth century to the present day are studied from the same points of view and with the same methods as in the first semester.
 Three hours of lecture a week and one bi-weekly conference.
11. DESIGN IN DRAWING AND PAINTING. Mr. Rhys. *Spring semester*
 The basic elements of design and their function in drawing and painting. Types of harmony, sequence and balance such as linear, tonal and special. The methods of design and representation that characterize the various historical styles. Practical exercises required demand no special technical aptitude, since the purpose of the course is to develop a critical understanding of drawing and painting and not technical skill.
51. ANCIENT ART. Mr. Walker. *Fall semester*
 The development of the forms of architecture, sculpture and painting as expressing various cultural patterns of the ancient civilizations of Greece and Rome.
52. MEDIEVAL ART. Mr. Williams. *Spring semester*
 A study of the relationship between art and society in Europe and the Near East from the fourth through the fourteenth centuries. The ideas and institutions which were instrumental in shaping Christian art during its formative stages of development. Special emphasis is placed on the Romanesque and Gothic periods in France; the abbey and the cathedral.
53. ITALIAN RENAISSANCE PAINTING. Mrs. Hanson. *Fall semester*
 A study of certain aspects of the art of the Renaissance in Italy as expressed in drawings and paintings. Emphasis is placed on such great masters as Masaccio, Leonardo da Vinci, Raphael, Michelangelo and Titian.
54. NORTHERN RENAISSANCE ART. Mr. Walker. *Fall semester*
 Developments in painting and the graphic arts of drawing and print making during the fifteenth and sixteenth centuries in England, France, the Netherlands, Germany, and Spain through the study of individual artists such as Jan van Eyck, Roger van der Weyden, Jean Fouquet, Albrecht Dürer, Grünewald, Holbein, Peter Bruegel, Jerome Bosch and El Greco.
55. BAROQUE ART. Mr. Rhys. *Spring semester*
 The characteristics of art in the seventeenth century in Italy, France, Flanders, Holland, and Spain. Special emphasis is given to the paintings of such masters as Caravaggio, Poussin, Rubens, Rembrandt, El Greco, and Velasquez.
 Not offered in 1963-64.
56. MODERN PAINTING. Mrs. Hanson. *Spring semester*
 Important stylistic developments in European painting from the French Revolution through Matisse and Picasso: the meanings of the various movements and their relationship to changing social and political attitudes.
57. AMERICAN ART. Mr. Rhys. *Fall semester*
 Architecture, sculpture and painting in North America from the Colonial Period to the present day, their connection with European art and their significance as a reflection of American culture.
58. MODERN ARCHITECTURE. Mr. Walker. *Spring semester*
 An introduction to the nature of architecture and the function of the architect through a study of developments in European and American building during the late nineteenth and twentieth centuries. The specific influence of economic, technological

and social changes upon design and structure. Emphasis placed on the study of original examples in the Philadelphia area and on the work of such men as Sullivan, Wright, Mies van der Rohe, Gropius and Le Corbusier.

The prerequisite of Fine Arts 1 is waived for students in Engineering.

59. FAR EASTERN ART. Mr. Rhys. *Fall semester*

An introduction to the history of pictorial art in Asia, especially China and Japan, from the earliest phases and origins of pictorial art in China to new movements in the eighteenth and nineteenth centuries. Iconography, stylistic definition, and the treatment of form, color, and space as they differ from such concerns in Western art will receive special attention.

Open only to Juniors and Seniors who have a prerequisite of either Fine Arts 1 or Fine Arts 2.

- 61-62. SENIOR CONFERENCE. Mr. Walker. *Spring semester*

HONORS SEMINARS

100. ANCIENT ART. Mr. Walker. *Spring semester*

Classical Greek art and architecture within the art historical context of ancient civilizations of the Near East.

101. MEDIEVAL ART. Mr. Williams. *Fall semester*

The development of the forms of Christian art during the Middle Ages, with special emphasis on the Romanesque and Gothic periods in France.

102. ITALIAN RENAISSANCE PAINTING. Mr. Williams. *Spring semester*

A study and analysis of painting in Italy from Giotto to Titian: the decisive contributions of the outstanding masters to its stylistic development and its relationship to the Renaissance movement as a whole.

103. NORTHERN RENAISSANCE PAINTING. Mr. Walker. *Fall semester*

Developments in painting and the graphic arts of drawing and print making during the fifteenth and sixteenth centuries in England, France, the Netherlands, Germany, and Spain through an intensive study of individual masters such as the Van Eycks, Roger van der Weyden, Jerome Bosch, Pieter Brughel, Jean Fouquet, Martin Schongauer, Albrecht Dürer, Hans Holbein, and El Greco.

104. THE BAROQUE. Mr. Rhys. *Spring semester*

The formation of the Baroque in Italy and its development as an international style in Western Europe. Some consideration is given to architecture and sculpture in Italy, but the primary orientation is toward painting, especially the work of such masters as Caravaggio, Poussin, Rubens, Rembrandt, and Velasquez.

105. MODERN PAINTING. Mr. Rhys. *Fall semester*

Important stylistic developments in European painting from the French revolution through Matisse and Picasso; the meanings of the various movements and their relationship to changing social and political attitudes.

106. MASTER PRINT MAKERS. Mr. Walker. *Spring semester*

A consideration of certain problems in the history of the graphic arts. A study of the significance of the work of such men as Schongauer, Dürer, Rembrandt, Goya, Daumier, Munch and Rouault for the development of expression in the media of the woodcut, engraving, etching, aquatint and lithography. Students work almost exclusively with original material in the Print Room of the Philadelphia Museum and the Lessing J. Rosenwald Collection in Jenkintown.

History

PROFESSORS: PAUL H. BEIK†
JAMES A. FIELD, JR., *Chairman*
LAURENCE D. LAFORE
FREDERICK B. TOLLES†

ASSOCIATE PROFESSOR: HARRISON M. WRIGHT

ASSISTANT PROFESSORS: ROBERT C. BANNISTER
GEORGE T. BEECH

INSTRUCTORS: JEAN H. KOPYTOFF
PHILIP R. MARSHALL

LECTURER: ALEXANDER V. RIASANOVSKY

The offerings of the History Department are designed to give the student a sense of the past and an acquaintance with the course of cultural and institutional development which has brought forth the world of today, and at the same time to provide some training in historical method and the use of evidence. Concerned as it is with these ends, the study of history in college emphasizes less the accumulation of data than the comprehension of those ideas and institutions—political, religious, social, economic—by which man has attempted to order his world.

The structure of the Department's program derives from the belief that some knowledge of European history since classical times is both an important part of a general education and a necessary prelude to further historical work. History 1-2 is planned as an introduction to this subject, to the methods and problems of the historian, and to the study and use of historical materials; it is a prerequisite for all other departmental offerings except Courses 4, 5, 12, and 61. Students contemplating further work in the Department should, if possible, take History 1-2 in the freshman year; those who take the course as sophomores may, if they have successfully completed History 1, elect an additional history course in the second semester. Under certain circumstances students who enter college with Advanced Placement credit in European history and who complete History 1 may be excused from History 2.

The courses open to sophomores, numbered 3 to 15, deal with our heritage from England, offer a choice of approaches to the history of the United States, and provide basic coverage of other important broad areas. Courses 52-61, normally restricted to juniors and seniors, are designed for more intensive and specialized study of a variety of subjects.

The minimum requirement for acceptance as a major in history is the successful completion of History 1-2 and a satisfactory standard of work in other departments. The work of the major in Course consists of not less than eight nor more than twelve courses in the Department, including History 1-2, a course in American history, a course in English history, and Special Topics; while considerable latitude is permitted in the planning of individual programs, it should be noted that the Comprehensive Examination assumes some knowledge of these basic fields. For those contemplating work in Honors, history provides a logical major or minor field in either the Humanities or the Social Sciences and can serve as a bridge in cross-divisional programs.

† Absent on leave, spring semester, 1964-65.

Students who are considering a major or minor in History Honors should give timely consideration to the prerequisites of their other fields. Those who intend to continue their studies after graduation should bear in mind that a reading knowledge of one or two foreign languages is now generally required for admission to graduate school.

COURSES

2. INTRODUCTION TO HISTORY. All members of the department. *Full course*
One of the basic courses in the curriculum. The historical problems considered follow in generally chronological order from the fall of the Roman Empire to the mid-twentieth century.
3. ENGLAND. Mr. Lafore. *Fall semester*
A survey of the history of the English people.
4. THE UNITED STATES TO 1877. Mr. Bannister or Mr. Field. *Fall semester*
The colonial experience; independence, a new society, and a new government; transcontinental expansion and the struggle between North and South.
5. THE UNITED STATES SINCE 1877. Mr. Bannister or Mr. Field. *Spring semester*
Industrialism and its consequences; the United States as a great power; the problems of a shrinking world.
6. AMERICAN INTELLECTUAL HISTORY BEFORE 1865. Mr. Tolles. *Fall semester*
The history of ideas in the United States from the colonial period through the middle of the nineteenth century. A general knowledge of the political and social history of the period is assumed.
7. AMERICAN INTELLECTUAL HISTORY AFTER 1865. Mr. Bannister. *Spring semester*
The history of ideas in the United States from the middle of the nineteenth century to the present time. A general knowledge of the political and social history of the period is assumed.
12. THE FAR EAST. Mr. Marshall. *Spring semester*
From the mid-nineteenth century to the present.
14. RUSSIA. Mr. Beik. *Fall semester*
The history of modern Russia. The course begins with the reign of Peter and gives half its time to the period since the Revolution.
15. THE EXPANSION OF EUROPE. Mr. Wright. *Spring semester*
A survey of the origins and character of European overseas expansion and of its impact on non-European societies, with a comparative study of selected areas and times.
52. MODERN BRITAIN. Mr. Lafore. *Spring semester*
The development of a modern industrial society and welfare state.
53. THE FRENCH REVOLUTION AND NAPOLEON. Mr. Beik.
The significance of the period from 1789 to 1815 in the development of modern European social theories and political institutions.
Not offered in 1964-65.
54. MEDIEVAL EUROPE. Mr. Beech. *Spring semester*
European and Mediterranean history from the disintegration of the Roman Empire to about 1300, with special emphasis on western Europe.
56. AMERICAN DIPLOMATIC HISTORY. Mr. Field. *Fall semester*
Official United States foreign policy considered as a part of the larger problem of American participation in world affairs.

57. MODERN EUROPE. Members of the department. *Fall semester*
Recent European problems and institutions examined primarily through the experiences of one nation in the nineteenth and twentieth centuries. In 1964-65 this nation will be Germany. Mr. Lafore.
60. AFRICA. Mr. Wright. *Fall semester*
Aspects of the history and civilization of Africa. The emphasis is on tropical Africa in modern times.
61. QUAKERISM. Mr. Tolles.
The history of the Society of Friends to the present day. The characteristic religious and social ideas of the Quakers are considered in their historical setting.
Not offered in 1964-65.
- 65-66. SPECIAL TOPICS. *Spring semester*
Group meetings of senior majors in their final semester to review, integrate, and supplement their programs. The readings and discussion center on the development of historical writing from the Middle Ages to the present, and on the relationship of the historian to his time.

HONORS SEMINARS

The following seminars are offered by the department to juniors and seniors to prepare for the examinations for a degree with Honors. They may be taken in any combination without regard to chronological order. History 1-2 is a prerequisite to all seminars. In addition, some preliminary reading is required for seminars 101, 102, and 103 if no work in American history has been previously elected.

Those who wish to specialize in international relations with a major in history (see p. 112, last paragraph) should include in their programs at least three of the following seminars: numbers 103, 110, 116, 117.

101. EARLY AMERICAN HISTORY. Mr. Tolles.
Political, economic, social, and cultural aspects of the period from the explorations to the end of the American Revolution.
Not offered in 1964-65.
102. PROBLEMS IN AMERICAN HISTORY. Mr. Bannister or Mr. Field. *Both semesters*
Selected topics in the history of the United States.
103. PROBLEMS IN AMERICAN HISTORY: FOREIGN. Mr. Field. *Spring semester*
The United States in the world community: a study of the evolution since 1776 of American policies toward Europe, Latin America, and the Orient, with emphasis on ideological, economic, and strategic developments.
109. ENGLAND SINCE 1785. Mr. Lafore. *Spring semester*
The rise of the first modern industrial state. Its social, political, and economic problems.
110. THE BRITISH EMPIRE. Mrs. Kopytoff or Mr. Wright. *Fall semester*
Selected areas of the Empire and Commonwealth from 1750 to the present, with special reference to the history and problems of Canada, Australia, India, South Africa, and tropical Africa.
111. MEDIEVAL EUROPE. Mr. Beech. *Spring semester*
The making and expansion of Western Europe (not excluding England) from Charlemagne to the twelfth century.

112. THE RENAISSANCE AND REFORMATION. *Fall semester*
The period of the Renaissance and the Reformation in continental Europe.
114. EUROPE 1760 TO 1870. Mr. Beik. *Fall semester*
The disintegration of the old regime and the rise of liberalism.
115. EUROPE 1870 TO 1939. Mr. Marshall. *Both semesters*
Political and social changes in Western Europe prior to the Second World War.
116. DIPLOMATIC HISTORY OF EUROPE. Mr. Marshall. *Spring semester*
The management of international affairs since 1870.
117. EASTERN EUROPE. Mr. Riasanovsky. *Spring semester*
The origins and consequences of the Russian Revolution and the development of the Soviet zone in East Central Europe.
120. THESIS.
A thesis may be substituted for one of the Honors examinations by permission of the department. The topic should be selected and approved by the end of the junior year. The thesis must be completed during the first semester of the senior year.

GRADUATE WORK

The Department of History offers work leading to the Master's degree for graduate students who wish to use the research resources of the Friends Historical Library for a thesis. In addition to the thesis the candidate normally takes three Honors seminars. For the general regulations concerning the Master's degree see pp. 66-67.

International Relations

Students who plan to enter upon a career in the field of international relations should include in their programs, during the first two years, the introductory courses in economics, history, and political science and should complete the intermediate course in one or more modern languages.

Advanced courses selected from the groups listed below may be incorporated in the programs of students who do their major work in economics, history, political science, or a modern language.

Those students who wish to concentrate in international relations may take their Senior Comprehensive Examination in this field. Students preparing for this examination should take eight, nine, or ten half courses from among those listed below, including all of those listed in Group I, one or more in Group II, and one or more in Group III. The examination is administered by a committee appointed by the chairmen of the Departments of Economics, History, and Political Science, under the Chairmanship of the Department of Political Science.

Group I

Political Science 12. INTERNATIONAL POLITICS
Political Science 13. INTERNATIONAL LAW AND ORGANIZATION
Political Science 57-58. AMERICAN FOREIGN POLICY
Economics 60. INTERNATIONAL ECONOMICS

Group II

History 12. THE FAR EAST
History 14. RUSSIA
History 15. THE EXPANSION OF EUROPE
History 60. AFRICA

Group III

Political Science 15. COMPARATIVE GOVERNMENT
Political Science 19. THE SOVIET SYSTEM
Political Science 20. GOVERNMENT AND POLITICS OF EAST ASIA
Political Science 55. MODERN POLITICAL THEORY

Students who plan to enter the Honors program will find it possible to select a similar combination of courses and seminars in the field of international relations. In planning such programs, they should consult with the chairmen of their prospective major departments.

Mathematics

PROFESSOR: HEINRICH BRINKMANN, *Chairman*

ASSOCIATE PROFESSORS: PHILIP W. CARRUTH
DAVID ROSEN

VISITING ASSOCIATE PROFESSOR: JOHN HUNTER

ASSISTANT PROFESSOR: STEVENS HECKSCHER

INSTRUCTORS: EUGENE A. KLOTZ
ERIKA A. MARES

Pure mathematics is an abstract subject and may be looked upon as the model of a deductive science. On the other hand, the subject matter of mathematics has for the most part arisen out of concrete applications to the physical sciences, among which geometry occupies a central position. The courses offered in the Department of Mathematics attempt to combine these points of view and to give a picture of the power and beauty of the subject when studied for its own sake, as well as its many relations to other fields of thought. The study of mathematics is essential as a tool for the understanding of the principles of the physical sciences and engineering; a knowledge of its techniques is indispensable for a successful pursuit of these subjects. The same is becoming increasingly true in the biological sciences and the social sciences.

The sequence consisting of courses 3-4, 11, 12 forms a possible preparation for further work in mathematics as well as for work in physics and other sciences, and engineering.

The sequence consisting of courses 5-6, 15, 16 forms a more rigorous preparation for further work in mathematics as well as for the sciences and engineering. It is the preferable sequence for students who expect to major in mathematics or who intend to apply for an honors program containing seminars in mathematics.

For students who intend to major in mathematics in course, the normal sequence of courses is the following: Freshman year, courses 5-6; Sophomore year, courses 15, 16; Junior and Senior years, courses 13, 14, 51, 52, 55, these are required of all majors in course. The completion of Physics 1, 2 is strongly recommended.

In order to be admitted to honors seminars in mathematics, either as a major or as a minor, a student must have completed courses 11, 12 or preferably 15, 16. Mathematics 7-8 can be used for this purpose by suitably prepared Freshmen. An honors student whose major is mathematics must also take Physics 1, 2; it is furthermore highly desirable that he have a reading knowledge of French or German. A junior honors student will normally take the seminar in Advanced Calculus or the seminar in Advanced Analysis; these seminars are offered each year. The remaining seminars are offered as they are required.

1-2. INTRODUCTION TO MATHEMATICS.

Full course

The purpose of this course is to acquaint the student with some of the principles and fundamental concepts of mathematics. The main topics for study will be an introduction to logic and sets, linear algebra, the basic ideas of the calculus, with probability theory and statistics as an application. Pertinent topics from algebra and trigonometry will be studied as needed. The course is designed as a terminal course in mathematics and cannot be used as a prerequisite for any course offered by the Department of Mathematics.

3-4. FIRST YEAR MATHEMATICS (a).

Full course

The subject matter of this course consists of calculus combined with appropriate material from analytic geometry. It is an introductory course and (as opposed to Mathematics 5-6) is designed for students whose preparation is less extensive and who want a somewhat less theoretical treatment of the subject.

5-6. FIRST YEAR MATHEMATICS (b).

Full course

The subject matter of this course consists of calculus and some material from analytic geometry. It is an introductory course but the treatment of the subject is more rigorous than that given in Mathematics 3-4 and it requires a somewhat better preparation on the part of the student.

7-8. HONORS COURSE IN CALCULUS.

Full course

This course is designed for those Freshmen who obtain a score of 5 or 4 on the Advanced Placement Examination in Mathematics. Students with equivalent preparation may take this course by special permission.

11, 12. SECOND YEAR MATHEMATICS (a).

Full course

In these courses the student continues the study of calculus and analytic geometry as begun in Mathematics 3-4. Some work on differential equations is included.

Prerequisite: Courses 3-4; these courses must be passed with a grade of C or better.

13. HIGHER GEOMETRY.

Spring semester

Various kinds of geometry (mostly in the plane) will be studied in this course, using both analytic and synthetic methods. A large part of the work will deal with projective geometry and its relation to metric and other geometries. The conic sections will be studied in some detail. This course is not open to freshmen except by special permission.

Prerequisite: Course 14.

14. HIGHER ALGEBRA.

Fall semester

The subject matter of this course consists of various topics of modern algebra, such as groups, vector spaces, and the algebra of linear transformations and matrices. This course is not open to freshmen except by special permission.

15, 16. SECOND YEAR MATHEMATICS (b).

These courses follow Mathematics 5-6 and in them the student continues the study of Calculus as begun there. Work on differential equations, including linear differential equations with constant coefficients, is included. Various topics from advanced algebra are also studied.

Prerequisite: Courses 5-6, passed with a grade of C or better.

51, 52. ADVANCED ANALYSIS.

These courses deal with the differential and integral calculus of functions of several variables. The treatment is sufficiently rigorous to develop the student's mathematical maturity and strengthen his understanding of the principles of analysis.

Prerequisites: Courses 7-8 or 11, 12 or 15, 16. These courses must be passed with a grade of C or better.

54. PROBABILITY AND STATISTICS.

This course deals with the mathematical theory of statistics, based upon a study of the theory of probability. An introduction to the theory of sampling and statistical inference will be given.

Prerequisite: Course 51 which may be taken concurrently.

55. SENIOR CONFERENCE.

Spring semester

A weekly meeting held for the purpose of integrating and supplementing the course program of majors in this department. It is required of all majors in the course program.

60. READING COURSE IN MATHEMATICS.

This course is to provide an opportunity for students to do special work in fields not covered by the undergraduate courses, listed above. The work consists in the preparation of papers requiring extensive and detailed examination of the literature of a problem.

HONORS SEMINARS

101. ADVANCED CALCULUS

Fall semester

The subject matter of this seminar includes the differential and integral calculus of functions of several variables as well as an introduction to Lebesgue theory. The treatment will provide the student with an opportunity to use the rigorous processes of analysis.

102. TOPOLOGY.

Spring semester

This seminar is intended to bridge the gap between Advanced Calculus and certain topics in abstract mathematics. A thorough study of topological and metric spaces with some applications to functional analysis will be included.

103. ADVANCED ANALYSIS.

Fall semester

This seminar is planned for students who have mathematics as a minor and who wish to have just one seminar in analysis. It is part of the Honors Program in Engineering Sciences (see p. 92). Among the subjects studied are functions of several variables, infinite series, uniform convergence of infinite processes, Fourier series, differential equations of the first order, linear differential equations, Bessel functions.

104. MODERN ALGEBRA.

This seminar deals with the theoretical properties of such formal systems as groups, rings, fields and vector spaces. While these concepts will be illustrated by many concrete examples, the emphasis will be on the abstract nature of the subject; the student will thus be introduced to an important aspect of modern mathematics.

105. THEORY OF FUNCTIONS OF A COMPLEX VARIABLE.

A brief study of the geometry of complex numbers is followed by a detailed treatment of the Cauchy theory of analytical functions of a complex variable. Various applications are given and some special classes of functions, such as elliptic functions, are studied. Analytic continuation and the theory of Weierstrass are briefly considered.

Prerequisite: Seminar 101.

106. THEORY OF NUMBERS.

Among the subjects studied in this seminar are: Elementary properties of integers, the congruence relation, quadratic residues, quadratic forms, certain classical Diophantine equations, simple examples of fields of algebraic numbers.

107. THEORY OF FUNCTIONS OF A REAL VARIABLE.

This seminar is intended for students of some mathematical maturity, and will be an introduction to some material that is important in present-day mathematics. Topics covered will include axiomatic set theory, topological and metric spaces, measure theory, topological groups, and elements of the theory of Banach and Hilbert spaces.

108. SYMBOLIC LOGIC.

This seminar is given by the Department of Philosophy. A description of it will be found under the offerings of that department. It may be presented as part of the mathematics program in Honors.

109. PROBABILITY AND STATISTICS.

The purpose of this seminar is to give the mathematical background necessary for an understanding of the mathematical analysis of statistical data. In addition the modern development of this subject provides a valuable application of the concepts and techniques acquired in the study of advanced calculus. The topics treated include: the axiomatic approach, the use of Stieltjes integrals, correlation and regression, some special distributions, sampling theory, and a short introduction to the theory of statistical estimation.

Modern Language and Literatures

PROFESSORS: FRANZ H. MAUTNER‡ (German)

JAMES D. SORBER, *Chairman* (Spanish)

VISITING PROFESSOR: GEORGES COUTON (French)

ASSOCIATE PROFESSORS: HILDE D. COHN (German)

FRÉDÉRIC J. GROVER‡ (French)

OLGA LANG (Russian)

ASSISTANT PROFESSORS: ELISA ASENSIO (Spanish)

GEORGE C. AVERY (German)

DAVID A. KUHN (French)

JEAN ASHMEAD PERKINS (French)

INSTRUCTORS: ANDREW BOELCSKEVY (German)

THOMPSON BRADLEY (Russian)

SIMONE VOISIN SMITH (French)

MARIE JOSE SOUTHWORTH (French)

LECTURER: MIGUEL GONZALEZ-GERTH (Spanish)

VISITING LECTURERS: ALBERT R. SCHMITT (German)

HELEN P. SHATAGIN (Russian)

The department of modern languages and literatures aims to give its majors a comprehensive view of the literature and culture represented by these languages, in relation to other humanistic studies. Literature courses listed in the separate sections are conducted in the language concerned, and progress in the language is always one of the aims.

The elementary and intermediate courses are designed to prepare the students for advanced work in literature as well as to meet college and departmental requirements. It is possible with some extra reading, to major or to enter honors seminars in a language started in college, but elementary and intermediate courses (numbered 1 to 4) do not count toward the minimum of eight half courses required of a major.

Prerequisites and recommended subjects for majors are noted under the listing of each language section.

MODERN LANGUAGE COURSE (conducted in English)

13. MEDIEVAL COMPARATIVE LITERATURE.

The tension between ideals and their realization as reflected in the literature of the Middle Ages.

MODERN LANGUAGE SEMINAR (conducted in English)

130. LINGUISTICS.

Spring semester—even years

I. The basic techniques of descriptive linguistics (phonology, morphology, syntax) with emphasis on their application to languages known to the participants; II. The methods and results of historical-comparative language study; other topics (such as language typology, translation problems, semantics, language and culture, histories of linguistics) may be covered, depending on time and students' interests.

French

All students offering French for entrance are placed at the level where they will presumably profit best by the course, according to their rating in the College Entrance Examination or a test given by the department.

‡ Absent on leave, 1964-65.

French may be offered as a major in course or as a major or minor in honors work. Prerequisites and recommended supporting subjects are the same for both course and honors students and are as follows:

Required:

French 11 or 12 Introduction to Literature, or evidence of equivalent work.

French 6 Advanced Composition and Diction.

Recommended supporting subjects:

History of France, History of Modern Philosophy, Psychology, courses in other literatures, Fine Arts, Music.

Majors are expected to speak French with sufficient fluency to take part in discussion in courses and seminars in the language and to pass an oral comprehensive or oral honors examination in French.

NOTE: Not all advanced courses are offered every year. Students wishing a major or minor in French should plan their course carefully in advance with the department in order to get a well rounded program.

COURSES

1-2. ELEMENTARY FRENCH.

For students who begin French in College and for those who have had only one year in high school. Equivalent to two years' French in high school. The initial approach is oral but a foundation is laid for a reading knowledge. No credit is given for French 1 alone.

3, 4. INTERMEDIATE FRENCH.

For students who have had French 1-2 or its equivalent (2 years' French in high school). Students who have had three years in high school usually enter French 4. Grammar is reviewed. Reading is from contemporary literature in French editions without notes or vocabulary. Every effort is made to help the student to increase his vocabulary and to discuss what he has read in the French language. Completion of French 4 satisfies the language requirement. The normal course to follow French 4 is French 11. (Both courses are offered in the fall semester.)

5. ADVANCED COMPOSITION.

Problems of syntax, stylistics, and translation.

6. ADVANCED COMPOSITION AND DICTION.

For those who intend to major in French or who wish an advanced linguistic course. An effort is made to correct faulty pronunciation and to improve self-expression in the language, both oral and written.

11, 12. INTRODUCTION TO LITERATURE.

In Course 11 the transition is made from reading as an aid to language learning to the consideration of literary values. The material is selected from works of the nineteenth and twentieth centuries, but it is not a systematic survey course. Prerequisite: French 4 or equivalent. (Offered each semester.)

In Course 12 the treatment is more historical with selected readings from the Middle Ages to the eighteenth century. (Offered spring semester.)

15, 16. LE DÉVELOPPEMENT DE L'IDÉE CLASSIQUE, 1549—1715.

Course 15, French Literature from the Renaissance through the Baroque period (the Pléiade, Montaigne, Malherbe, Corneille, Descartes, Pascal).

Course 16, a study of Classicism and its ultimate decline (La Fontaine, Boileau, Molière, Racine, La Bruyère, Saint-Simon and others).

17. LE 18^e SIÈCLE.
The development of narrative prose and the theatre in the works of Montesquieu, Prévost, Marivaux, Voltaire, etc.
19. ROMAN DU 19^e SIÈCLE.
Balzac, Stendhal, Flaubert, Zola, and others.
20. ROMAN DU 20^e SIÈCLE.
Representative 20th century novelists.
21. THÉÂTRE MODERNE.
The theater since the classic period.
22. POÉSIE LYRIQUE. *Fall semester*
Poets of the Middle Ages.
23. POÉSIE LYRIQUE. *Spring semester*
Poets of the modern period.
52. SPECIAL TOPICS. (For senior majors.)
Readings selected to fit the needs of individual seniors and to supplement their selection of courses. Not designed to prepare for any specific type of comprehensive examination but to give an opportunity in the senior year for the student to see his courses in perspective and to see possible relationships with work in other fields.

HONORS SEMINARS

100. LITTÉRATURE DU MOYEN AGE.
Old French readings in lyric poetry, theater and fiction.
101. LA RENAISSANCE.
102. LE THÉÂTRE CLASSIQUE.
Corneille, Racine, Molière.
103. L'ÂGE DES LUMIÈRES.
The "Philosophes," the theater and the novel of the eighteenth century.
104. BALZAC, STENDHAL, FLAUBERT.
105. PROUST.
106. POÉSIE MODERNE.
Baudelaire, Rimbaud, Verlaine, Mallarmé, Claudel, Valéry.
108. LE ROMAN DU 20^e SIÈCLE.
While some honors seminars treat the same subject matter as the courses, the reading required is more extensive both in the texts and in critical material. The work of a seminar corresponds to two half courses.

German

All students offering German for entrance are placed at the level where they can presumably profit best by the course, according to their rating in the College Entrance Examination or a test given by the department. As far as possible, German is the language of the classroom, with the exception of German 7-8.

German may be offered as a major in course or as a major or minor in honors work. Prerequisites and recommended supporting subjects are the same for both course and honors students and are as follows:

Required:

German 11 or 12. Introduction to German Literature or equivalent work.

Recommended supporting subjects:

Courses in other literatures, History of Philosophy and of Germany, Fine Arts.

Majors are expected to speak German with sufficient fluency to take part in discussion in courses and seminars in the language and to pass oral examinations in German.

NOTE: Since not all advanced courses and seminars are offered every year, students wishing a major or minor in German should plan their course of studies carefully in advance with the department in order to get a well-rounded program.

COURSES

1-2. ELEMENTARY GERMAN.

For students who begin German in college. Equivalent to two years' German in secondary school. Fundamentals of grammar; easy literary prose.

NOTE: German 2 is usually also offered in the fall semester for students not ready for German 3.

3. INTERMEDIATE GERMAN.

Prerequisite: German 1-2 or its equivalent. Narrative and expository prose of moderate difficulty such as Hesse: *Knulp*; Brecht: *Kalendergeschichten*; Schweitzer: *Leben und Denken*. Review grammar.

4. INTERMEDIATE GERMAN.

Fulfills the college requirement. Literary narrative, drama, poetry, expository prose of greater difficulty, conversation.

Prerequisite: German 3 or equivalent.

6. WRITING AND SPEAKING GERMAN.

Composition and conversation in connection with contemporary literature.

Prerequisite: Course 3-4 or equivalent.

7-8. ELEMENTARY GERMAN (Special Reading Course.)

A special course designed for those who wish to acquire only a reading knowledge of German. German 7-8 may be used to fulfill the requirements of certain departments or of graduate schools, but not the college foreign language requirement.

11, 12. INTRODUCTION TO GERMAN LITERATURE.

A study of representative German dramas, *Novellen*, and lyric poems. Discussion, papers. Not a survey course.

Prerequisite: German 4 or equivalent.

Course 11 deals mainly with 19th and 20th century authors, course 12 with the classical period.

13. DIE GOETHE-ZEIT.

The most significant works of Goethe, Schiller, and their contemporaries.

14. GOETHE'S FAUST, ERSTER UND ZWEITER TEIL.
An intensive study of *Faust, I and II*. Also for students who only know *Faust, Part One*.
15. DIE DEUTSCHE ROMANTIK.
An introductory study of the Romantic movement in Germany, with readings from representative authors such as Novalis, Tieck, Arnim, Brentano, Eichendorff.
16. DIE DEUTSCHE NOVELLE SEIT GOETHE.
A study of significant examples of this typically German genre. Authors: Goethe, Eichendorff, Kleist, Stifter, Keller, Meyer, Storm, Thomas Mann, and contemporary writers. This course is at times also given as a seminar.
17. MODERNE DEUTSCHE LITERATUR.
A study of leading German writers of the twentieth century, including Hauptmann, Thomas Mann, Rilke, Hofmannsthal, Kafka.
18. DIE DEUTSCHE LYRIK.
A study of German poetry through the ages. The interrelation of form and "contents." Reading will include, among others, Goethe, Schiller, Hölderlin, Eichendorff, Heine, Mörike, Meyer, George, Rilke, and contemporary poets.
20. DIE DEUTSCHE KOMÖDIE.
Outstanding comedies from Goethe to the present time will be studied in their own right, as examples of the *genre*, and as illustrations of German intellectual history.
21. KAFKA.
51. SPECIAL TOPICS.
Readings selected to fit the specific needs of students with an advanced knowledge of the German language. Not designed to prepare for any specific type of comprehensive examination.

HONORS SEMINARS

101. LITERATUR DES MITTELALTERS.
Elements of Middle High German grammar as introduction. A study of mediaeval epics and other poetry, especially *Nibelungenlied*, *Parzival*, *Tristan*, *Minnesang*, and Walther von der Vogelweide.
103. DEUTSCHES BAROCK UND AUFKLAERUNG.
A study of German literature in the seventeenth and early eighteenth centuries. The lyric poetry of the period, the mysticism of Angelus Silesius and Jakob Böhme, the plays of Gryphius, and the prose of Grimmelshausen; a study of Lessing.
104. GOETHE.
Goethe's most significant works and his rôle in German intellectual history will be studied.
105. DIE DEUTSCHE ROMANTIK.
Romanticism as the dominant movement in German literature and thinking of the first third of the nineteenth century.
106. "BIEDERMEIER" UND "REALISMUS."
Studies in the works of Grillparzer, Stifter, Keller, Meyer, and Storm. Emphasis on the *novelle*.
107. DEUTSCHE LITERATUR SEIT 1900.
The chief writers from naturalism to expressionism: Hauptmann's dramas; Thomas Mann's prose; Rilke's poetry; Hofmannsthal's prose and poetry; Kafka; Brecht.
108. DAS DEUTSCHE DRAMA.
Representative examples of the dramatic genre in German literature from the end of the 18th century to the present.

9. **DIE DEUTSCHE LYRIK.**

Studies in German poetry. Methods and problems of interpretation.

Russian

Russian may be offered as a major in course or as a major or minor in Honors work. Prerequisites and recommended subjects are the same for both course and Honors students. Required: Russian 11, 12. Introduction to Russian Literature, Russian 13, Russian Novel.

Recommended supporting subjects: Russian History, The Soviet System.

Recommended for minors in Honors: Russian Novel, Russian History, The Soviet System.

2. **ELEMENTARY RUSSIAN.**

Full course

Designed to familiarize the beginner with the essentials of the spoken and written language. Fundamentals of grammar and reading of easy literary prose.

4. **INTERMEDIATE RUSSIAN.**

Readings in Russian literature. Short outline of Russian history. Translations from Russian fiction and periodicals. Review of grammar.

Conversation. Reports. Composition. Conducted in Russian.

Prerequisite: Russian 1-2 or its equivalent.

6. **ADVANCED RUSSIAN.**

For majors and those who are not primarily interested in literature. Problems of syntax and style, composition, conversation, and translation. Conducted in Russian.

1, 12. **INTRODUCTION TO LITERATURE.**

Readings in Russian classical literature: Pushkin, Lermontov, Gogol, Tolstoy, Turgenyev, Dostoevsky, Chekhov. Study of these writers' biographies and their political and social backgrounds. Intensive work in translation and composition. Advanced conversation. Conducted in Russian.

Prerequisite: Russian 3, 4 or its equivalent.

13. **RUSSIAN NOVEL.**

Lectures and reading in English. The Russian majors will be required to read a part of the material in Russian.

51. **SPECIAL TOPICS.**

Readings selected to fit the specific needs of students.

HONORS SEMINARS

(Open to majors in course.)

01. **TOLSTOY.**

02. **CHEKHOV AND GORKY.**

03. **PUSHKIN AND LERMONTOV.** Not offered in 1964-65.

04. **DOSTOEVSKY.** Not offered in 1964-65.

Spanish

All students offering Spanish for entrance are placed at the level where they will presumably profit best by the course, according to their rating in the College Entrance Examination or a test given by the department.

Spanish may be offered as a major in course or as a major or minor in honors work. Prerequisites and recommended supporting subjects are the same for both course and honors students and are as follows:

Required: Spanish 11, 12 Introduction to Literature.

Recommended supporting subjects:

Introduction to Philosophy, Psychology, English or other foreign or classic literature, Fine Arts, Music, South American History.

Majors are expected to speak Spanish with sufficient fluency to take part in discussion in courses and seminars in the language and to pass an oral comprehensive or oral honors examination in Spanish.

COURSES

- 1-2. ELEMENTARY SPANISH.
For students who begin Spanish in college. Equivalent to two years' Spanish in high school. The emphasis is both on the spoken language and on reading.
- 3, 4. INTERMEDIATE SPANISH.
For students who have had Spanish 1-2 or its equivalent (two years in high school). Students who have had three years usually enter Spanish 4. Grammar is reviewed. Reading is from Spanish and South American literature with emphasis on increasing the student's vocabulary and his ability to discuss his reading in oral and written Spanish.
9. ADVANCED COMPOSITION AND DICTION.
For majors and others who wish an advanced course in which the emphasis is not primarily literary. An effort is made to correct faulty pronunciation and to improve self-expression in the language both oral and written.
- 11, 12. INTRODUCTION TO SPANISH LITERATURE.
Representative texts of modern Spanish and Latin American writers. Conducted in Spanish with frequent written work in Spanish.
13. EL TEATRO MODERNO.
Plays of the major Spanish writers in the nineteenth and twentieth centuries.
14. LA NOVELA HISPANOAMERICANA.
Representative novelists from Marmol in Argentina to Yanez in Mexico.
- 15, 16. LAS OBRAS DE CERVANTES.
Novelas ejemplares. The *Quixote*. (A year course giving a thorough study of Cervantes. The first semester may stand alone.)
17. LA POESIA EN EL SIGLO XX.
A study of the major poets of Spain and Latin America since *modernismo*.
18. LA NOVELA EN EL SIGLO XX.
A study of the major novelists since the Spanish Civil War.
19. POESIA, TEATRO Y NOVELA DEL SIGLO DE ORO.
Representative authors of the Siglo de Oro, excluding Cervantes.
52. SPECIAL TOPICS FOR SENIOR MAJORS.
Readings selected to fit the needs of seniors and to supplement their selection of courses. Not designed to prepare for any specific type of comprehensive examination, but to give an opportunity in the senior year for the student to see his courses in perspective and to see possible relationships to work in other fields.

SEMINARS

101. LA NOVELA HISPANOAMERICANA.
102. LA NOVELA EN EL SIGLO XX.
103. LAS OBRAS DE CERVANTES.
104. EL TEATRO MODERNO.
105. POESIA, TEATRO Y NOVELA DEL SIGLO DE ORO.
106. LA POESIA EN EL SIGLO XX.
107. LA LITERATURA DE LA EDAD MEDIA.

NOTE: While the titles of seminars in Spanish correspond to the titles of courses, honors students read more extensively both in the texts and critical work. The work of a seminar corresponds to that of two half courses.

Music

ASSOCIATE PROFESSORS: CLAUDIO SPIES

PETER GRAM SWING, *Chairman*

VISITING LECTURER: ALVIN H. JOHNSON

ASSISTANT: CARL R. BERKY

The study of music as a liberal art requires an integrated approach to theory, history and performance, experience in all three fields being essential to the understanding of music as an artistic and intellectual achievement. Theory courses and seminars train the student to work with musical materials, to understand modes of organization in compositions, and to evolve methods of musical analysis. History courses and seminars trace the development of music in historical time, exploring relationships with other arts and areas of thought. Performance is assumed as part of the training in hearing and understanding music and is made a part of classroom work. While the Department does not give course credit for instruction in instruments or voice, it encourages its students to develop performing skills through private study and through participation in the orchestra and chorus, both of which are conducted by members of the Department. Members also coach individual performers and chamber music groups organized by the students for Bond concerts and other public performances. They also hold informal chamber music readings at home.

Students wishing to combine instrumental or vocal studies outside the College with a major in music at Swarthmore can, with special permission from the Department and the Dean, elect a five-year plan of study, thus reducing the normal number of courses to be taken per semester.

REQUIREMENTS FOR MAJORS AND MINORS

Music 11-12 or 13-14 are prerequisite for acceptance as a major. All majors will take three full courses in Theory and four half courses (or the equivalent in seminars) in History. Music 1, 2 can be counted toward meeting the History requirement. A major who does not take Music 1, 2 will normally include both Music 151 and Music 152 in his program.

Majors in Honors: A major in honors will normally take four examinations in music. He will take Music 61-62 in course, preferably in the junior year, in preparation for an honors examination on the material covered.

Minors in Honors: A minor in honors will normally take two examinations in music. A full course in Theory is prerequisite for all History seminars. Music 1, 2 may, with permission of the Department, be substituted for the Theory prerequisite. Such permission is normally granted when the student's work has shown sufficient technical grasp of music to indicate that he can handle the work of a particular seminar.

Language Requirements for Graduate Schools: Students are advised that graduate work in music requires a reading knowledge of French and German. A reading knowledge of Latin is also desirable for students planning to do graduate work in musicology.

Instrumental proficiency: All majors in music will be expected to play the piano well enough to perform at sight a two-part invention of J. S. Bach and a first movement of an easy late 18th or early 19th century sonata. By the end of the junior year they should be able to read chamber music scores as well as vocal music in four clefs. Students with exceptional proficiency in an instrument other than the piano or in singing will not be expected to meet the performing standards of pianists.

THEORY AND COMPOSITION

11-12. HARMONY. Mr. Spies.

Full course

A course in elementary Harmony. Emphasis will be placed on written exercises along with ear-training, dictation and keyboard harmony. Frequent reference will be made to a variety of keyboard and chamber compositions which will be carefully analysed.

13-14. COUNTERPOINT. Mr. Spies.

Full course

An introductory course offering training in Modal Counterpoint with reference to sixteenth-century practice, and in Tonal Counterpoint with specific reference to the style of J. S. Bach. Students will be required to submit exercises at regular intervals. Toward the end of the course they will compose several two-part Inventions. In addition to exercises there will be analyses of a variety of compositions for vocal and instrumental media. This course may be taken concurrently with Music 11-12.

61-62. INTERMEDIATE THEORY. Mr. Spies.

Full course

A continuation of Music 11-12 and 13-14 covering specialized areas of Harmony, Counterpoint and analysis.

Prerequisite: Music 11-12, Music 13-14, or the equivalent.

HONORS SEMINARS

163. ADVANCED THEORY. Mr. Spies.

181. COMPOSITION. Mr. Spies.

Offered as a tutorial to qualified students. Prerequisite: Music 61-62.

HISTORY OF MUSIC

1. INTRODUCTION TO THE HISTORY OF MUSIC. Mr. Swing and Mr. Berky

Fall semester

The history of music in Western civilization from the Middle Ages to 1750. This course works with a basic repertory of compositions studied in the intellectual context of the eras in which they were written. Particular emphasis is given to training in listening and analysis, and the relevance of analysis to listening.

Open to all students without prerequisite.

2. INTRODUCTION TO THE HISTORY OF MUSIC. Mr. Swing and Mr. Berky

Spring semester

A continuation of Music 1, dealing with the history of music in Western civilization from 1750 to the present. The same approach to listening and analysis is followed, with particular attention given to music of the Classic era and music of the 20th century.

Open to all students without prerequisite. For both Music 1 and Music 2, prior familiarity with the rudiments of music is desirable but not essential.

21. THE SYMPHONY FROM HAYDN TO MAHLER. Mr. Johnson

Fall semester

27. J. S. BACH. Mr. Swing.

Spring semester

A study of representative works, including the *Mass in B minor* and the *St. John Passion*.

Music 21 and 27 are designed for students who have taken Music 1 or Music 2 (or a course in Theory) wishing to do further work in special areas of music history. Both courses may be counted for credit in a major-in-course program.

HONORS SEMINARS

128. W. A. MOZART. Mr. Swing.

Fall semester

A study of representative works in the light of modern style criticism. A reading knowledge of French or German is desirable.

132. HISTORY OF THE STRING QUARTET. Mr. Swing.

Spring semester

This seminar traces the development of the string quartet from the middle of the 18th century to the present through study of selected quartets by Haydn, Mozart, Beethoven, Schubert, Brahms, Bartók, Webern, and Carter.

Not offered in 1964-65; offered in 1965-66.

51. MEDIEVAL AND RENAISSANCE MUSIC. Mr. Johnson.

Fall semester

An introduction to the study of music from the 9th century to the middle of the 16th century. Emphasis will be placed on analysis of selected compositions, related problems in performance practice, the function of music in the Catholic liturgy and the relationship of music to the thought and art of the times.

Not offered in 1964-65; offered in 1965-66.

52. MUSIC IN THE BAROQUE ERA. Mr. Johnson.

Spring semester

A continuation of Music 151. The emergence of opera, oratorio and cantata in Italy and their dissemination over the Continent; the development of idiomatic instrumental music.

191. TUTORIAL. Staff.

Philosophy and Religion

PROFESSORS: MONROE C. BEARDSLEY, *Acting Chairman*
JOHN M. MOORE

ASSOCIATE PROFESSOR: JEROME A. SHAFFER

ASSISTANT PROFESSOR: P. LINWOOD URBAN†

INSTRUCTORS: WILLIAM GUSTASON
LAWRENCE SKLAR

LECTURER: GILMORE STOTT

VISITING LECTURER: JAMES F. ROSS**

The study of philosophy consists in examining the beliefs to which one is committed by accepting scientific knowledge and common-sense views of the world; clarifying basic concepts; determining the circumstances under which statements may properly be said to be true in all fields of human inquiry and concern, including ethical and aesthetic discourse; and drawing the outlines of an account of human experience coherent with the evidence of the sciences. Because of the role of philosophy in the history of human thought, and because of the relation of philosophical ideas to problems in other fields, philosophy may be studied as instrumental to the understanding of wider areas of history or thought.

Religion is studied primarily as a system of ideas, both ethical and theological: systematically, through a consideration of representative forms of contemporary religious thought; and historically, through an examination of the great religions and the development of religion, particularly of the Judaeo-Christian tradition.

REQUIREMENTS AND RECOMMENDATIONS FOR MAJORS AND MINORS

The minimum prerequisite to admission as a major in either philosophy or religion will normally be the completion of one year's work in the department. Students who major in philosophy must obtain permission in order to count for credit in fulfillment of their major requirement more than one course in religion; and students who major in religion must obtain permission in order to count for credit in fulfillment of their major requirement more than one course in philosophy. (Courses 25, 26 and 27 may be counted either as philosophy or as religion.) Philosophy majors in course must elect course 52 in their senior year.

1. INTRODUCTION TO PHILOSOPHY. The staff.

Each semester

Several of the most important problems of philosophy, and alternative answers to them, are discussed. Typical examples are: the problem of free will, the arguments for the existence of God, the nature of logic and mathematics, the sources and kinds of knowledge, the justification of ethical judgments.

NOTE: Course 1 is a prerequisite for courses 11 through 27. Other courses may be taken in any order that is convenient. Members of the department will offer advice on request concerning an order of courses to suit individual needs. Students planning to do honors work should not take courses dealing with material to be covered in honors seminars.

† Absent on leave, spring semester, 1964-65.

** Fall semester, 1964-65.

11. ETHICS. Mr. Stott. *Each semester*
 A study of the principal theories about value and moral obligation, and of their justification. The emphasis is systematic, but works of leading ethical philosophers, both classical and contemporary, will be read as illustrations of the major theories.
12. LOGIC. Mr. Gustason. *Fall semester*
 An introduction to deductive logic with some attention to the problems of inductive logic. The emphasis is on principles of logical inference in the propositional calculus and general quantification theory. Due attention will be given to practical applications of these principles. Other topics include: theory of definition, algebra of classes, the nature of axiomatic systems, and probability.
13. SELECTED MODERN PHILOSOPHERS. Mr. Shaffer or Mr. Beardsley. *Spring semester*
 The history of modern philosophy, with primary attention given to the problem of the foundations, scope and limits of human knowledge, as examined by Descartes, Locke, Berkeley, Hume and Kant.
14. ANCIENT PHILOSOPHY. Mr. Gustason. *Spring semester*
 A study of ancient philosophy in all its aspects: ethics, political theory, metaphysics, and aesthetics. Primary emphasis is placed on the dialogues of Plato; briefer attention is given to the pre-Socratics, Plato's contemporaries, and Aristotle.
15. PHILOSOPHY OF SCIENCE. Mr. Sklar. *Spring semester*
 A study of the nature, scope, and limitations of scientific method and scientific explanations. This involves, on the one hand, a treatment of a number of particular logical problems such as the nature of laws, explanations, probability, and theories; and, on the other hand, some treatment of a number of particular scientific topics such as the definition of life, action at a distance, cosmology, the uncertainty principle, and evolution.
16. CONTEMPORARY PROBLEMS. Mr. Shaffer. *Fall semester*
 A study of contemporary discussions of fundamental problems, such as the theory of meaning, the foundations of knowledge, the perception of physical objects, the nature of the self. Readings in the articles and books of major living philosophers, including Russell, Lewis, Ayer, and Ryle.
17. AESTHETICS. Mr. Beardsley. *Fall semester*
 A study of some problems that arise in describing, interpreting, and evaluating aesthetic objects, including literature, music and fine arts. Among these problems are the clarification of such terms as "form," "style," and "meaning," an examination of current attempts to subsume aesthetic objects under the general theory of signs, and the analysis of the reasoning by which value judgments about aesthetic objects are supported and defended.
18. SOCIAL PHILOSOPHY. Mr. Sklar. *Spring semester*
 A survey of the philosophical problems arising from the study of the history and behavior of human societies. Some examples are: the possible limitations on prediction and explanation, the methodological role of value-judgments, the idea of the society as more than its members, historical relativism, the concept of progress, objectivity, the sociology of knowledge, the justification of democracy.
19. RECENT PHILOSOPHICAL MOVEMENTS. Mr. Shaffer. *Fall semester*
 An examination of some of the basic trends in recent thought such as Pragmatism, Positivism, Analytical Philosophy, and Existentialism. Special emphasis will be placed upon the degree of adequacy of these systems in dealing with questions concerning the nature, scope, and limits of human knowledge.
 Not offered in 1964-65.
20. THE PHILOSOPHY OF LANGUAGE. Mr. Sklar. *Spring semester*
 A study of language in its nonformal aspects: the concept of meaning and types of meaning; the functions of language; definitions; ambiguity; metaphor; symbolism; reference.

25. PHILOSOPHY OF RELIGION. Mr. Moore. *Spring semester*
 The nature of religion; the psychology and interpretation of religious experience; the problem of religious knowledge; the validity and difficulties of Christian theology and ethics.
26. MEDIEVAL PHILOSOPHY. Mr. Urban. *Spring semester*
 Philosophical thought from Augustine to the fifteenth century. Attention will be paid both to specific problems such as universals, analogy, and epistemology and to outstanding thinkers such as Anselm, Aquinas, and Ockham. Although the primary emphasis will be historical, attention will be given to the contemporary relevance of medieval thought.
 Not offered in 1964-65.
27. THEOLOGICAL AND ANALYTICAL PHILOSOPHY. Mr. Moore or Mr. Urban. *Fall semester*
 A study in the meaning and verification of religious statements, the concept of analogy, the nature of theological explanation, and the analytical critique of the arguments for the existence of God. Readings in the articles and books of contemporary thinkers, including Ayer, Flew, Hepburn, MacIntyre, Toulmin and Zuurdeeg. The course will consider both the question of the validity of the analytical critique of traditional theology and the possibility of a philosophy of religion within analytical philosophy.
31. PROBLEMS OF CHRISTIANITY TODAY. Mr. Urban. *Each semester*
 The purpose of this course is to study various answers to the chief religious problems of the twentieth century. Problems include: faith and reason, the existence of God, religion and morality, science and religion, the Bible, and the problem of evil. Answers include reference to various schools of thought: fundamentalism, liberalism, humanism, and neo-orthodoxy; and to the works of individual thinkers: Reinhold Niebuhr, Paul Tillich, Martin Buber, and others. The student will be urged to find his own answers and to work out his own religious beliefs.
- NOTE: Students planning to take more than one course in Religion should normally commence with Course 31, although this course is not a prerequisite for the others.
33. EARLY CHRISTIAN THOUGHT. Mr. Urban. *Fall semester*
 The rise and development of Christian thinking to the 13th century, the influence of Judaism and Greek philosophy, the formation of the creeds, Scholasticism, Augustine and Aquinas.
 Not offered in 1964-65.
34. MODERN CHRISTIAN THOUGHT. Mr. Urban. *Spring semester*
 The development of Christian thought from the Reformation to the twentieth century with emphasis upon the relationship between Christian and secular thinking; the main ideas of the Reformation, church and sect in the Reformation, Roman Catholic development, Protestant orthodoxy, Protestant liberalism.
 Not offered in 1964-65.
35. HISTORY OF RELIGIONS. Mr. Moore. *Fall semester*
 An historical and comparative study of the world's religions: primitive religions, Hinduism, Buddhism, Chinese and Japanese religion, Islam. Stress will be placed upon the ethical and philosophical teaching of these religions and their role in the interaction of modern cultures. Comparisons and contrasts will be made between these religions and Judaism and Christianity.
36. THE OLD TESTAMENT AND THE RISE OF JUDAISM. Mr. Ross. *Fall semester*
 An introduction to the literature and history of the people of Israel. Early traditions, the law and the prophets, the emergence of Judaism.

37. THE NEW TESTAMENT. Mr. Moore. *Spring semester*
 An introduction to the literature and history of early Christianity. The formation of the gospels, the life and teachings of Jesus, the Christian movement in the apostolic age.
51. SPECIAL TOPICS. Staff.
 An intensive course may be offered from time to time in a field not covered by the regular program. Open only to juniors and seniors.
52. SENIOR CONFERENCE. Staff. *Spring semester*
 For senior majors in philosophy. Individual programs are planned to prepare for the comprehensive examination.
- HISTORY 61. QUAKERISM. Mr. Tolles.
 The history of the Society of Friends to the present day. The characteristic religious and social ideas of the Quakers are considered in their historical setting. (May be counted toward a major in religion.)

HONORS WORK

For admission of honors in philosophy, the requirement is normally two semester courses drawn from those numbered from 1 to 27. For admission to honors work in religion, the requirement is normally two semester courses selected from among courses numbered 1, and 25 to 45.

101. MORAL PHILOSOPHY. *Spring semester*
 A study of the principal theories about value and moral obligation, and of their justification, in the light of psychological and anthropological material; of the concepts of justice and human rights; of the implications for ethics of different theories about the freedom of the will. The emphasis is systematic, but works of representative theorists, both classical and contemporary, will be read.
102. ANCIENT PHILOSOPHY. Mr. Gustason.
 The development of Greek thought in ethics, metaphysics, logic and science, with special attention to Plato and Aristotle. Emphasis is given to tracing the emergence of distinctively philosophical and scientific methods, and the relation of these methods to contemporary techniques.
103. HISTORY OF MODERN PHILOSOPHY. Mr. Beardsley or Mr. Shaffer.
 The development of modern thought from Descartes to Kant. This seminar may appropriately be combined with work in any of the three divisions.
104. CONTEMPORARY PROBLEMS. Mr. Shaffer.
 A study of contemporary theories on some basic problems such as the theory of meaning, universals, the foundations of knowledge, theories of perception, the nature of the self and mental states, and the relation of mind and body. The reading is in the recent work of such philosophers as Broad, Ayer, Russell, Lewis, Ryle, and Wittgenstein.
105. PHILOSOPHY OF SCIENCE. Mr. Sklar. *Spring semester*
 An advanced treatment of some fundamental problems in the field. Some of the topics are: the nature of scientific explanations, laws, and theories; the concepts of probability and meaningfulness; the thesis of determinism; definition and inference; the role of mathematics and models in science; simplicity; the problems of definition and verification in such fields as cosmology, evolution, and psychoanalysis.
106. AESTHETICS. Mr. Beardsley.
 A systematic examination of the philosophy of art and the methodological foundations of criticism. (See course 17.) Recommended for students of literature, music and the fine arts.

107. SOCIAL PHILOSOPHY. Mr. Sklar. *Fall semester*

An advanced treatment of some problems arising from the study of societies and individuals. Examples of topics: the nature of scientific method; the possibility and significance of distinctions between these studies and the physical sciences; sophisticated experimental design; analytical philosophy of history; the logical character of explanations of behavior; the difference between causes of beliefs and reasons for beliefs; the descriptive-evaluative distinction; ideal types and ideal societies.

108. SYMBOLIC LOGIC. Mr. Sklar. *Fall semester*

The three aims of this seminar are (1) thorough coverage of the techniques of elementary and intermediate symbolic logic, and some attention to advanced topics; (2) development of the various views about the foundations of mathematics in the light of (1); (3) study of the logical implications and difficulties with (1) and (2) with reference to, e.g., the paradoxes, orders of infinity, extensions of the number concept, the Gödel and Skolem theorems.

110. MEDIEVAL PHILOSOPHY. Mr. Urban.

Philosophical thought from Augustine to the fifteenth century. Attention will be paid both to specific problems such as universals, analogy, and epistemology and to outstanding thinkers such as Anselm, Aquinas, Scotus and Ockham. Although the primary emphasis will be historical, attention will be paid to the contemporary relevance of medieval thought.

111. THE IDEA OF GOD IN WESTERN THOUGHT. Mr. Urban.

An examination will be made of writings which have contributed most to Western concepts of God. The study will include Plato, Aristotle, the Bible, Athanasius, Augustine, Thomas Aquinas, Luther, Calvin, Kant, Schleiermacher, Rudolf Otto, John Baillie and others.

112. CONTEMPORARY RELIGIOUS PHILOSOPHERS. Mr. Urban.

This seminar will concentrate on representative thinkers and schools of thought in the present century. These will include Karl Barth, Martin Buber, Jacques Maritain, Reinhold Niebuhr, William Temple, Paul Tillich, and Henry N. Wieman.

120. THESIS.

A thesis may be submitted by majors in the department in place of one of the seminars, upon application by the student and at the discretion of the Department.

Physical Education for Men

DIRECTOR OF ATHLETICS AND PHYSICAL EDUCATION FOR MEN AND ASSOCIATE PROFESSOR: WILLIS J. STETSON

ASSOCIATE PROFESSORS: LEWIS H. ELVERSON
EDWIN J. FAULKNER

ASSISTANT PROFESSOR: GOMER DAVIES

ASSISTANTS: BROOKE P. COTTMAN

ROBERT B. FORWOOD

JOSEPH LEITNER

JAMES W. LUKENS, JR.

JAMES C. MAYER

JAMES J. McADOO

ROBERT McCOACH

JAMES H. MILLER

JAMES W. NOYES

COLLEGE PHYSICIAN: DR. MORRIS A. BOWIE

The course in Men's Physical Education is designed to acquaint each participant with both team and individual sports. The value of team play is developed while emphasis is also placed on the so-called "carry over" sports which one can enjoy after graduation. Each individual, while benefiting from the physical exercise, also becomes better acquainted with the fundamentals, rules, etc., of the various sports and so is better able to enjoy these activities as a spectator.

The intercollegiate athletic program is a comprehensive one with varsity schedules in eleven different sports. In many of these activities there are contests arranged for junior varsity teams, thus providing ample opportunity for large numbers of men to engage in intercollegiate competition.

FACULTY REQUIREMENTS

Physical education is required of all non-veteran freshmen and sophomores unless excused by the College physician. During this two-year period, men students must attend a minimum of three classes per week.

All men not excused for medical or other reasons are expected to fulfill this requirement. A semester's work failed in the first two years must be repeated in the Junior year. No man with a deficiency in physical education is permitted to enter his Senior year.

FALL ACTIVITIES

Badminton
*Cross Country
*Football

Golf
*Soccer
Swimming

Tennis
Touch Football

WINTER ACTIVITIES

Badminton
*Basketball
Boxing

Lacrosse
*Swimming
Tennis

Track
Volley Ball
*Wrestling

SPRING ACTIVITIES

*Baseball
*Golf
*Lacrosse

Softball
*Tennis

*Track
Volley Ball

* Indicates intercollegiate competition.

Physical Education for Women

ASSOCIATE PROFESSORS: VIRGINIA RATH, *Chairman*
IRENE MOLL

ASSISTANT PROFESSOR: ELEANOR K. HESS

INSTRUCTOR: AILYN TERADA

COLLEGE PHYSICIAN: DR. MORRIS A. BOWIE

The aim of the Department is to contribute to the education of all women students through the medium of physical activity. We believe this contribution can best be achieved through participation in a broad program of sports, dance and developmental activities. The program provides: instruction and experience in sports and dancing; swimming instruction on all levels; corrective and developmental exercises. It is our hope that the student will also acquire: appreciation of the dance as an art form; good sportsmanship; added endurance; good posture; leadership training; joy in outdoor exercise; and a program of interests and skills that will carry over for her after college, so she may become a useful part of her community.

Classes are kept small to insure individual attention, and students are grouped where possible according to ability. Ample opportunities are given for intramural and inter-collegiate competition, as well as for public performances and demonstrations.

Freshmen and sophomores take three periods of activity each week. These may be elected from classes listed below with the stipulation that they take swimming until a test is passed; take a dance activity; take a team sport; take an individual sport; and take developmental gymnastics if the posture grade or motor skill test indicate a need for it.

Regulation costumes should be ordered before college opens. Blanks for this purpose will be sent out from the Office of the Dean to all incoming students.

SPORTS

ARCHERY. Miss Rath. Class and Varsity.	<i>Fall and Spring</i>
BADMINTON. Miss Hess, Miss Rath, Mr. Faulkner, Miss Terada. Class and Varsity.	<i>Winter</i>
BASKETBALL. Miss Moll, Miss Hess. Class and Varsity.	<i>Winter</i>
BOWLING. Staff.	<i>Winter</i>
GOLF. Miss Moll. Class and Varsity.	<i>Fall and Spring</i>
HOCKEY. Miss Hess. Class and Varsity.	<i>Fall Term</i>
LACROSSE. Miss Hess. Class and Varsity.	<i>Spring</i>
SOCCER. Miss Hess. Class and Varsity.	<i>Winter</i>
SOFTBALL. Miss Moll. Class and Varsity.	<i>Spring</i>

- SWIMMING. Miss Rath, Miss Hess, Miss Terada. *Fall, Winter and Spring*
 Beginner, intermediate and advanced classes in strokes, diving, and water ballet.
 Class and Varsity.
- TENNIS. Miss Terada, Miss Hess, Mr. Faulkner, Miss Rath and Miss Moll. *Fall, Winter and Spring*
- VOLLEYBALL. Miss Moll, Miss Hess, Miss Terada. *Winter*
 Class and Varsity.
- WATER BALLETT. Miss Terada. *Fall and Spring*

OTHER ACTIVITIES

- DEVELOPMENTAL GYMNASTICS. Miss Rath, Miss Terada. *Winter*
 Required of all first-year students whose posture grade or motor ability test indicate
 a need for it.
- FOLK AND SQUARE DANCING. Miss Moll. *Fall and Winter*
 Open to men students also.
- MODERN DANCE. Miss Terada. *Fall, Winter and Spring*
 Class and Club.
- RECREATIONAL MATERIALS AND RESOURCES. Staff. *Winter and Spring*
- RED CROSS LIFE SAVING AND WATER SAFETY. Miss Rath. *Winter and Spring*
 Senior and Instructors' courses.

Physics

PROFESSORS: WILLIAM C. ELMORE, *Chairman*
MILAN W. GARRETT‡

ASSOCIATE PROFESSORS: OLEXA-MYRON BILANIUK
MARK A. HEALD
PAUL C. MANGELSDORF, JR.†

ASSISTANT PROFESSOR: JARL A. ELMGREN

INSTRUCTOR: CLAIR W. NIELSON

The physics department, through its introductory course in general physics, endeavors to give an integrated account of basic physics. In this course, as well as in the advanced work of the department, emphasis is placed on quantitative, analytical reasoning, as distinct from the mere acquisition of facts and skills. The introductory course makes no pretense of covering all material of interest to physicists, but rather comprises a selection of topics which form a coherent group.

Advanced work in the department involves a more intensive study of topics covered at the introductory level, and of many phases of modern physics which require a considerable background in mathematics and electricity. In all courses and seminars particular importance is attached to laboratory work, since physics is primarily an experimental science. Honors candidates taking physics seminars accompanied by laboratory work must submit their laboratory notebooks to the visiting examiners for their inspection.

REQUIREMENTS AND RECOMMENDATIONS FOR MAJORS AND MINORS

Students who intend to major in physics normally take Physics 1, 2 and Chemistry 1, 2 in the freshman year and Physics 11, 12 in the sophomore year. In addition they should complete Mathematics 12 or 16 by the end of their sophomore year. In view of graduate school requirements and of the extensive literature of physics in German and Russian, it is strongly recommended that the student fulfill his language requirement in one of these languages. A grade of C or better in Physics 1, 2 is normally prerequisite for all further work in the department, and Chemistry 2 is a prerequisite for Physics 112 and 113.

Honors students majoring in physics normally take Physics 102, 112, 113, in that order, and Mathematics 101, 102. A third mathematics seminar, usually Mathematics 104, is encouraged but not required. An honors student who has been unable to schedule Physics 11, 12 should plan to take Physics 111. Other seminars in the program may be chosen from astronomy, biology, chemistry, electrical engineering, engineering sciences, experimental psychology, or philosophy. Such a program is a particularly satisfactory way of preparing for graduate or other professional work in physics or mathematics. However, it constitutes in itself an effective educational program, since the aim throughout is to achieve an understanding of fundamental ideas and concepts, as distinct from the mastery of information, skills, and techniques in a limited segment of science.

Course students majoring in physics normally complete the following courses in their junior and senior years: Mathematics 51, 52; Chemistry 61, 62; and Physics 51, 52, 53, 54, 56. It is recommended that Physics 60 be included in the program of course students who intend to do graduate work in physics. This program provides a well-rounded study of physics, and by requiring less intensive concentration than an honors program offers the

‡ Absent on leave, 1964-65.

† Absent on leave, spring semester, 1964-65.

student the opportunity to extend his work outside the Division of the Natural Sciences. It should also meet the needs of those who wish to teach science in secondary school.

Secondary school students who are considering majoring in physics at Swarthmore are strongly encouraged to complete four years of mathematics and a minimum of two years of either German or Russian, or French if neither of these is available.

COURSE STATEMENT

1, 2. GENERAL PHYSICS. Mr. Bilaniuk, Mr. Elmgren, and Staff.

An introductory course in basic physics. During the first semester special emphasis is placed on particle mechanics, conservation principles, harmonic motion, kinetic theory and heat. During the second semester the topics include basic concepts in electricity and magnetism, direct current circuits, and optics, with a brief introduction to quantum physics. This course, or its equivalent, must precede any advanced courses or seminars in physics. It is required of most science majors. Three lectures, a conference, and a laboratory period weekly.

Prerequisite: Mathematics 3, 4 taken concurrently, or adequate preparation in mathematics.

7-8. CONCEPTS AND THEORIES IN PHYSICAL SCIENCE. Mr. Rosenberg. *Full course*

The first semester consists in an analysis of motion leading to the Newtonian synthesis, the conservation laws of physics, the development of an atomic theory of matter, the periodic table of elements, and the kinetic theory of gases.

The second semester considers the evolution of modern physics: physical properties of light, aspects of relativity, the wave versus the quantum theory of light, certain elemental phenomena, the atomicity of charge, Bohr's model of the atom, radioactivity, elementary particles, the nuclear atom and nuclear energy, stellar energy.

This course is designed as a terminal course in physical science to meet the needs of non-science majors and fulfills the group 1 distribution requirement. It is not intended to fulfill the physics requirement of medical schools, and cannot be used as a prerequisite for further work in the Division of the Natural Sciences.

Three lectures and one three-hour laboratory per week.

11, 12. MECHANICS AND WAVE MOTION. Mr. Heald and Mr. Elmore.

Particle and rigid body mechanics with an introduction to advanced dynamics. Elastic waves and wave motion. Interference and diffraction phenomena. Considerable emphasis is placed on laboratory work, both to illuminate and extend the subject matter, and to foster the students' ability to work independently. This course is required of physics majors. In addition, this course or its equivalent, Physics 111, is recommended for others who desire further work in physics.

Prerequisite: Mathematics 11, 12 taken concurrently.

51, 52. MODERN PHYSICS. Mr. Mangelsdorf and Staff.

A selection of topics including special relativity; quantum theory with applications to atomic structure and solid-state physics; nuclear and high-energy physics. Three lectures and one laboratory period weekly. Open to seniors only.

Prerequisite: Mathematics 12 and consent of the instructor.

53. CIRCUIT THEORY I.

Fall semester

(Identical with Electrical Engineering 53)

54. THERMAL PHYSICS. Mr. Mangelsdorf.

Even years, fall semester

Continuum properties of matter and of thermal energy. Thermodynamics and statistical mechanics of mechanical, chemical, electrical and magnetic systems. Entropy, fluctuation theory, irreversible thermodynamics. Brownian motion, diffusion theory, transport processes. Three lectures and one conference section weekly.

Prerequisite: Mathematics 12.

56. FIELD THEORY.

Spring semester

(Identical with Electrical Engineering 56)

60. SPECIAL TOPICS. Staff.

A semester course that may be elected by senior physics majors. Readings and problems will be assigned in areas of physics not covered in other courses. The associated laboratory work will be directed toward the acquisition of knowledge and skills that will be useful to future research, and normally will involve the development of apparatus and the performance of an experiment of contemporary significance in physics. A carefully written report of the experiment, together with solutions of assigned problems, is required in lieu of a final examination.

HONORS SEMINARS

102. ELECTRICITY AND MAGNETISM. Mr. Heald

Spring semester

Classical electrodynamics, covering static and dynamic electricity, magnetism and electromagnetism, with some electronics. Laboratory measurements in direct and alternating currents and in magnetism, together with fundamental experiments in electronics.

Prerequisites: Mathematics 101, or 103, and Physics 11, 12 (or 111).

104. THEORETICAL PHYSICS. Mr. Nielson.

Fall semester

Topics in mathematical physics, including vector spaces and matrices, expansions in orthogonal functions, boundary value problems, Fourier transforms, partial differential equations, and the calculus of variations, all presented with an emphasis on applications. Accompanied by instruction and practice in the use of a digital computer, using examples selected from the seminar according to the interests and previous experience of the student.

Prerequisites: Mathematics 101 or its equivalent, and Physics 11, 12 (or 111).

111. CLASSICAL MECHANICS AND WAVES. Mr. Elmgren.

Fall semester

This seminar covers substantially the same material as Physics 11, 12. It is offered for students unable to schedule the course, and who desire further work in physics as part of an honors program. One full-day laboratory each week.

Prerequisite: Mathematics 12.

112. RADIATION AND STATISTICAL PHYSICS. Mr. Elmore

Fall semester

Free and guided electromagnetic waves, with particular emphasis on waves in the microwave, optical and X-ray regions. The velocity of electromagnetic waves and the theory of special relativity. Thermodynamics and statistical mechanics. Thermal radiation, and quantum statistics with applications. Accompanied by a full-day laboratory each week.

Prerequisite: Chemistry 2 and Physics 102.

113. QUANTUM AND NUCLEAR PHYSICS. Mr. Bilaniuk and Mr. Nielson.

Spring semester

The particle-wave duality in quantum theory. Schrodinger's equation and its solution. Atomic structure and spectra including X-rays. The band theory of solids. Nuclear and high-energy physics. The laboratory includes basic experiments in atomic and nuclear physics.

Prerequisites: Chemistry 2, Physics 11, 12 (or 111) and Physics 102, or equivalent preparation in the Honors Program in Engineering Sciences.

Political Science

PROFESSORS: J. ROLAND PENNOCK, *Chairman*
KENNETH N. WALTZ

ASSOCIATE PROFESSORS: CHARLES E. GILBERT*
DAVID G. SMITH†

INSTRUCTORS: DONALD C. HELLMANN
GEORGE VON DER MUHLL

LECTURER: FREDERICK A. HARGADON

The aim of the Department of Political Science is to study, both in ideal and in reality, the place of politics in society and to contribute to an understanding of the purposes, organization, and operation of political institutions, domestic and international. For the beginning student, the Department offers an introduction to the nature of politics and to the problems of various political systems. For those who become majors or for others who take additional work in political science, courses are provided that will permit giving special attention to the areas of political theory, comparative political systems, and politics in the United States, and international relations.

REQUIREMENTS AND RECOMMENDATIONS FOR MAJORS

Course 1-2 is prerequisite to all other work in the department. Students who intend to major in political science should, preferably, take Course 1-2 in the freshman year and Course 11 in the sophomore year; however, Course 11 may be taken by sophomores concurrently with Course 2. Students who desire to concentrate on international affairs without taking the full International Relations Program referred to below may substitute Comparative Government (Political Science 15) or The Soviet System (Political Science 19) or Government and Politics of East Asia (Political Science 20) for Course 11. Majors are also advised to take Economics 1-2. Courses in Statistics (Economics 4) and in American history are recommended. Political Theory, either in seminar or in course (Political Science 54), is required of all majors; course majors should take Course 60.

PROGRAM IN INTERNATIONAL RELATIONS

Students who plan to enter upon a career in the field of international relations should include in their programs, during the first two years, the introductory courses in economics, history and political science and should complete the intermediate course in one or more modern languages.

Advanced courses selected from the groups listed below may be incorporated in the programs of students who do their major work in economics, history, political science, or a modern language.

Those students who wish to concentrate in international relations may take their Senior Comprehensive Examination in this field. Students preparing for this examination should take eight, nine, or ten half courses from among those listed below, including all of those listed in Group I, one or more in Group II, and one or more in Group III. The examination is administered by a committee appointed by the chairmen of the Departments of Economics, History, and Political Science, under the Chairmanship of the Department of Political Science.

* Absent on leave, fall semester, 1964-65.

† Absent on leave, spring semester, 1964-65.

GROUP I

Political Science 12—International Politics
Political Science 13—International Law and Organization
Political Science 57-58—American Foreign Policy
Economics 60—International Economics

GROUP II

History 12—The Far East
History 14—Russia
History 15—The Expansion of Europe
History 60—Africa

GROUP III

Political Science 15—Comparative Government
Political Science 19—The Soviet System
Political Science 20—Government and Politics of East Asia
Political Science 55—Modern Political Theory

Students who plan to enter the honors program will find it possible to select a similar combination of courses and seminars in the field of international relations. In planning such programs, they should consult with the chairmen of their prospective major departments.

COURSES

1-2. INTRODUCTION TO POLITICAL SCIENCE. All members of the department. *Full course*

The foundations of politics—historical, economic, psychological, sociological, and ideological; nature and development of political institutions. Application of the foundations as instanced by major types of government, including a more detailed study of selected aspects of American national government. Political Science 1-2 is open to all students and is prerequisite to all other courses offered by the department. Credit is not given for a single semester of this course.

11. PROBLEMS IN COMMUNITY GOVERNMENT. Mr. Von der Muhll. *Spring semester*

The sociological, economic, and legal setting of local government. Politics and administration at the state and local levels. Federalism, intergovernmental relations, and the metropolitan area. City planning. The course emphasizes field work and research in nearby communities.

12. INTERNATIONAL POLITICS. Mr. Waltz. *Alternate years, fall semester*

Approaches to the theory and practice of international politics such as those developed by liberals, pacifists, behaviorists, and socialists will be examined in some detail before considering the abiding and changing patterns of relations among states and the various factors that affect them.

13. INTERNATIONAL LAW AND ORGANIZATION. Mr. Waltz. *Alternate years, spring semester*

The development of international law and organization, including a study of the major problems of international law and world government and of the structure, accomplishments and limitations of general and regional organizations.

15. COMPARATIVE GOVERNMENT. Mr. Hargadon or Mr. Smith. *Alternate years, fall semester*

A critical study of selected political systems of Western and Eastern Europe. The major countries studied include France, Germany, Italy, and the states of Central and Eastern Europe. Major emphasis will be placed on comparative politics and comparative public policy, as well as the relation of domestic politics to problems of foreign policy and international cooperation.

Not offered in 1964-65.

18. POLITICS OF DEVELOPING NATIONS. Mr. Hellmann.

An examination of theories of political modernization and their application to developing societies, particularly those in South and Southeast Asia and Africa. The relation between the total social process and the emergence of nationalist movements will be studied, and the political processes will be functionally analyzed and compared in terms of such categories as political culture, ideology, leadership, and social mobilization.

19. THE SOVIET SYSTEM. Mr. Hargadon.

Spring semester

An analysis of the Soviet political system in relation to its theoretical and historical bases and its socio-economic setting. Topics included are the role of the Party, the nature of governmental institutions and mass organizations, economic structure and policy, selected problems of domestic and foreign policy, and a comparative examination of other Communist political systems, notably that of China.

20. GOVERNMENT AND POLITICS OF EAST ASIA. Mr. Hellmann.

Fall semester

A comparative analysis of the political systems of China, Japan, and Korea in upheaval. Emphasis is on the various kinds of nationalist movements and their traditional, revolutionary, communist, and liberal-democratic components.

51. PUBLIC ADMINISTRATION. Mr. Gilbert.

Alternate years, fall semester

An analysis of policy-making and administration in modern governments with illustrative material drawn chiefly from the national government of the United States and with particular reference to recent developments. Problems of administrative organization, conduct of regulatory and managerial activities, financial administration, personnel, public relations, administrative law, politics and administration.

Open to juniors and seniors only, except by special arrangement.

Not offered in 1964-65.

52. AMERICAN CONSTITUTIONAL LAW. Mr. Von der Muhll.

Fall semester

The role of the Supreme Court in the American political system, viewed both historically and through analysis of leading cases. Areas of Constitutional development emphasized are: the nature and exercise of judicial review; federalism and the scope of national power; civil liberties.

Open to sophomores and upperclassmen. Sophomores carrying five courses will be relieved of the term paper requirement.

53. AMERICAN PARTY POLITICS. Mr. Von der Muhll.

Alternate years, fall semester

An historical and functional analysis of American political parties. The study of interest groups, public opinion and voting behavior, electoral systems and representation, the legislative process.

54. POLITICAL THEORY: PLATO TO ROUSSEAU. Mr. Smith.

Fall semester

The development of thought on the nature of the state and of individual rights and duties, based largely on readings of the chief political philosophers from Plato to Rousseau. Topics studied include: Greek and Roman political thought; medieval universalism and the divine right of kings; the Reformation and the development of contractual theory; natural law and natural rights.

Open to sophomores planning to take the "Modern and Analytical" version of the Political Theory honors seminar; otherwise to juniors and seniors only, except by special arrangement.

55. MODERN POLITICAL THEORY. Mr. Hargadon.

Spring semester

Political theory from the Enlightenment to the present. Idealism and romantic and conservative nationalism; anarchism, Marxism, and later socialist doctrines; Utilitarianism and "revisionist" Liberalism; pragmatic and sociological theories of politics; conservative critics of democracy and the political theories of authoritarianism and of fascism. Considerable time will be devoted to the analysis of liberal, democratic, and totalitarian theories and to influential theories of an ideological quality such as nationalism, Marxism, and fascism.

56. JURISPRUDENCE. Mr. Pennock. *Alternate years, spring semester*
 A study of the sources and nature of law; historical, sociological and philosophic approaches to legal theory; the nature of the judicial process; key problems of jurisprudence illustrated by case study in selected areas of American constitutional law.
 Open to sophomores by arrangement with the instructor.
- 57-58. AMERICAN FOREIGN POLICY. Mr. Waltz. *Alternate years, full course*
 The problem of defining the objectives of American foreign policy and of selecting the means for achieving them; past, present and suggested American strategies in world politics; the influence of internal and external conditions on the making of foreign policy; the effects of our policies in crucial parts of the world.
 Not offered in 1964-65.
59. MARXISM. Mr. Smith.
 A study of Marxist political theory and philosophy. Primary emphasis is placed on the works of Marx, Engels, Lenin, and Stalin. In addition, some attention is devoted to the background of Marxist thought as well as to influential derivatives of Marxism other than Communism. Selected examples of contemporary Marxist theory are also considered.
 Not offered in 1964-65.
60. SPECIAL TOPICS IN POLITICAL SCIENCE. Mr. Von der Muhll. *Spring semester*
 This course, conducted in seminar fashion, is designed for senior majors. By means of papers and assigned readings it covers aspects of political science not elsewhere intensively developed and helps the students to integrate materials studied previously.

HONORS WORK

Prerequisite: Political Science 1-2. The following seminars prepare for examination for a degree with Honors:

101. (a) and (b). POLITICAL THEORY. Mr. Pennock or Mr. Smith. *Each semester*
 The nature of the state, the bases of political obligation, sovereignty and the nature of law, liberty, equality, rights, democracy, totalitarianism—all in the light of the theories set forth by writers on these subjects from Plato to the present. This seminar is given in two versions, one (101a) beginning with Plato and proceeding chronologically, and the other (101b, designated "Modern and Analytical") starting with Machiavelli and organized in more topical fashion. It is desirable but not required for students planning to take 101b to take Political Science 54 during their sophomore year.
102. POLITICS AND LEGISLATION. Mr. Gilbert. *Spring semester*
 The study of political parties, interest groups, public opinion and voting behavior, electoral systems and representation, the legislative process. Emphasis is on American politics, with some comparative material; and, ultimately, on politics from the standpoint of theories of political democracy.
103. PROBLEMS IN GOVERNMENT AND ADMINISTRATION. Mr. Gilbert. *Fall semester*
 A detailed study of the forms and functions of modern government, particularly on the administrative side. Problems of administrative organization, policy-making and responsibility in the light of democratic political purposes and processes and the legal, sociological, and economic setting. Emphasis is on United States experience, although relevant experience abroad is examined.
104. INTERNATIONAL POLITICS. Mr. Waltz. *Fall semester*
 An inquiry into the principles and problems of international politics in order to answer the question: What are the causes of war and the conditions of peace?

105. AMERICAN FOREIGN POLICY. *Spring semester*
 A study of key problems faced by the United States in the modern world together with a detailed, critical investigation of the making and implementing of American foreign policy. The changing assumptions of our policy and the political, economic, and social influences upon it will be carefully considered.
106. PUBLIC LAW AND JURISPRUDENCE. Mr. Pennock. *Spring semester*
 Sources and nature of law; historical, sociological, philosophic, and "realistic" approaches to law; key problems of jurisprudence illustrated by study of the fields of federalism and civil liberties in American constitutional law.
107. THE SOVIET SYSTEM. Mr. Hargadon. *Spring semester*
 A study of political, social, and economic institutions in the Soviet Union in relation to their theoretical and historical background; selected problems of domestic and foreign policy; a comparative examination of other Communist political systems, notably that of China.
108. COMPARATIVE GOVERNMENT. Mr. Smith. *Fall semester*
 Advanced study of comparative government; governmental structures and political processes largely as exemplified by selected governments of Western and Eastern Europe; inquiries into common problems, such as planning, defense, nationalization, and trans-national political movements.
109. POLITICAL DEVELOPMENT. Mr. Hellmann. *Fall semester*
 An examination of theories of political modernization and their application to developing societies.
120. THESIS. All members of the department.
 Approval must be secured early in the student's junior year.

Psychology and Education

PROFESSORS: HANS WALLACH, *Chairman*
SOLOMON E. ASCH
JOSEPH B. SHANE

ASSISTANT PROFESSORS: GERALD R. LEVIN
JOHN ANTHONY NEVIN
DEAN PEABODY‡

LECTURER: ALICE K. BRODHEAD

VISITING LECTURERS: JOHN A. CERASO**
JOSEPH J. GREENBAUM**

The work of the Department of Psychology deals with the scientific study of human behavior and experience: the basic processes of perception, learning, thinking and motivation, and consideration of their relation to development of the individual personality; and the social relations of the individual to other persons and to groups. For those students planning for graduate and professional work in psychology the courses and seminars of the department are designed to provide a sound basis of understanding of psychological principles and a grasp of research method. Other students learn the nature of psychological inquiry and the psychological approach to various problems encountered in the humanities, the social sciences and the life sciences.

REQUIREMENTS AND RECOMMENDATIONS

Both semesters of the course Introduction to Psychology are required of all students who wish to take other courses or seminars in the department. The two semesters of this course may be taken in either sequence. Credit is given for either semester, and either semester may be used to fulfill the general curriculum requirement. Majors in course are required to take at least one course with a laboratory and majors in Honors one of the seminars in experimental psychology: 101, 102, or 108.

Courses in education—11, 12, 14, 15 and 16 will not be credited toward a major in psychology. Education alone may not be elected as a major subject, and not more than two full courses in education will be accepted for credit toward the bachelor's degree.

Swarthmore students may fulfill the Pennsylvania requirements for the certification of secondary school teachers by taking:

Psychology 1—Introduction to Psychology.

Education 11—Educational Psychology.

Education 14—Introduction to Teaching.

Education 12—Principles and Methods of Secondary Education.

Education 15—History of Education.

History 4, 5, 6 or 7—The United States (arrangements must be made for special work in the History of Pennsylvania). Only one term is required.

A minimum of three full courses (or six half-courses) in the subject or field in which the student expects to teach.

Education 16—Practice Teaching.

‡ Absent on leave, 1964-65.

** Fall semester, 1964-65.

Swarthmore students may receive credit toward a Pennsylvania elementary school certificate by taking:

Psychology 1—Introduction to Psychology.

Psychology 55—Child Psychology.

Education 11—Educational Psychology.

Education 14—Introduction to Teaching.

History 4, 5, 6 or 7—The United States (with special work in Pennsylvania history)

Only one term is required.

Psychology

1. INTRODUCTION TO PSYCHOLOGY. Staff. *Spring semester*
An introduction to the basic processes underlying human and animal behavior: sensation and perception, learning and thinking, emotion and motivation.
Three lectures plus weekly conference hour to be arranged.
2. INTRODUCTION TO PSYCHOLOGY. Staff. *Fall semester*
An introduction to the study of human behavior in its social context. Topics to be stressed: conflict, personality development and psychopathology; the psychology of language and of the arts; individual differences and testing; attitudes and social action.
Three lectures plus weekly conference hour to be arranged.
12. MOTIVATION. Mr. Nevin. *Spring semester*
The determination of behavior by maturation, early experience, deprivation, stimulation, and reward. The concepts of instinct, homeostasis, drive, reinforcement, arousal, and incentive are analyzed with reference to data drawn largely from animal experimentation. Some reference is made to recent findings in the physiology of drive and reinforcement. Term paper or an original experiment is required.
13. STATISTICS FOR PSYCHOLOGISTS. Mr. Nevin.
The logic and the application of standard statistical tests in the analysis of data. Emphasis is placed on the relations between experimental and statistical procedures. No mathematics required.
50. PERCEPTION. Mr. Wallach.
Laboratory section one afternoon per week to be arranged. The major facts and some problems of visual perception are outlined and used to acquaint the student with experimental research.
51. LEARNING AND BEHAVIOR THEORY. Mr. Nevin.
The experimental analysis of the major phenomena of learning and conditioning is studied mainly at the animal level. Specific empirical and theoretical issues are considered in detail, and the major theories of learning are evaluated. The laboratory is designed to acquaint students with the major processes considered, and an opportunity for original experimentation is provided.
52. HUMAN LEARNING AND THINKING.
An examination of the phenomena of association, memory, problem solving, thinking and language.
55. CHILD PSYCHOLOGY. Mr. Levin. *Alternate years*
Cognitive development, the socialization process, and the influence of child-rearing practices will be emphasized. Observing of preschool children will be required.

56. SOCIAL PSYCHOLOGY. Mr. Asch, Mr. Peabody. *Fall semester*
 A study of some basic processes and products of interaction between persons and groups and between groups. The following topics are covered: the formation of the social field of the individual. Perception of persons as psychological entities. Perception of groups. Formation of the self; social relations of the self. Psychological forces supporting group-belonging. Functional consequences of group membership. The psychological investigation of group processes. Group requirements and group standards. Formation and change of attitudes.
57. PSYCHOLOGICAL TESTS AND MEASUREMENTS. *Alternate years*
 The concept of psychological measurements are applied to tests of intelligence, personality, interests, and abilities. The course surveys a wide variety of contemporary tests and studies intensively the characteristics and underlying assumptions of one representative test of each major type. (Open to sophomores.)
58. PERSONALITY. Mr. Levin, Mr. Peabody. *Fall semester*
 Representative theories, methods, and findings related to such topics as personality structure, the self, aggression, and the achievement motive will be examined.
59. PSYCHOLOGY OF ATTITUDES. Mr. Peabody.
 The course will concentrate on topics designed to supplement Psychology 56, Social Psychology, with particular attention to social and political attitudes. Topics will include some aspects of the psychology of language, the concept and measurement of attitudes and opinions, attitudes and political behavior, the organization of attitudes and personal ideologies.
- 63-64. SYSTEMATIC SEMINAR. The Staff. *Full course, spring semester*
 A double credit course requiring half the student's time for a semester. This seminar covers the major integrative theories or approaches to psychology, including structuralism, functionalism, behaviorism, Gestalttheorie, and psychoanalysis. Majors students who so elect will take Course 63-64 in their senior year. The course is open only to senior psychology majors except by special arrangement.
65. HISTORY AND SYSTEMS OF PSYCHOLOGY. Staff.
 The course is particularly intended to provide integration of different fields of psychology, and to help majors prepare for comprehensives. Historical treatment will concentrate on the major systematic points of view. Special consideration will be given to problems overlapping several areas of psychology.
- The following course is not to be counted toward a major in psychology and is not included in the comprehensive examination; it is designed primarily for students whose major work is in other departments.
42. APPLIED SOCIAL PSYCHOLOGY. *Spring semester*
 This course deals with communications within groups, leadership, attitudes and propaganda, wage payment plans, consumer motivation and behavior, and the structure of organizations. Attention will be given to the application of concepts that have been drawn from the laboratory study of motivation, perception, and learning.

Education

11. EDUCATIONAL PSYCHOLOGY. Mr. Levin. *Alternate years*
 The application of psychology to education. The psychology of learning and psychometrics will be stressed. Projects will be required.
 Prerequisite: Course 1.
12. PRINCIPLES AND METHODS OF SECONDARY EDUCATION. Mr. Shane. *Fall semester, alternate years*
 A study of the principles of secondary education, with emphasis upon aims and organization. Visits to nearby schools are made.

14. **INTRODUCTION TO TEACHING.** Mrs. Brodhead. *Each semester*
 Current educational theory and practice. Weekly seminar plus three hours a week (term minimum of 36 hours) assisting in a classroom in the local schools. This course meets the requirement for basic reading instruction.
15. **HISTORY OF EDUCATION.** Mrs. Brodhead. *Each semester*
 Educational thought in our western culture from the Greeks to the present day. Weekly seminar.
16. **PRACTICE TEACHING.** Mrs. Brodhead.
 Thirty hours of guided observation in the local high school, followed by a six weeks program (120 hours) of full-time teaching in the summer school. Students should enroll for this course at the January registration. They must be recommended by the college department whose subject they plan to teach.

HONORS SEMINARS

101. **PERCEPTION.** Mr. Wallach.
 Reading and discussion combined with independent experimental projects. The student is expected to know the basic facts about human perceptual mechanisms, particularly visual ones, by the time he has completed this seminar. Specific topics covered are: color vision, grouping and form, depth and distance, size, movement, influences of learning and needs and attitudes, general theory of perception. When time permits, some attention is given to parallel problems in other senses.
102. **LEARNING AND BEHAVIOR THEORY.** Mr. Nevin.
 The major phenomena of learning and conditioning—taken largely from the animal level—are discussed. An attempt is made to systematize the experimental literature on each topic. The relationship of motivational concepts to learning is discussed and the major theories of learning and some recent mathematical theories are considered. The laboratory acquaints students with problems and methods of experimentation in learning. An opportunity for original research is provided.
104. **INDIVIDUAL IN SOCIETY.** Mr. Asch, Mr. Peabody.
 The relationship between man and his society, approached from the points of view of social psychology, sociology, and cultural anthropology; the study of group-structures and the psychological consequences of group-membership; the critique of available procedures for scientific treatment of group-behavior and group-influences.
105. **PERSONALITY.** Mr. Levin, Mr. Peabody.
 A scrutiny of attempts to build an objective basis for "understanding the person as a whole." Contrasting theoretical orientations, techniques of observation, and specific problems will be examined. Theoretical orientations: psychoanalysis, factor analysis, learning theory, phenomenology. Observation techniques: interviews, questionnaires, fantasy material. Problems: aggression, need achievement, prediction, psychotherapy, and psychological maturity.
106. **DEVELOPMENT.** Mr. Levin.
 The development of complex psychological processes in the individual will be studied. Problems of intellectual, linguistic, and social development will be stressed. While the focus will be on the child, relevant studies of other species will also be examined. Observing of preschool children will be required.
108. **MEMORY, THINKING, LANGUAGE.** Mr. Asch.
 An inquiry into human cognitive processes, including human learning, memory functions, thinking, and language phenomena. Topics to be considered will be: principles of association; association and perceptual organization; recognition and recall; interference phenomena; trace theory; attention and mental set; concept formation; problem-solving and insight; symbolic operations; semantic and syntactic processes.

120. **THESIS.** All members of the department.

May be presented as a substitute for one seminar, provided the student is doing major work in psychology with four seminars, and provided some member of the department is available to undertake the direction of the thesis.

MASTER'S DEGREE

A limited number of students may be accepted for graduate study toward the Master's degree in psychology. Students receiving the Bachelor's degree from Swarthmore are not normally eligible for this work.

The program of work for the Master's degree requires the completion of four seminars, or their equivalent. One of the seminars must be a research seminar leading to a Thesis. The work of the seminars is judged by external examiners. The requirements for the Master's degree can normally be completed in one year.

Russian Studies

A grant from the Carnegie Corporation made possible the inauguration of a Russian Studies program, in the fall of 1949, at Bryn Mawr, Haverford, and Swarthmore Colleges. While the grant has now expired, Swarthmore College continues to offer courses in Russian language and literature, history, and political and economic institutions.

Courses and seminars in Russian language and literature comprise a major subject. Courses and seminars in Russian history and Russian political and economic institutions may not in themselves comprise a major subject, but may be counted toward a major or minor in the departments offering them. These courses and seminars are listed below and described more fully under their appropriate departments.

RUSSIAN LANGUAGE AND LITERATURE

- 1-2. ELEMENTARY RUSSIAN.
- 3, 4. INTERMEDIATE RUSSIAN.
- 5, 6. ADVANCED RUSSIAN.
- 11, 12. INTRODUCTION TO LITERATURE.
- 13. RUSSIAN NOVEL.
- 101. TOLSTOY.
- 102. CHEKHOV AND GORKY.
- 103. PUSHKIN AND LERMONTOV.
- 104. DOSTOEVSKY.

HISTORY

- 14. RUSSIA.
- 117. EASTERN EUROPE.

POLITICAL AND ECONOMIC INSTITUTIONS

- Econ. 61 and 106. COMPARATIVE ECONOMIC SYSTEMS.
- Pol. Sci. 19 and 107. THE SOVIET SYSTEM.

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WILLIAM BENTLEY

WILLIAM BENTLEY

WILLIAM BENTLEY

REFERENCE SECTION

SWARTHMORE COLLEGE

Swarthmore, Pennsylvania

Visiting Examiners—1964

ASTRONOMY: PROFESSOR LEENDERT BINNENDIJK, *University of Pennsylvania*; PROFESSOR ERNEST C. RAY, *Cornell University*.

BIOLOGY: PROFESSOR WALTER D. BONNER, JR., *University of Pennsylvania*; PROFESSOR VINCENT G. DETHIER, *University of Pennsylvania*; PROFESSOR TIMOTHY H. GOLD-SMITH, *Yale University*; PROFESSOR ROBERT E. OGREN, *Wilkes College*, DR. JACK SCHULTZ, *Institute for Cancer Research*, PROFESSOR HEWSON SWIFT, *University of Chicago*.

CHEMISTRY: PROFESSOR DAVID N. HUME, *Massachusetts Institute of Technology*; PROFESSOR ROBERT I. WALTER, *Haverford College*; PROFESSOR GEORGE ZIMMERMAN, *Bryn Mawr College*.

CLASSICS: PROFESSOR GEORGE E. DUCKWORTH, *Princeton University*; THE REV. HERBERT MUSURILLO, S.J., *Fordham University*.

ECONOMICS: PROFESSOR IRMA ADELMAN, *The Johns Hopkins University*; WILLIAM M. CAPRON, *Council of Economic Advisers, Washington, D. C.*; PROFESSOR JOHN C. H. FEI, *Yale University*; PROFESSOR IRVING B. KRAVIS, *University of Pennsylvania*.

ENGINEERING: PROFESSOR ROBERT J. BRUNGRABER, *Princeton University*; PROFESSOR MUNIR R. EL-SADEN, *North Carolina State College*; PROFESSOR JAMES K. ROBERGE, *Massachusetts Institute of Technology*; PROFESSOR STEPHEN S. WOLFF, *The Johns Hopkins University*.

ENGLISH LITERATURE: PROFESSOR GEORGE S. FRASER, *University of Rochester and University of Leicester*; PROFESSOR GEORGE GIBIAN, *Cornell University*; PROFESSOR THOMAS GREENE, *Yale University*; PROFESSOR S. FRED JOHNSON, *Columbia University*; PROFESSOR WILLIAM NELSON, *Columbia University*; PROFESSOR WILLARD THORP, *Princeton University*.

FINE ARTS: PROFESSOR GERALD ACKERMAN, *Bryn Mawr College*; PROFESSOR ROBERT A. KOCH, *Princeton University*; PROFESSOR MARIANNE MARTIN, *Douglass College*; PROFESSOR KYLE M. PHILLIPS, JR., *Bryn Mawr College*; PROFESSOR JAMES E. SNYDER, *University of Michigan*.

HISTORY: PROFESSOR GEORGE T. BEECH, *Western Michigan University*; PROFESSOR DAVID DONALD, *The Johns Hopkins University*; PROFESSOR GRAHAM W. IRWIN, *Columbia University*; PROFESSOR JOHN A. LUKACS, *Chestnut Hill College and La Salle College*; PROFESSOR WALLACE T. MACCAFFREY, *Haverford College*; PROFESSOR ALAN B. SPITZER, *State University of Iowa*.

MATHEMATICS: PROFESSOR DAVID GALE, *Brown University*; PROFESSOR EMIL GROSSWALD, *University of Pennsylvania*; PROFESSOR ROBERT MCNAUGHTON, *University of Pennsylvania*; PROFESSOR JOHN OXTOBY, *Bryn Mawr College*.

MODERN LANGUAGES—FRENCH: PROFESSOR RENE GIRARD, *The Johns Hopkins University*; PROFESSOR ARMAND HOOG, *Princeton University*. **LINGUISTICS—**PROFESSOR GEORGE CARDONA, *University of Pennsylvania*. **RUSSIAN—**PROFESSOR ROBERT L. BELKNAP, *Columbia University*. **SPANISH—**PROFESSOR JOAQUIN CASALDUERO, *Hunter College*.

MUSIC: PROFESSOR A. TILLMAN MERRITT, *Harvard University*.

PHILOSOPHY: PROFESSOR W. P. ALSTON, *University of Michigan*; PROFESSOR NUEL D. BELNAP, JR., *University of Pittsburgh*; PROFESSOR JEAN A. POTTER, *Bryn Mawr College*; PROFESSOR JOHN RAWLS, *Harvard University*; PROFESSOR F. N. SIBLEY, *Cornell University*.

PHYSICS—PROFESSOR FAY AJZENBERG-SELOVE, *Haverford College*; PROFESSOR WILLIAM C. DAVIDON, *Haverford College*; PROFESSOR EDWARD D. LAMBE, *State University of New York at Stony Brook*.

POLITICAL SCIENCE: PROFESSOR THOMAS A. FLINN, *Oberlin College*; PROFESSOR LEON GORDENKER, *Princeton University*; PROFESSOR JOHN D. LEWIS, *Oberlin College*; PROFESSOR HERBERT PACKER, *Stanford University*.

PSYCHOLOGY: PROFESSOR JOSEPH J. GREENBAUM, *New School for Social Research*; PROFESSOR JACOB NACHMIAS, *University of Pennsylvania*; PROFESSOR IRVIN ROCK, *Yeshiva University*; DR. WALTER C. STANLEY, *National Institute of Mental Health*; PROFESSOR DAVID R. WILLIAMS, *University of Pennsylvania*; PROFESSOR JULIUS WISNER, *University of Pennsylvania*.

Degrees Conferred

June 8, 1964

BACHELOR OF ARTS

in the Division of the Humanities

EMILY KLEIN ABEL (History)	RICHARD JARED LUBARSKY (English Literature)
EDWARD HENRY ALLEN, II (English Literature)✓	ABIGAIL KATHI MALMGREEN (Greek)
ELEANOR ATWOOD ARNASON (Fine Arts)	NANCY CREIGHTON McAVOY (Fine Arts)
DIANA WHITLEY BAILEY (English Literature)✓	MARGARET EILEEN MCGINLEY (English Literature)
JOAN KENDALL BRADBURY (Psychology)	SHARON IRENE MCGRAYNE (Fine Arts)
JOANN MYRTLE BROADBOOKS (History)	PHILIP DAVID MOREHEAD (French)
CONSTANCE WARREN BROWN (English Literature)	ELIZABETH ANN MORROW (English Literature)
C. OLIVER BURT, III (History)	ANNA PEIRCE NEISSER (Psychology)
WILLIAM FREDERICK BYNUM (English Literature)	NANCY L. NICKERSON (Fine Arts)
FRANCES CADY (Greek)	JEAN CAROL OAKLEY (Greek)
ANNE ELIZABETH COCHRAN (History)	REBECCA ROWE PARFITT (Fine Arts)
JOYCE McAVOY COLKET (Fine Arts)	HELENE MARIE PEET (English Literature)
WALLACE ANN CRUCIGER (Fine Arts)	CHRISTINE KATHERINE PELZER (French)
DIANA IRENE DAVIDS (History)	ANNE PERRY (Fine Arts)
RICHARD DANIEL DePUMA (Fine Arts)	JED SAUL RAKOFF (English Literature)
CHERYL BETH DIAMOND* (Fine Arts)	MARY GARNETT RANEY (History)
ELIZABETH ARCHER DOBSON (Fine Arts)	TOIVO ULO RAUN (History)
EVANTHIA ANTHOULA DOXIADIS (Fine Arts)	LYDIA RAZRAN (Psychology)
MARTHA LELIVELT STOCKING EUWEMA (History)	HELEN RHODES (French)
MARION COLBY FOSTER (English Literature)	DAVID MICHAEL RICE (Philosophy)
PETER L. FREEDMAN (Philosophy)	TIMOTHY ALLAN RIGGS (Fine Arts)
NANCY ANN GARDNER (English Literature)	ROSLYN RIVKIN (English Literature)
RICHARD REVINGTON GIST, JR. (English Literature)	ELIZABETH EDNA SAMS (Fine Arts)
PHILIP TODD GRIER (Philosophy)	MICHAEL ABRAHAM SAND (English Literature)
SHARON JANE HAAS (English Literature)	RONALD GRIFFEN SCHAEFER (Philosophy)
KATE LINDLEY HEARNE (Fine Arts)	PHILIP JOSEF SILVERMAN (History)
MARGARET HODGKIN (English Literature)	JOHN OLIVER SIMON (English Literature)
ALISON HOLT (Fine Arts)	SUSAN GIFFORD SLADE (Russian)
ANN ELIZABETH HOOVER (English Literature)	CAROLINE WARE SLY (Music)
SUSAN AMY SCHMITTER JACK (Psychology)	J. HARVEY SMITH (History)
LOUISE JUNG (Psychology)	LINDA SHELLEY SMITH (English Literature)
ROBERT ALEXANDER KAPP (History)	MARY HOWARD SMITH (Philosophy)
JULIE ANN KELLER (Fine Arts)	AMY F. J. STONE (History)
GERILYN MILLER KELLY (English Literature)	BART FRANCIS TEUSH (English Literature)
JANET ANNE KELLY (English Literature)	JAMES THORPE, III (English Literature)
RITA KOPLOWITZ (History)	REBECCA COTTRELL TODD (English Literature)
TERESE LOEB KREUZER (Fine Arts)	PENELOPE ANN TOWNSEND (History)
DANIEL HENRY LEDERER (English Literature)	KATRINA NOURSE VAN BENSCHOTEN (English Literature)
	CATHA M. WINN (History)
	DAVID MCKENDREE WINN (English Literature)
	ROSAMUND STONE WORTH (English Literature)

* As of the Class of 1963.

in the Division of the Social Sciences

- JULIE FRANCES ADAMS (History)
 VICTOR OLUFEMI ADEFELA
 (Political Science-International Relations)
 JASON KENDRICH ASHBY (Economics)
 WILLIAM SMALLWOOD AYRES (History)
 MARC G. BALADI (Political Science)
 BERNARD ALLEN BANET (Psychology)
 CATHERINE A. BARRETT
 (Political Science-International Relations)
 RICHARD NEWELL BARRETT (Economics)
 CAROL ANN BEATTIE (Psychology)
 BARBARA ELIZABETH BERGER (History)
 PAUL ROBERT BOOTH (Political Science)
 RONATHAN D. CASPER (Political Science)
 BELLA M. CLARK (History)
 MARGARET ANN COLVIN (Political Science)
 NINA WILSON CORNELL (Economics)
 JOANNA DUBARRY (Psychology)
 BARBARA WENDY EDWARDS (Psychology)
 DUNCAN KARL FOLEY (Mathematics)
 SUSAN W. FOSTER (Economics)
 ROEL DAVID GELBER (History)
 JAMES WILLIAM GEZORK (Economics)
 MICHAEL ALAN GROSS (Philosophy)
 BENJAMIN HARRISON (History)
 DAVID ARTHUR HEIDER (History)
 FREFFREY WILLIAM HEYEN (History)
 EDWARD HEARNE HITCHCOCK
 (Political Science)
 ANDREA WUTKE HOFF (History)
 ROBERT DEGREEFF JACOBI (Economics)
 BARBARA LEE KLINE (Economics)
 ARTHUR TERRY LAVER (History)
 MICHAEL WOODRUFF LILLIE
 (Political Science-International Relations)
 VALERIE W. LOWE (Economics)
 JOHN LESLIE LUDLAM (Political Science)
 RICHARD WALLACE MANSBACH
 (Political Science)
- MARY MARTHA MCCASLIN (Psychology)
 STEPHEN K. MCNEES (Economics)
 EUGENE ROBINSON MCNINCH, JR.
 (Economics)
 MICHAEL MEEROPOL (Economics)
 BRUCE CAMPBELL MEYERS (Economics)
 REBECCA ADAMS MILLS** (History)
 MICHAEL L. MONTGOMERY
 (Political Science-International Relations)
 JOHN CROTHERS POLLOCK
 (Political Science)
 REBECCA PRENTICE (Psychology)
 HOWARD NEIL RABINOWITZ (History)
 JOHN ALAN RIGGS (History)
 JAMES P. ROBINSON (Psychology)
 ANN RUBIO (History)
 ESMÉ ROSITA SARNOFF (History)
 THOMAS C. SAYLOR* (History)
 CAROL O. SEABROOK (History)
 SUSAN STEVENS SMART (Psychology)
 MARY FREDRICKA SNYDER (Psychology)
 ALAN LEON SPIELMAN (Political Science)
 JANE HELEN STALLMANN
 (Political Science)
 MICHAEL HENRY STEIN
 (Political Science)
 NADINE HOPE TAUB (Economics)
 LILA KATHRYN TOWLE (Psychology)
 CONRAD JOHN WEILER, JR. (History)
 ELIOT ROY WEINTRAUB (Mathematics)
 JAMES M. WEISS (Political Science)
 PHILIP WELLONS (Political Science)
 ANNE TOMLINSON WELSH* (Economics)
 CARL PETER WITTMAN (History)
 FRIEDNER DIAMOND WITTMAN
 (Philosophy)
 GEORGE TREXLER WOLF
 (Political Science)
 SUSAN BERYL ZINN (Psychology)

in the Division of the Natural Sciences

- SAMUEL BERTRAM ALLISON (Zoology)
 BARBARA ANN BANNISTER (Botany)
 BERNARD DAVID BEITMAN (Chemistry)
 ALLAN BERLIND (Zoology)
 JOSEPH W. BERNHEIM (Psychology)
 GERALD D. BLUM (Physics)
 DOUGLAS LINDSAY BRAND (Psychology)
 SUSAN ELIZABETH DAY (Mathematics)
 BARBARA HART DIEBOLD (Zoology)
 ALAN O. FEINGOLD (Zoology)
 MICHAEL IRA FRIEDMAN (Philosophy)
 LUCY FUCHSMAN (Zoology)
 ROBERT L. GENTILE (Psychology)
 JOAN MARIE GLENN (Chemistry)
 ROBERT GOLD (Mathematics)
- JONATHAN GLENN GOLDSTINE
 (Mathematics)
 ROBERT PETER GORDON (Zoology)
 ELLEN CAROL GOWER (Psychology)
 RICHARD LEE GREEN (Zoology)
 ARNOLD KOONS GRIFFITH (Mathematics)
 ELIZABETH GRONKIEWICZ (Psychology)
 ROBERT LINDSAY HALL (Chemistry)
 THOMAS MATTHEW HAMMOND
 (Chemistry)
 ROBERT SUTTON HARRINGTON (Physics)
 PETER HALDAN HARTLINE (Physics)
 ARTHUR DANIEL HLAVATY (Philosophy)
 ELIZABETH MURRAY HODGSON (Botany)
 WILLIAM HINES HOOKE (Physics)

* As of the Class of 1963.

** As of the Class of 1962.

TED VELO JOSEPH HOULE (Zoology)	JOSEPH RICHARD PETERSON (Chemistry)
JONATHAN KAPLAN (Psychology)	RUSSELL A. ROY (Physics)
JOHN WINSPEARE KAST (Physics)	RICHARD CHIH-PING SAH (Physics)
FREDERICK SAUL KELLER (Zoology)	JAMES BALDWIN SALISBURY (Physics)
CHARLES WILSON LAMB (Mathematics)	STEPHEN VICTOR SAVRAN (Chemistry)
SCOTT KENNETH LEHMANN (Mathematics)	JOHN SOAME SCHUSTER (Chemistry)
DAVID NORMAN LEVIN (Physics)	PETER SETLOW (Chemistry)
MARVIN JAY LIPSCHUTZ (Zoology)	LUBA SHARP (Psychology)
BENNETT LORBER (Zoology)	STEVEN HAROLD SHMURAK (Mathematics)
JOYCE THOMPSON MABRY (Psychology)	ELISABETH ANN SMITH (Biology)
MARTHA KATE McCRUMM (Zoology)	ROBERT ALLEN SMITH, JR. (Physics)
ANN PRESTON McNEAL (Mathematics)	ROBIN ELIZABETH SMITH (Psychology)
PETER STERLING MILLER (Physics)	JAMES WOODROW STEVENS (Mathematics)
EMMETTE OHMER MILTON, III (Mathematics)	EDITH BALCH TWOMBLY (Biology)
ELIZABETH ANN NORTHROP (Mathematics)	ISRAEL LLOYD TYLER (Physics)
ROBERT OLSHANSKY (Physics)	STEPHEN B. VAN CAMERIK (Chemistry)
	PETER JAY WEINBERGER (Mathematics)
	TIMOTHY CHENEY WILLIAMS (Biology)

BACHELOR OF SCIENCE
in the Division of Engineering

WILLIAM TIFFANY CARPENTER (Electrical Engineering)	PETER PEI YUAN LEE (Electrical Engineering)
RAYMOND HENRY ELLIS (Civil Engineering)	PAUL COLLINS RAMER (Mechanical Engineering)
THOMAS A. GOODWIN (Electrical Engineering)	GILL GROVES RICHARDS (Electrical Engineering)
DAVID L. JAQUETTE (Engineering Sciences)	ERIC RALPH RIES (Civil Engineering)
WILLIAM SWAN JEWETT (Mechanical Engineering)	RICHARD WILLIAM WEEKS, II (Mechanical Engineering)
WILLIAM STANFORD JOHNSON (Electrical Engineering)	SAMUEL MADISON WORTHINGTON, III (Electrical Engineering)
STERLING B. JOHNSTON (Civil Engineering)	

CIVIL ENGINEER

RAYMOND CRARY INGERSOLL

MASTER OF ARTS

LYNNE DAVIS MIFFLIN

DOCTOR OF LAWS

LYNDON BAINES JOHNSON
JOHN J. McCLOY
GUNNAR MYRDAL
ALEXANDER C. PURDY
U THANT

DOCTOR OF LETTERS

WYSTAN HUGH AUDEN

DOCTOR OF LAWS

HERMANN J. MULLER

Awards and Distinctions

June 8, 1964

HONORS AWARDED BY THE VISITING EXAMINERS

HONORS:

Eleanor Atwood Arnason, William Smallwood Ayres, Carol Ann Beattie, Barbara Elizabeth Berger, Allan Berlind, Joan Kendall Bradbury, Douglas Lindsay Brand, Constance Warren Brown, Frances Cady, William Tiffany Carpenter, Robert L. Gentile, Thomas A. Goodwin, Michael Alan Gross, Thomas Matthew Hammond, Robert Sutton Harrington, Peter Haldan Hartline, William Hines Hooke, Ann Elizabeth Hoover, Jonathan Kaplan, John Winspeare Kast, Terese Loeb Kreuzer, Charles Wilson Lamb, Sharon Irene McGrayne, Michael Meeropol, Elizabeth Ann Morrow, Elizabeth Ann Northrop, Helene Marie Peet, Lydia Razran, Timothy Allan Riggs, James P. Robinson, Richard Chih-Ping Sah, Carol O. Seabrook, Philip Josef Silverman, Robert Allen Emith, Jr., Jane Helen Stallmann, Michael Henry Stein, Amy F. J. Stone, Conrad John Weiler, Jr., James M. Weiss, Timothy Cheney Williams, Friedner Diamond Wittman.

HIGH HONORS:

Bernard Allen Banet, Joseph W. Bernheim, Gerald D. Blum, Jonathan D. Casper, Margaret Ann Colvin, Diana Irene Davids, Barbara Hart Diebold, Duncan Karl Foley, Lucy Fuchsman, Robert Gold, Philip Todd Grier, Arnold Koons Griffith, William Stanford Johnson, Robert Alexander Kapp, David Norman Levin, Abigail Kathi Malmgreen, Richard Wallace Mansbach, Stephen K. McNees, Peter Sterling Miller, Jean Carol Oakley, Howard Neil Rabinowitz, Roslyn Rivkin, Michael Abraham Sand, Ronald Griffen Schaefer, Caroline Ware Sly, Robin Elizabeth Smith, Alan Leon Spielman, James Thorpe, III, Peter Jay Weinberger.

HIGHEST HONORS:

Jonathan Glenn Goldstine, John Oliver Simon.

DISTINCTION IN COURSE AWARDED BY FACULTY

Joanna DuBarry, Raymond Henry Ellis, Louise Jung, Daniel Henry Lederer, Ann Preston McNeal, Susan Gifford Slade, Nadine Hope Taub, Richard William Weeks, II.

ELECTIONS TO HONORARY SOCIETIES

PHI BETA KAPPA:

Bernard Allen Banet, Joseph W. Bernheim, Gerald D. Blum, Joan Kendall Bradbury, Jonathan D. Casper, Margaret Ann Colvin, Diana Irene Davids, Barbara Hart Diebold, Joanna DuBarry, Duncan Karl Foley, Lucy Fuchsman, Robert Gold, Jonathan Glenn Goldstine, Arnold Koons Griffith, Louise Jung, John Winspeare Kast, Charles Wilson Lamb, David Norman Levin, Abigail Kathi Malmgreen, Richard Wallace Mansbach, Stephen K. McNees, Peter Sterling Miller, Jean Carol Oakley, Lydia Razran, Roslyn Rivkin, Michael Abraham Sand, John Oliver Simon, Robin Elizabeth Smith, James Thorpe, III, Peter Jay Weinberger, Timothy Cheney Williams.

SIGMA XI:

Barbara Ann Bannister, Allan Berlind, Gerald D. Blum, Lucy Fuchsman, Robert Gold, Jonathan Glenn Goldstine, Arnold Koons Griffith, Thomas Matthew Hammond, Robert Sutton Harrington, Peter Haldan Hartline, William Hines Hooke, William Stanford Johnson, John Winspeare Kast, Charles Wilson Lamb, Scott Kenneth Lehmann, David Norman Levin, Peter Sterling Miller, Elizabeth Ann Northrop, Joseph Richard Peterson, Richard Chih-Ping Sah, Peter Setlow, Robert Allen Smith, Jr., Richard William Weeks, II, Peter Jay Weinberger, Timothy Cheney Williams.

SIGMA TAU:

William Tiffany Carpenter, Raymond Henry Ellis, Thomas A. Goodwin, William Stanford Johnson, Gill Groves Richards, Richard William Weeks, II.

SWARTHMORE COLLEGE FELLOWSHIP AWARDS

- The Hannab A. Leedom Fellowship* to ELIZABETH GRONKIEWICZ.
The Joshua Lippincott Fellowship to PHILIP TODD GRIER.
The John Lockwood Memorial Fellowship to MARGARET HODGKIN.
The Lucretia Mott Fellowship to SUSAN GIFFORD SLADE.
The Martha E. Tyson Fellowship to WALLACE-ANN CRUCIGER.

SPECIAL AWARDS*

- The Ivy Award* to PHILIP TODD GRIER.
The Oak Leaf Award to ROBIN E. SMITH.
The McCabe Engineering Award to RICHARD W. WEEKS, II.
The John W. Nason Award to GILMORE AND MARY STOTT.
The Katherine B. Sicard Prize to RUTH C. BERNARD.
The William Plummer Potter Public Speaking Fund Awards:
 The Potter Poetry Reading Contest: first prize, PETER LINEBAUGH; second prize, CATHA WINN; third prize, DAVID SWENSON.
 The Potter One-Act Play Contest: prizes awarded to PAUL CHALMERS, JOHN O. SIMON, RICHARD GIST, AND DANIEL LEDERER.
The John Russell Hayes Poetry Prizes: for an original poem, JAMES TATE; for a verse translation, ROBERT WILLIAMS.
The Lois Morrell Poetry Awards: first prize, JOHN O. SIMON, second prize, ELEANOR ARNASON.
The Brand Blanshard Prize to RONALD G. SCHAEFER.
The Phi Beta Kappa Prize to MARK FRANKENA.
The Scott Award to THOMAS RIDDELL.
The Sarah Kaighn Cooper Scholarship to GAVIN WRIGHT.

* A description of each of these awards can be found in another section of the catalogue.

Enrollment of Students by Classes—1963-64

	<i>Men</i>	<i>Women</i>	<i>Total</i>
Senior	122	92	214
Juniors	117	112	229
Sophomores	151	115	266
Freshmen	156	123	279
	<hr/>	<hr/>	<hr/>
	546	442	988
Special Students	1	4	5
Graduate Students	0	1	1
	<hr/>	<hr/>	<hr/>
Totals	547	447	994

Geographical Distribution—1963-64

New York	210	Nebraska	2
Pennsylvania	164	Oregon	2
New Jersey	83	Arkansas	1
Massachusetts	74	Idaho	1
Maryland	44	Oklahoma	1
Virginia	35	South Carolina	1
California	32	South Dakota	1
Illinois	31	Canal Zone	1
Ohio	31	Puerto Rico	1
Connecticut	27		
District of Columbia	23	Total United States	959
Delaware	19		
Florida	18	Canada	3
Michigan	17	France	3
North Carolina	15	Italy	3
Tennessee	12	Dahomey	2
Indiana	9	England	2
Rhode Island	9	Germany	2
Texas	9	India	2
Wisconsin	9	Mexico	2
Missouri	8	Nigeria	2
Colorado	7	Poland	2
New Hampshire	7	Switzerland	2
Kentucky	6	B. W. I.	1
Georgia	5	Greece	1
Maine	5	Japan	1
Minnesota	5	Morocco	1
New Mexico	5	Norway	1
Vermont	5	Peru	1
Hawaii	4	Republic S. Africa	1
West Virginia	4	Tanganyika	1
Alabama	3	Turkey	1
Iowa	3	Venezuela	1
Kansas	3		
Washington	3	Total from abroad	35
Arizona	2		
Louisiana	2	Grand Total	994

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 1A Parrish Hall Annex
 2 Hall Gymnasium
 3 Sharples Pool
 4 Martin Building
 5 Pierre S. duPont Science Building
 6 Beardsley Hall
 7 Trotter Hall
 8 Arts Center
 9 Hicks Hall
 10 Bartol Foundation
 11 Friends Meeting House
 12 Whittier House
 13 Professors' Residences
 14 Woolman House
 15 President's House
 16 Robinson House
 17 Cunningham House
 18 Somerville Student Center
 19 Willets Dormitory
 20 Worth Dormitory
 21 Bond Memorial and Class Lodges
 22 Benjamin West House
 23 College Library and Friends Historical Library
 24 Tennis Courts
 25 Cunningham Field</p> | <p>26 Pennsylvania Railroad Station
 27 Palmer Hall
 28 Pittenger Hall
 29 Roberts Hall
 30 Storage
 31 Mary Lyon Dormitories
 32 Hydraulic Laboratory
 33 Clothier Fields
 34 Lamb-Miller Field House
 35 Heating Plant
 36 Employees' Houses
 37 Phi Beta Psi Fraternity Lodge
 38 Delta Upsilon Fraternity Lodge
 39 Phi Sigma Kappa Fraternity Lodge
 40 Tau Alpha Omicron Fraternity Lodge
 41 Kappa Sigma Pi Fraternity Lodge
 42 Wharton Hall
 43 Sproul Observatory
 44 Clothier Memorial
 45 Scott Outdoor Auditorium
 46 Scott Foundation Building
 47 Ashton House
 48 Service Building
 49 Philip T. Sharples Dining Hall
 50 Library (proposed site)
 51 Health Center (proposed site)</p> |
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*Plan of the Grounds
of
Swarthmore College*

