

BULLETIN
OF THE
AMERICAN ASSOCIATION
OF
JESUIT SCIENTISTS

Eastern States Division

Survey Issue: SCIENCE EDUCATION



IN JESUIT COLLEGES AND UNIVERSITIES

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Eastern States Division

(FOUNDED IN 1922)

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To our readers . . .

Because of an oversight the fortieth anniversary of the BULLETIN went unobserved in the March issue. In August of 1922 the first annual meeting of "The Association of Science and Mathematics Teachers of the Maryland-New York Province" was held at Canisius College, Buffalo, with Fr. Michael Ahern, S.J. presiding. It is interesting that the Association was modeled on a similar group then existing in the Missouri province, and when it was announced that the latter was changing its name to "The American Association of Jesuit Scientists, Central Section," the Maryland-New York group decided to call itself "The American Association of Jesuit Scientists, Eastern Section." Unfortunately, we do not have time to delve into more of the early history of the Association, but we might mention some familiar names of those taking an active part in that first meeting.

Fr. Henry M. Brock, S.J. was elected chairman of the physics section, Fr. Joseph S. Didusch, S.J., chairman of the biology section, and Fr. (then Mr.) J. Joseph Lynch, S.J. was elected secretary-treasurer. Also quite active at that first meeting was Fr. Joseph M. Kelley, S.J., whose diamond jubilee in the Society we will commemorate in the next issue.

Since the eastern division of the Association was modeled on the central division it is appropriate that in this fortieth anniversary year of the BULLETIN we should be engaged in a nation-wide survey of science education in Jesuit colleges and universities. As we look back in gratitude to the original central section for being the inspiration forty years ago for our own section, we welcome the present opportunity to collaborate with science educators in Jesuit institutions throughout the country. We also look forward to future opportunities to extend the work of the Association beyond the eastern seaboard. Reports from the departments represented in the survey will be most welcome from time to time as part of our regular section in the BULLETIN, "Reports of Scientific Activity."

The results of the survey should be useful as one of the bases for the panel discussion to be held at the annual meeting of the Association in August on "The future of Jesuit scientific education and research."

To complement the present survey we plan to publish in future issues of the BULLETIN surveys of: engineering education in Jesuit schools, Jesuit graduate students in science, science doctorates in houses of studies, and science education in Jesuit high schools. A report on the Jesuit Research Council is also planned.

We hope that the generosity of all those cooperating in this survey will be repaid by the benefits derived from the mutual exchange of information.

A SURVEY OF SCIENCE EDUCATION IN JESUIT COLLEGES AND UNIVERSITIES

Introduction. During the past year the editors of the BULLETIN have received several requests for the publication of information which would assist teachers in advising students concerning educational opportunities in the natural sciences. At the beginning of this year questionnaires were sent to the chairmen of the departments of astronomy, biology, chemistry, geology, geophysics, mathematics, and physics in Jesuit colleges and universities throughout the country. Eighty-one percent of 117 such departments responded and the information which they submitted is presented here. The purpose of this survey is to provide Jesuit science teachers in high schools, colleges and universities with information which will help them in counselling students concerning the opportunities for science education in Jesuit schools.

Departments of the medical schools at Creighton, Georgetown, Loyola (Chicago), Marquette, and St. Louis Universities which offer graduate degrees in the various fields of the life sciences have not been included in this survey. In most cases this necessarily presents an inadequate picture of the educational opportunities in the fields of biology and chemistry at these schools. It has been thought best, however, in a first attempt at such a survey as this not to include the medical schools. Further revisions of the survey are envisioned, and it is hoped that it will then be possible to include pertinent information concerning courses in the life sciences offered by the medical schools.

The engineering disciplines as such have not been included in the present survey. Plans are underway to publish a survey of these disciplines in the near future.

Format. In determining the format in which to present this survey, the BULLETIN staff has been guided by the following two norms: (1) the information from all departments should be presented in a sufficiently schematic and homogeneous form as to meet the purposes of counselling for which it is intended; (2) each department should be fairly represented according to the information submitted by that department. Consequently we have given in tabular form all information which can be fairly represented in that form. In addition, text material, including a list of the faculty and their fields of interest, current research projects and research equipment has been given for each school for which such information was available. A section entitled "Supplementary Information" in this text

material includes pertinent information not otherwise mentioned or clarifies material given in the tables. In the latter case an asterisk (*) in the table refers to such text material. In a few cases it has not been possible in the text material to distinguish between fields of interest for the faculty members and current research projects. In these cases all pertinent information has been included in a single section entitled "Faculty and Research Fields."

Acknowledgements. We would like to take this opportunity to thank most sincerely all of the departmental chairmen for their generosity in responding to the questionnaire. The chairmen have been indicated in the list of faculty under each school by the designation †. Anyone wishing to contact these chairmen will find in this issue of the *BULLETIN* a convenient list of addresses of all Jesuit colleges and universities in the country. Editorial judgement has had to be used in order to reduce the information submitted by ninety-five departments to manageable size. We hope that the information submitted by each department is fairly represented and we welcome suggestions and criticisms of the survey as it is presented here.

TABLES

In the tables which follow we have tried to give a schematic presentation of the information submitted by the various department chairmen. In the last three columns a code has been used in order to facilitate the presentation of information concerning special undergraduate programs and financial assistance. We have limited the number of symbols used in this code in order to facilitate the use of the tables. Only the more common programs have been coded. In many cases information does not fall clearly into one of the coded categories. In these cases reference is made in the table by the use of an asterisk to information included in the text material under the given school.

Since these tables are meant to present only a schematic view, they should be used in conjunction with the text material which follows them. Even the more common types of programs find widely different applications at different schools, and in cases where the peculiarities of a program have been made known to us this information has been included in the text material. Blank spaces in the table indicate that no information is available.

Because there are only a few departments in the fields of astronomy, geology, and geophysics, the information on these departments has been placed, for convenience, after the more common disciplines. Consequently the order of presentation of both the tabular material and the text material is as follows: 1) biology, 2) chemistry, 3) mathematics, 4) physics, 5) astronomy, geology, geophysics.

SCHOOL	BIOLOGY D						
	NUMBER ON FACULTY	NUMBER OF PH.D.'S ON FACULTY	NUMBER OF SENIOR UNDER-GRADUATES	NUMBER IN M.S. PROGRAM		NUMBER PH.D. PROGRAM	
				FULL-TIME	PART-TIME	FULL-TIME	PART-TIME
Detroit	9	8	24-28	11	45	×	×
Fairfield	5	3	28	×	×	×	×
Fordham	9	8	60	28	18	16	11
Georgetown	8	4	50-60	×	×	×	×
Gonzaga	5	3	8	×	×	×	×
Holy Cross	7	5	40	×	×	×	×
John Carroll	6	5	25	8	3	×	×
Le Moyne	4	2	15	×	×	×	×
Loyola (Baltimore)	4	3	15-20	×	×	×	×
Loyola (Chicago)	9	8	30-35	×	×	×	×
Loyola (Los Angeles)	3	3	20	×	×	×	×
Loyola (New Orleans)	7	7	12	8	2	×	×
Marquette	13	13	100	25	0	5	×
Rockhurst	3	1	8	×	×	×	×
St. Joseph's	4	3	33	×	×	×	×
St. Louis	8	8	10				
St. Peter's	5	2	20	×	×	×	×
San Francisco	4	4	10	3	2	×	×
Santa Clara	4	3	12	×	×	×	×
Scranton	3	3	25	×	×	×	×
Spring Hill	5	2	15	×	×	×	×
Xavier	4	4	12	×	×	×	×

The numbers listed for both undergraduate and graduate students are estimated averages. In the last two columns no information on scholarships, part-time work or student loan formation concerning them can be obtained from either the school catalogs or the registrars.

Numbers in parentheses in the last three columns indicate the number of students who may

* See descriptive material given in the "Supplementary Information" under

× Program is not offered.

AP Advanced placement.

AsRes Research assistantship.

AsT Teaching assistantship, including laboratory assistance.

Fel Graduate fellowship.

FelNSF NSF cooperative fellowship.

Gr Graduate courses available to capable undergraduates.

HP Honors program, enriched courses and tutorial work, generally available

Res Research available, in some instances required for degree program.

ResNIH NIH undergraduate research participation program.

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DEPARTMENTS

SPECIAL UNDERGRADUATE PROGRAMS	FINANCIAL ASSISTANCE	
	UNDERGRADUATE	GRADUATE
AP, HP*	AsT, ResNIH(1)	AsT*, Fel* ×
Gr, HP		AsT(14) ×
Gr, Res		×
Res*	AsT	×
ResNSF(2)	AsT, ResNSF(2)	×
Gr		AsT ×
AP, HP*		×
Res	AsRes, AsT	×
HP, Res	AsRes(1), AsT(10)	×
Gr, Res*, Sem	AsRes*	AsRes*, AsT*, Fel
		AsT(14), AsRes, Fel*, FelNSF
Res*	AsRes, AsT	×
	AsT(7)	×
Gr, ResNSF	AsT, ResNSF*	AsRes, Fel*, FelNSF*,
Res, Th		×
AP, Gr, Res	AsT	AsT, Fel
HP		×
ResNSF*		×
Res	AsT	×
Res	AsRes, ResNSF	×

over the past few years.

programs has been given, since these types of financial assistance are quite common and in-
of the respective schools.

participate in the listed program.

listed school.

for credit.

SCHOOL	CHEMISTRY						
	NUMBER ON FACULTY	NUMBER OF Ph.D.'S ON FACULTY	NUMBER OF SENIOR UNDERGRADUATES	NUMBER IN M.S. PROGRAM		NUMBER Ph.D. PROGRAM	
				FULL-TIME	PART-TIME	FULL-TIME	PART-TIME
Boston College	11	11	14	3	8	10	3
Canisius	10	7	12	2	30	×	×
Creighton	7 (60)	5	12	10-12	2-4	×	×
Detroit	9	8	28	22	30	×	×
Fairfield	6	4	7	×	×	×	×
Fordham	13	13	15	34		40	
Georgetown	10	10	4*	20	50*	10	25*
Holy Cross	10	7	10-12	10	×	×	×
John Carroll	10	6	10	5	30	×	×
Le Moyne	5	4	8	×	×	×	×
Loyola (Baltimore)	5	4	7	×	×	×	×
Loyola (Chicago)	10	10	12	*		*	
Loyola (Los Angeles)	3	3	3	×	×	×	×
Loyola (New Orleans)	6	6	10	×	×	×	×
Marquette	11	8	14	15	20	×	*
Regis	3	2	4	×	×	×	×
Rockhurst	3	2	8	×	×	×	×
St. Joseph's	5	5	8	35	40	×	×
St. Louis	10	10	9	22	15*	15	2
St. Peter's	5	3	13	×	×	×	×
Santa Clara	4	4	3	×	×	×	×
Seattle	7	6	10		25*	×	×
Spring Hill	5	3	10	×	×	×	×
Wheeling	3	3	6	×	×	×	×
Xavier	6	5	12	12	38	×	×

The numbers listed for both undergraduate and graduate students are estimated averages

In the last two columns no information on scholarships, part-time work or student loan formation concerning them can be obtained from either the school catalogs or the registrars

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DEPARTMENTS

SPECIAL UNDERGRADUATE PROGRAMS	FINANCIAL ASSISTANCE	
	UNDERGRADUATE	GRADUATE
AP, Gr, HP, Res, ResNSF	AsT, ResNSF	AsT*, AsRes
Res	×	AsT*
Gr, HP*, Sem	AsT	AsT
ResNSF	ResNSF	AsT(22), Fel
AP, ResNIH, ResNSF	ResNIH, ResNSF(3)	×
AP, Gr, ResNSF	ResNSF	AsRes(25)*, AsT(23)*
AP, Gr, Res	*	AsRes(15)*, AsT(13), FelNSF
AP, Gr, HP, Th		Fel(10)
AP, Gr, Res	*	AsT(5)
Sem, Th		×
		×
HP		
Res*	AsT	×
AP*, HP*, Res, Sem, Th	AsRes, AsT	×
Gr, Res	AsT	AsRes, AsT*, Fel
Res	AsT	×
AP, Res	AsRes*, AsT	×
AP, Gr, Res, Sem		AsRes*, AsT*
AP, Gr, HP*, Res, Th		AsRes(8), AsT(16) FelNSF(2)
AP*, Res, Th		×
Res	AsT	×
Gr, Res	AsT	*
AP, Res	AsT	×
AP, ResNIH, ResNSF, Sem, Th	AsT, ResNIH(2), ResNSF,*	×
AP, Gr, Res*, ResNSF, Sem, Th	ResNSF*,	AsRes(2),* AsT(11), Fel

over the past few years.

programs has been given, since these types of financial assistance are quite common and in-
of the respective schools.

may participate in the listed program.

the listed school.

for credit.

SCHOOL	MATHEMATICS						
	NUMBER ON FACULTY	NUMBER OF Ph.D.'s ON FACULTY	NUMBER OF SENIOR UNDERGRADUATES	NUMBER IN M.S. PROGRAM		NUMBER Ph.D. PROGRAM	
				FULL-TIME	PART-TIME	FULL-TIME	PART-TIME
Boston College	17	8	25	20	12	×	×
Canisius	5	2	6	×	×	×	×
Crcighton	5	2	20	×	*	×	×
Detroit	26	5	40	60*		×	×
Fordham	11	8	12	10	26	×	×
Georgetown	7	7	25	12	6	2	1
Gonzaga	9	1	8	4	2	×	×
Holy Cross	8	4	10	×	×	×	×
Le Moyne	5	1	10	×	×	×	×
Loyola (Baltimore)	5		8	×	×	×	×
Loyola (Chicago)	3	3	12*	3	25	×	×
Loyola (Los Angeles)	5	4	15	*	*	×	×
Loyola (New Orleans)	5	1	4	×	×	×	×
Marquette	8	7	31	5	20	×	×
Regis	4	2	10	×	×	×	×
Rockhurst	3	1	2	×	×	×	×
St. Joseph's	7	0	10*	×	×	×	×
St. Louis	7	7	65	35	63	15	2
St. Peter's	8	2	15	×	×	×	×
San Francisco	8	2	7	×	×	×	×
Scranton	5	0	5	×	×	×	×
Seattle	6	4	45	×	×	×	×

The numbers listed for both undergraduate and graduate students are estimated averages

In the last two columns no information on scholarships, part-time work or student loan formation concerning them can be obtained from either the school catalogs or the registrars

Numbers in parentheses in the last three columns indicate the number of students who may

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DEPARTMENTS

SPECIAL UNDERGRADUATE PROGRAMS	FINANCIAL ASSISTANCE	
	UNDERGRADUATE	GRADUATE
AP, Gr, HP*, Res*	AsT	AsT*, Fel*
AP		×
AP, Gr, HP, Res	*	AsT*, Fel*
AP		AsT
AP, Gr, HP, ResNSF	*	AsT(2)*, Fel(2)*
AP, Gr, Res		Fel*, AsRes
AP, Gr, HP, Res*	AsT*	AsT*
AP, HP, Res*	AsT, ResNSF	×
Sem		×
AP		×
AP, HP*		AsT(5)*
Res, Sem		
AP*	AsT	×
Gr	AsT*	AsT*, FelNSF*
AP, HP		×
		×
		×
AP, Gr, HP, ResNSF*	AsT	AsT, Fel
AP, HP*, Res*		×
AP*		×
		×
*	AsT	×

over the past few years. programs has been given, since these types of financial assistance are quite common and in- of the respective schools. participate in the listed program. the listed school.

credit.

SCHOOL	PHYSICS DE						
	NUMBER ON FACULTY	NUMBER OF PH.D.'S ON FACULTY	NUMBER OF SENIOR UNDERGRADUATES	NUMBER IN M.S. PROGRAM		NUMBER PH.D. PROGRAM	
				FULL-TIME	PART-TIME	FULL-TIME	PART-TIME
Canisius	4	4	11	×	×	×	×
Detroit	9	6	10	11	13	×	×
Fordham	11	8	15	20	5	10	5
Georgetown	9	9	10	12	25	12	25
John Carroll	11	8	23	15	89	×	×
Le Moyne	4	2	9	×	×	×	×
Loyola (Baltimore)	7	3	15	×	×	×	×
Loyola (Chicago)	5	4	7	×	×	×	×
Loyola (Los Angeles)	6	4	4	×	×	×	×
Loyola (New Orleans)	6	4	15	×	×	×	×
Marquette	8	5	32	35	35	×	×
Regis	2	0	*	×	×	×	×
Rockhurst	4	2	6	×	×	×	×
St. Joseph's	11	2	40	×	×	×	×
St. Louis	9	8	10	29	14	22	0
St. Peter's	5	1	10	×	×	×	×
San Francisco	5	2	9	×	×	×	×
Scranton	4	4	25	×	×	×	×
Seattle	5	3	8	20*	0	×	×
Spring Hill	3	1	9	×	×	×	×
Xavier	6	2	13	×	×	×	×

The numbers listed for both undergraduate and graduate students are estimated averages

In the last two columns no information on scholarships, part-time work or student loan formation concerning them can be obtained from either the school catalogs or the registrars

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PARTMENTS

SPECIAL UNDERGRADUATE PROGRAMS	FINANCIAL ASSISTANCE	
	UNDERGRADUATE	GRADUATE
AP*, Res	AsT	×
Gr, Res	AsT	AsRes, AsT
Gr, HP, Sem, Res, ResNSFSum (10)	ResNSFSum(10)	AsRes, AsT, FelNSF*,
AP, Gr, HP, ResNSF(6)*	ResNSF(6)*	AsRes(4), AsT(6)*, Fel- NSF(2)*
AP, Gr, Res,*		AsRes*, AsT*
AP*, HP, Res	AsT	×
AP, ResNSF	ResNSF	×
AP, HP	AsT(4)	×
		×
HP, Res, ResNSF(12)*, ResNSF- Sum(12)	AsT, ResNSF(12)*, ResNSF- Sum(12)	×
Gr, Sem		AsRes*, AsT*, FelNSF
		×
Res*, Sem	AsT	×
AP, Res, Sem	*	×
AP, Gr, ResNSF	ResNSF	AsRes*, AsT*
HP, ResNSF*	AsT	×
Res,*		×
Res,*	AsT	×
Res	AsT	*
		×
Res, ResNSFSum	ResNSFSum	×

over the past few years.

programs has been given, since these types of financial assistance are quite common and in-
of the respective schools.

participate in the listed program.

the listed school.

for credit.

SCHOOL	ASTRONOMY						
	NUMBER ON FACULTY	NUMBER OF PH.D.'S ON FACULTY	NUMBER OF SENIOR UNDERGRADUATES	NUMBER IN M.S. PROGRAM		NUMBER PH.D. PROGRAM	
				FULL-TIME	PART-TIME	FULL-TIME	PART-TIME
Georgetown	6	6	1*	5	30	3	15
GEOLOGY							
Boston College	5	4	10	×	×	×	×
St. Louis	4	4	10	2	1	×	×
GEOPHYSICS							
Boston College	4	0	×	6	4	×	×
St. Louis	11	10	6	30	0	22	0

The numbers listed for both undergraduate and graduate students are estimated averages. In the last two columns no information on scholarships, part-time work or student loan information concerning them can be obtained from either the school catalogs or the registrars of Numbers in parentheses in the last three columns indicate the number of students who may

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- × Program is not offered.
- AP Advanced placement.
- AsRes Research assistantship.
- AsT Teaching assistantship, including laboratory assistance.
- Fel Graduate fellowship.
- FelNSF NSF cooperative fellowship.
- Gr Graduate courses available to capable undergraduates.
- HP Honors program, enriched courses and tutorial work, generally available
- Res Research available, in some instances required for degree program.
- ResNIH NIH undergraduate research participation program.
- ResNSF NSF undergraduate research participation program.
- ResNSFSum NSF undergraduate research participation program during summer months.
- Sem Seminars, small meetings with presentation of papers by students.
- Th Senior thesis required for undergraduates.

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DEPARTMENT

SPECIAL UNDERGRADUATE PROGRAMS	FINANCIAL ASSISTANCE	
	UNDERGRADUATE	GRADUATE
Gr		AsRes, AsT(1)

DEPARTMENTS

ResNSF* Res, Th	ResNSF*	AsT(1) ×
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DEPARTMENTS

× Gr, HP, Res, ResNSF,*	× ResNSF	AsRes*, AsT* AsRes, AsT, FelNSF,*
----------------------------	-------------	--------------------------------------

over the past few years.
grams has been given, since these types of financial assistance are quite common and in-
the respective schools.
participate in the listed program.
the listed school.

for credit.

BIOLOGY

UNIVERSITY OF DETROIT

Faculty

† R. Gerard Albright, S.J., Ph.D., Loyola University (Chicago), comparative morphology.

Lester P. Coonen, Ph.D., Wisconsin, history of biology.

Paulinus F. Forsthoefel, S.J., Ph.D., Ohio State, genetics.

J. Donald LaCroix, Ph.D., Purdue, plant morphology and taxonomy.

J. Forbes McClellan, Ph.D., Illinois, protozoology.

R. Jay Smith, Ph.D., Michigan, invertebrate zoology, parasitology.

Robert M. Twedt, Ph.D., Colorado, microbiology.

Charles J. Wideman, S.J., M.S., Detroit, histology.

Pauline Wood, Ph.D., Michigan, histology and embryology.

Current Research

Prenatal development of the human palate.

Autoradiographic studies of DNA synthesis and cell growth in a syncytium.

A clonal approach to nuclear diversification in multinuclear systems.

The use of cobalt-60 as an immunizing agent for the human lung fluke.

A survey of the parasites of Fleming Creek (Michigan) fishes.

Life-cycle study of two species of trematodes.

A comparative study of the oxygen consumption and carbon dioxide release in certain fresh water invertebrates and in certain trematode cercariae.

A study of schizogony of *Plasmodium berghei* in the gerbil and other rodents.

Genetics of a luxoid mutant in the house mouse; development of alopecia in Strong's luxoid mutant.

Rhythmicity in plant tissue culture cells.

Effects of gibberellic acid and radiation on the germination of gymnosperm seeds.

Research Equipment

Oscilloscope, physiological stimulators, spectronic 20 colorimeter, D.C. preamplifier, highspeed centrifuge, paper chromatography apparatus,

† Chairman of the department.

phase and dissecting microscopes, potentiometer, muffle furnace, cold temperature water bath, radiation scalers, scintillation detector, survey meters, ratemeters, G-M detectors, flow counters, dosimeters and reader, radiation analyzer, Forro radiochromatograph, Micro-Kjeldahl apparatus, micro-centrifuge, automatic pipetting machine, shaker, scopicon, Freed freeze-dry apparatus, cold incubator.

Supplementary Information

Teaching fellowships pay \$1800 per year plus tuition and normally run for two years. About fourteen hours per week of service to the department are required and about two-thirds of the normal course load is permitted.

Graduate assistantships pay \$1000 per year but do not cover the tuition. Graduate assistants carry a full course load.

FAIRFIELD UNIVERSITY

Faculty

John E. Klimas, Jr., Ph.D., State University of Iowa, diabetes.

Frank J. Rice, Ph. D., Missouri, biometrics, genetics of swine.

† Donald J. Ross, Ph.D., Fordham, insect biochemistry.

Lecturers on part-time basis:

Marvin Chernow, M.D. (associate professor of pathology, Yale Medical School), histology.

Theodore Combs, M. S. (chief bacteriologist, St. Joseph's Hospital), biology of *Leptospira*.

Current Research

Diabetes. The effects of aging on the intestinal absorption of glucose in the albino rat. Dr. Klimas.

Insect biochemistry. Changes in G-O and G-P transaminase levels during the life cycle of the Japanese beetle.

Research Equipment

Warburg manometric apparatus, spectrophotometers: Coleman Junior and Spectronic 20, centrifugal chromatograph, Beckman Spinco electrophoresis apparatus, Leica photomicrographic apparatus, two shaking incubators.

Supplementary Information

A special senior elective course is run for specially qualified students planning graduate work in biology or biochemistry. This course is an intensive physiology course with heavy biochemical overtones. Laboratory work for the course emphasises the instrumental methods of spectrophoto-

tometry, manometry, electrophoresis, chromatography, photomicrography, and polygraphy. A small analog computer will soon be added to the instrument pool for this course.

Though the department serves a large number of pre-medical and pre-dental students, the emphasis at present is to increase the number of biology majors. Consequently undergraduates are encouraged to undertake short terminal research projects with the hope of attracting them to a research career.

FORDHAM UNIVERSITY

Faculty

† Charles A. Berger, S.J., Ph.D., Johns Hopkins, cytology of development.

James Forbes, Ph.D., Fordham, entomology.

R. Kenedy, Cand. Ph.D. Fordham, radiation biology.

Daniel Ludwig, Ph.D., Pennsylvania, insect physiology.

Louis S. Marks, Ph.D., Fordham, taxonomy of insects.

Joseph H. McSweeney, Ph.D., Fordham, tissue culture and microtechnique.

James A. Mullen, Ph.D., Fordham, entomology.

E. R. Witkus, Ph.D., Fordham, cytology of development in plants.

Alexander A. Wolsky, Ph.D., Budapest, experimental embryology and genetics:

Research Equipment

Beckman DU spectrophotometer, Bron-Will Warburg apparatus, AMINCO Warburg apparatus, low temperature incubators, Kjeldahl digestion apparatus, cathode ray oscillograph, potentiometer, densitometer, colorimeters, Marchant calculators, chromatocabs, homogenizers, vacuum pumps, phase contrast accessories, research greenhouse, electronic flash equipment, microdissection apparatus, photomicrographic cameras, phase-contrast time-lapse cinemicrophotographic apparatus, tissue culture equipment, inverted microscope, radiation equipment for undergraduates, freezing microtome.

Supplementary Information

The total number of publications by three members of the faculty is 252; many publications have been produced by other faculty members. A large number of research grants has been received by members of the faculty.

GEORGETOWN UNIVERSITY

Faculty

M. H. Bauer, S.J., Ph.D., thyroid gland and tissue culture.

† A. Coniff, S.J., electron microscopy.

G. Ferguson, plant taxonomy.

J. L. Harley, S.J., protozoology.

T. A. O'Keefe, biochemical bacteriology.

W. T. Taylor, Ph.D., leucemias and radiation.

S. Vernich, Ph.D., marine biology.

R. J. Weber, Ph.D., cellular physiology.

Current Research

Biochemical bacteriology, action of thyroid hormone on cultured cardiac cells.

Supplementary Information

Three new laboratories are being equipped for research in physiology, microbiology, and cytology. There is closed circuit TV in all laboratories.

GONZAGA UNIVERSITY

Faculty

† Robert C. Hurd, Ph.D., Washington State, microbiology.

T. V. Kuriakose, Ph.D., St. Louis, comparative histology.

Mary Q. Luther, M.D., Temple (part time at nursing school).

Maryln M. Stanton, M.A., Gonzaga.

Howard B. Stough, Ph.D., Harvard, cytology and neurology.

Current Research

The effect of low concentrations of snake poison on the red blood cells of mammals.

Comparative histology of the enteron and poison glands of Cobra, Viper, and the Krait. Dr. Kuriakose.

Supplementary Information

The Mendel Club (biology majors, pre-meds, etc.) are involved in a simple research program concerning a possible etiological agent of cancer. A course is also offered in elementary problems involving laboratory experimentation.

COLLEGE OF THE HOLY CROSS

Faculty

- Joseph F. Busam, S.J., mammalian anatomy.
 William A. Campbell, M.S., St. Francis, radiation biology.
 Benjamin J. Cook, Ph.D., Rutgers, insect embryology.
 Robert S. Crowe, Ph.D., Iowa, chemical mutagenesis in *Drosophila*.
 † John W. Flavin, S.J., Ph.D., Brown, cytology of hepatomas in mice.
 B. T. Lingappa, Ph.D., Purdue, experimental botany.
 Thomas L. Malumphy, Ph.D., Clark, microtechnique.

Current Research

- Cytochemical study of development in the cockroach.
 Histochemical study of larval and pupal development of the gut of *Culex pipiens*.
 Self-inhibition and related dormancy of fungus spores. Dr. Lingappa.
 Cytological study of normal and leukemic bloods cultured *in vitro*.
 Analysis of amino acid changes in the blastemata of regenerating Planaria.

Research Equipment

Beckman DU spectrophotometer, International refrigerated high speed centrifuge, Lapine cryostat, refrigerated Warburg apparatus, scalers, and auxiliary equipment for Geiger-Mueller, proportional, and scintillation counting.

JOHN CARROLL UNIVERSITY

Faculty

- John G. Allen, M.A., Western Reserve, human genetics.
 Jean J. Cummings, Ph.D., Smith, cytogenetics.
 Edwin F. Gilchrist, Ph.D., St. Louis, neuro-anatomy.
 Joseph T. Velardo, Ph.D., endocrinology of female reproductive system.
 † Philip H. Vogel, S.J., Ph.D., Loyola (Chicago), radiation biology.
 d'Alte A. Welch, Ph.D., Johns Hopkins, Hawaiian tree snails.

Current Research

- Endocrinology of female reproductive system. Dr. Velardo.
 Problem of aging in mice using Iodine 131.

Research Equipment

- Scalers, rate meters, scintillation counter.

Supplementary Information

Dr. Velardo is also the director of the Institute for the Study of Human Reproduction, a private corporation.

LE MOYNE COLLEGE

Faculty

- † Louis De Gennaro, Ph.D., Syracuse, developmental biology.
- Francis X. Flood, S.J., M.A., Woodstock.
- Garrit J. Lugthart, Ph.D., Wisconsin, insecticides.
- Jack L. Yudell, M.S., Oklahoma.

Current Research

Developmental biology, differentiation of the glycogen body of the chick embryo.

LOYOLA COLLEGE (BALTIMORE)

Faculty

- † Joseph A. Burke, S.J., Ph.D., Fordham, experimental embryology, psychopharmacology.
- Jacob Fisher, Ph.D., Catholic University, radiation biology.
- Mitchell Twardowicz, M.S., Marquette University, endocrinology.
- John L. Zaharis, Ph.D., Kansas State University, insect microbiology.

Current Research

Physiological action of certain psychogenic agents, especially lysergic acid diethylamide-25 (LSD-25), on developing vertebrate embryos. Fr. Burke.

A survey of the symbionts in several groups of arthropods, particularly Acarina and Araneae. Dr. Zaharis.

Effects of electro-magnetic irradiation in the infrared and radio-wave end of the spectrum on photosynthesis in plants. Drs. Fisher and Zaharis.

Research Equipment

Grass multichannel polygraph, Beckman-Spinco Nucric-analyzer lab, Sanborn ECG, micromanipulator, research microscopes, biological photography laboratory including still and time-lapse equipment.

Supplementary Information

At the invitation of the AEC, the biology department in cooperation with the physics department is applying for a grant from the AEC to conduct a course in radiation biology. Also in cooperation with the physics department, the biology department is contemplating a program in bio-

physics, intending to seek NSF support. An undergraduate research participation program is planned.

LOYOLA UNIVERSITY (CHICAGO)

Faculty

Arif Hayat, Ph.D., botany.

Kenichi Hisaoka, Ph.D., development of oocytes in the Zebrafish.

John W. Hudson, botany.

Benedict Jaskoski, Ph.D., culture methods for parasitic nematodes.

Naomi Lemkey, Ph.D., histochemistry.

Edward Palincsar, Ph.D., effects of metabolic inhibitors on the regression-replacement cycle of *Campanularia flexuosa*.

Walter Peters, Ph.D., morphology of situs inversus in *K. femorata*.

John Rippon, Ph.D., experimental pathogenicity of *Aspergillus* and *Penicillium* species for deep organs of animals.

Laszlo Szijj, Ph.D., ecology.

Current Research

Culture methods for parasitic nematodes.

The effects of metabolic inhibitors on the regression-replacement cycle of *Campanularia flexuosa*.

Inheritance of asymmetry in *K. femorata*.

Research Equipment

Micro-Kjeldahl apparatus, Bausch and Lomb Spectronic 20, oscilloscope, Warburg apparatus, Harris cryostat.

LOYOLA UNIVERSITY (LOS ANGELES)

Faculty

Floyd Jenkins, S.J., Ph.D., St. Louis, embryology.

† Carl G. Kadner, Ph.D., California, insect nutrition.

Thomas D. Pitts, Ph.D., UCLA, parasite physiology.

Current Research

Parasite physiology, *in vitro* and *in vivo* studies of development of *Asebris* larvae.

Research Equipment

Low temperature incubators, Warburg apparatus, inverted compound microscope.

LOYOLA UNIVERSITY (NEW ORLEANS)

Faculty

John G. Arnold, Ph.D., New York University, parasitology.

E. L. Beard, Ph.D., Tulane, proteolytic enzymology.

Joseph J. Cooney, Ph.D., Syracuse, bacterial physiology.

Edward J. Feeley, Ph.D., Fordham, plant and animal virology.

Richard T. Jackson, Ph.D., Florida State, sensory physiology.

Walter G. Moore, Ph.D., Minnesota, fresh-water invertebrates.

† John H. Mullahy, S.J., Ph.D., Vanderbilt, morphology and physiology of Rhodophyceae.

Current Research

Parasitology. A study of parasites of Louisiana fresh-water fishes. Dr. Arnold.

Determination of the relationship of blood proteolytic activity to the development and inhibition of the shock syndrome. Dr. Beard.

Physiology of sporulation in *Bacillus cereus*; role of metals in sporulation and spore resistance. Pigments in *Micrococcus roseus*. Nutrition of nematodes in axenic culture. Dr. Cooney.

Virology. Tobacco ringspot virus; chemotherapy of EMC virus. Dr. Feeley.

Sensory physiology. Measurement of rates of nasal congestion and decongestion brought about by autonomic mediators and sex hormones; relation between olfactory acuity and nasal congestion; production of olfactory nerve degeneration; active transport mechanisms in onion epidermis. Dr. Jackson.

Invertebrates. Factors affecting egg-hatching, development and survival of Anostraca under field and laboratory conditions. Dr. Moore.

Regional soil algae survey; cytology of two fresh-water red algae. Fr. Mullahy.

Research Equipment

Varied radioisotope equipment, multichannel physiological recorder, spectrophotometer, flame photometer, Warburg apparatus, refrigerated centrifuge, ultrasonic apparatus, etc.

Supplementary Information

Undergraduate. Students regularly receive research grants from various health organizations. Seniors are obliged to do an undergraduate research project under the supervision of a faculty member and they are obliged to seek their own financial aid for this work from these organizations. The

results of their research are frequently presented before the state and regional science groups.

Graduate assistantships cover full tuition and research assistantships pay \$1500 in addition to this.

MARQUETTE UNIVERSITY

Faculty

Peter Abramoff, Ph.D., Wisconsin, immunology.

James M. Barrett, Ph.D., Illinois, biology of the protozoa.

Rezneat M. Darnell, Ph.D., Minnesota, animal ecology.

Irwin M. Greenblatt, Ph.D., Wisconsin, genetics and cytogenetics.

Eugene S. McDonough, Ph.D., Iowa State, mycology.

L. W. Macior, O.F.M., Ph.D., Wisconsin, plant anatomy.

William F. Millington, Ph.D., Wisconsin, plant morphogenesis.

John P. O'Brien, C.S.V., Ph.D., Johns Hopkins, radiation biology.

James C. Perry, Ph.D., Cincinnati, endocrinology.

Ellen M. Rasch, Ph.D., Chicago, cytology.

Walter G. Rosen, Ph.D., Wisconsin, plant and cellular physiology.

† John W. Saunders, Jr., Ph.D., Johns Hopkins, developmental biology.

Oliver H. Smith, Ph.D., Stanford, biochemistry.

Current Research

Cellular biology. The detection and immunochemical characterization of protein associated with the mitotic cycle in protozoa. The analysis of biochemical events in the cycles of DNA, RNA and protein in correlation with the mitotic cycle in root tips. A program concerning the control of quality and quantity in specific protein synthesis in *E. coli*. Etiology of certain fungal diseases of man and the sensitivity of pathogens to antibiotics. Ultrastructure of the developing pollen tube in correlation with a study of its growth and chemotropic response. Development of chloroplasts in algae and analysis of the cambium and its differentiated cell products by electron microscopy.

Developmental biology. Study of embryonic inductions which determine the outgrowth of the avian limb bud and those which bring about the differentiation of the integument and its derivatives. The role of cell death in animal morphogenesis. Control of heterophylly in aquatic plants and in woody perennials; analysis of the mechanisms which determine leaf form. Study of shoot morphogenesis. Genetic and cytogenetic techniques are applied to the study of the transposable factor, "Modulator," which has been shown to transpose from one factor, "Diffuse," as it affects the inheritance of pericarp color in maize.

Regulatory biology. Pathological manifestations resulting from stress induced by hormonal administration, with emphasis on the connective

tissue disease, *Polyarteritis nodosa*. Histochemistry of endocrine and other organs. Study of the mechanisms involved in competition of antigens; effects on antibody production of irradiating the exteriorized blood of the rabbit. Differentiation of normal and neoplastic mouse tissue; detection of biochemical relationships among geographically dispersed groups within a species.

Radiation biology. Study of factors affecting radiation-sensitivity in mammals, especially the effects of oxygen tension during whole body X-irradiation.

Environmental biology. Natural aquatic communities are studied from the standpoint of energy flow from producer species through the various consumer species. Population size and distribution, behavior, reproduction and growth in populations under natural and laboratory conditions.

Supplementary Information

Besides the fellowships listed in the table, Marquette has been awarded an NIH pre-doctoral training program grant in developmental biology. Selected trainees receive full stipends plus tuition fees and an additional summer stipend.

Graduate teaching assistantships offer stipends ranging upwards from \$1800 depending on qualifications and experience. Teaching assistants normally register for eight hours of course work each semester and carry on full research programs, but pay no tuition or laboratory fees.

ROCKHURST COLLEGE

Faculty

Lloyd Hess, M.S., Missouri, inorganic ions in plant nutrition and metabolism.

† Edward S. Kos, Ph.D., Illinois, microbial physiology and metabolism.

Jerome F. Wermuth, M.S., Wisconsin, cell physiology and membrane phenomena.

Current Research

Microbial metabolism. Degradation of cholesterol by micro-organisms; melanin pigmentation in *Azotobacter*.

Membrane phenomena. Gaseous exchange in red blood cells using ion exchange resins. J. Wermuth.

Research Equipment

International refrigerated centrifuge, Model HR-1, Bron-Will Warburg apparatus, Beckman GC-2 gas chromatograph, automatic recording telethermometer, minute oxygen uptake studies equipment, (MOUSE), and other equipment of a divisional nature shared with other departments.

Supplementary Information

There is an undergraduate research program, involving either participation in a staff member's project or independent research on the part of the student. This program is required of all seniors.

Financial assistance. Besides the normal college aids funds the department has several undergraduate assistantships. These are paid according to the following scale: sophomores, \$90 per semester; juniors, \$95 per semester; seniors, \$100 per semester.

ST. JOSEPH'S COLLEGE

Faculty

Paul R. Beining, S.J., Ph.D., Catholic University, microbiology.

Francis J. MacEntee, S.J., Ph.D., Catholic University, microbiology.

† Carroll B. Nash, Ph.D., Maryland, parapsychology.

Catherine S. Nash, M.S., Ohio State, parapsychology.

Current Research

Parapsychology. Relationship between personality traits and ESP scoring level. Effect of the relationship between subject and experimenter on the ESP scoring level.

Biochemistry. Analysis of the amount of alkaline phosphatase produced in liver and bone abnormalities.

Immunology. Immunoelectrophoretic patterns with soluble staphylococcal products.

Supplementary Information

The parapsychology laboratory of St. Joseph's College is an adjunct of the biology department.

ST. LOUIS UNIVERSITY

Faculty

† John D. Dwyer, Ph.D., Fordham, systematic botany.

Dorothy J. Feir, Ph.D., Wisconsin, entomology.

W. Hardwick, Ph.D., Texas, microbiology.

Irwin H. Herskowitz, Ph.D., Columbia, genetics.

Xavier J. Musacchia, Ph.D., Fordham, animal physiology.

Carmen A. Privitera, Ph.D., Saint Louis, tissue metabolism.

Raymond H. Reis, S.J., Ph.D., Saint Louis, comparative anatomy.

Nelson J. Wade, Ph.D., Kansas, cytology.

Current Research

Systematic botany. Legumes and *Rubiaceae* of Panama. Dr. Dwyer. *Poikilotherms and Homoiotherms.* A comparative study of hexokinase

distribution and related enzymes. Heart energy metabolism in the turtle, *Chrysemys picta*; influence of cold exposure on heart energy metabolism in the turtle. Energy relationships in the hatching muscle of the developing chick. Histochemical studies of poikilotherm heart tissues under various conditions.

Characteristics of the Ehrlich ascites tumor in the mouse, or when growing in the rat; survival of tumor cells after various treatments. Effects of estrogenic hormones in the rat.

Insect hematology. Morphological study of milkweed bug blood cells; study of phagocytosis and phagocytic cells; study using tritiated thymidine to determine stem blood cells. Electrophoresis patterns throughout life cycle; immunological reactions of milkweed bug.

Insect feeding behavior and nutrition. Effect of normal bacterial fauna on nutritional requirements; transport of amino acids across the gut membrane; effect of amino acid concentration on feeding behavior. Isolation of feeding attractants in milkweed plant for milkweed bug.

Radiation biology. Studies of the effects of radiation (X-ray and Cobalt 60) on intestinal function with emphasis on active transport. The possible use of hibernators in studies of radio-protection. The effects of radiation on mitotic activity in the intestinal epithelium.

Cardiovascular (neuro-humoral) physiology. The role of catecholamines in hibernators—epinephrine and nor-epinephrine are known to influence the course of hibernation. Comparisons of tissue catecholamines in irradiated and non-irradiated animals.

Comparative (reptile) physiology. Carbohydrate metabolism in turtles. A long term survey of seasonal variations in chemistry and physical properties of blood in turtles. Studies of active transport in intestinal mucosa in selected reptiles and fishes.

Genetics. Mutation and parabiotic relationships involving *Drosophila melanogaster*.

Supplementary Information

The department of biology is adding two additional faculty members in the fall, a plant physiologist and experimental embryologist.

Beginning this September a few fellowships in space biology will also be available in the department.

Financial assistance. The NSF undergraduate research grants offer \$200 per academic year and \$60 maximum per week for ten weeks during the summer. The graduate fellowship offers \$2500 for the academic year but tuition must be paid. The NSF cooperative fellowships offer \$2400 per year. NSF summer fellowships are available at \$85 per week.

ST. PETER'S COLLEGE

Faculty

Rocco G. Belmonte, S.J., Ph.D., Catholic University, embryology and histology.

Jerome H. Gruszczyk, S.J., M.S., Fordham, botany and microbiology.

† John J. McGill, Ph.D., Fordham, embryology and entomology.

Stephen L. O'Malley, M.S., Boston College, zoology.

Arthur H. Weintraub, M.S. (temporary part-time instructor).

Current Research

Physiology. Effects of SU 9064 Ciba on the hypothalamo-hypophyseal area of *Carassius auratus* (Goldfish) subject to heat stress; effect of water soluble reserpine on respiration.

Effect of thalidomide on development of eggs and on metamorphosis in *Drosophila melanogaster*.

Effect of polychromatic light on cellular multiplication.

Effects of stimulants on respiration in *Periplaneta americana*.

Study of macrofauna in the mud of a measured area of the Shark River estuary.

Tissue culture of root tip cells in carrot and tomato under aseptic conditions.

Supplementary Information

For the senior thesis requirement, most students undertake a literature review problem; a few participate in undergraduate research, usually working in pairs. In all cases the research begins in junior year.

UNIVERSITY OF SAN FRANCISCO

Faculty

Francis P. Filice, Ph.D., California, parasitology and invertebrate zoology.

† Edward L. Kessel, Ph.D., California, entomology.

Robert T. Orr, Ph.D., California, mammalogy.

Leola Woolley, Ph.D., Stanford, physiology.

Current Research

Biochemical properties of 5 nitro-2-furylacrylates, natural history of bats, ecology of sea lions, commercial contamination of bay waters, Platypezidae of western North America.

Research Equipment

Electron microscope, refrigerated centrifuge, dark-room equipment and cameras.

Supplementary Information

The department edits and publishes the *Wasmann Journal of Biology*.

UNIVERSITY OF SANTA CLARA

Faculty

Lloyd L. Bolton, Ph.D., Cornell, histology.
 Thomas W. Fast, Ph.D., Stanford, biological oceanography.
 † Francis R. Flaim, Ph.D., Stanford, comparative vertebrate anatomy.
 Ethel Meece, M.S., Radcliffe, immunology.

Current Research

Stratum granulosum of alimentary canal of salmonoid fishes. Dr. Bolton.
Oceanography. Influence of fish solubles on plant growth. Dr. Fast.
Anatomy. Anatomy of *Ondatra zibethicus* and *Nutria*. Dr. Flaim.
Immunology of blood. Study of techniques for diagnosis of "rare" hemophilia-like diseases. Mrs. Meece.

Research Equipment

Usual microscopic and physiological equipment.

Supplementary Information

Programs of study available: biology major, pre-medical and pre-dental, pre-professional training in physical therapy and medical technology, teacher education program.

SCRANTON UNIVERSITY

Faculty

John J. Callaghan, M.S., Cork, cand. Ph.D., Pennsylvania State, cytological genetics.
 Joseph T. Evans, Ph.D., Catholic University, amphibian morphogenesis.
 † Leonard N. Wolf, Ph.D., Pittsburgh, endocrinology, blood coagulation.

Current Research

Cytological genetics. Incorporation of C¹⁴ maleic hydrazide into RNA in *Allium*; production of chromosome abnormalities with C¹⁴ maleic hydrazide in *Allium*. Mr. Callaghan.

Animal physiology. Existence of a tumor factor producing the Wessler effect in rabbit blood coagulation. Dr. Wolf.

SPRING HILL COLLEGE

Faculty

- Paul J. Biebel, M.S., St. Louis, phycology.
A. Frederick Hemphill, Ph.D., Alabama, ichthyology.
Joy Morrill, M.S., Alabama, phycology.
Ella D. Morris, M.S., Tulane, effects of radiation on cells.
† Patrick H. Yancey, S.J., Ph.D., St. Louis, philosophy of biology.

Current Research

Ichthyology. Classification of the fishes of southwest Alabama.

Phycology. Conjugation in the saccoderm desmids; classification of marine algae of the Gulf Coast.

Supplementary Information

Programs offered: biology major, pre-medical and pre-dental, medical technology.

XAVIER UNIVERSITY

Faculty

- Charles Cusick, Ph.D., Cincinnati, neurophysiology.
John Hinni, Ph.D., Northwestern, developmental biology.
† Joseph J. Peters, S.J., Ph.D., Fordham, physiology and development.
John Tafuri, Ph.D., Fordham, entomology.

Current Research

Developmental physiology. Sensory input, nervous integration, and motor output in the developing chick embryo as revealed by electrical studies (EEG, ERG, EMG, etc).

Development. Differentiation of tissues in hypophysectomized chicks; development of the intestine in the chick embryo.

Research Equipment

Two laboratories well equipped for studies in electrical neurophysiology: three Grass electroencephalographs, two Tetrionix oscilloscopes with camera attachments, Grass electrical stimulators, photic stimulators, audio monitors, micromanipulators, and accompanying optical instruments.

Supplementary Information

Sixteen papers have been published by the faculty and their students in the past nine years.

CHEMISTRY

BOSTON COLLEGE

Faculty

O. Francis Bennett, Ph.D., Pennsylvania State, organic syntheses.

Andre J. deBethune, Ph.D., Columbia, electrochemistry.

Raymond F. Bogucki, Ph.D., Clark, inorganic chemistry.

Joseph Bornstein, Ph.D., Massachusetts Institute of Technology, organic syntheses.

John H. Kennedy, Ph.D., Harvard, analytical chemistry.

Timothy E. McCarthy, Ph.D., Georgetown, analytical biochemistry.

Albert F. McGuinn, S.J., Ph.D., Fordham.

David C. O'Donnell, Ph.D., Ohio State, identification of organic compounds.

† Robert F. O'Malley, Ph.D., Massachusetts Institute of Technology, inorganic chemistry.

John R. Trzaska, S.J., Cand. Ph.D., Catholic University, physical organic chemistry.

George Vogel, D.Sc., Prague, organic syntheses.

Current Research

Biochemistry. Complexing between methionine and threonine and its effect on metabolism. Dr. McCarthy.

Inorganic chemistry. Investigation of mixed chelates of heavy metal ions. Dr. Bogucki.

Mild fluorination of nitrogen compounds, association of lead ions with trifluoroacetate ions, reactions of copper (I) nitride. Dr. O'Malley.

Organic chemistry. Synthesis and reactions of diphenyl sulfones, kinetic studies of ortho-substituted diphenyl sulfones, and organic reactions in fused inorganic systems. Dr. Bennett.

Rearrangement accompanying the addition of fluorine to substituted ethylenes. Dr. Bornstein.

Preparation of solid derivatives with iodobenzoic acids. Dr. O'Donnell.

Reactions of 2-pyrones with nucleophilic reagents, reductions of pyran-2-ones with metal hydrides, and preparations of pyrones. Dr. Vogel.

Physical chemistry. Measurement of thermal temperature coefficients of electrode potentials. Dr. deBethune.

† Chairman of the department.

Research Equipment

Perkin-Elmer Model 421 infrared spectrophotometer, Perkin-Elmer Model 202 ultraviolet spectrophotometer, Beckman DU spectrophotometer, F & M vaporphase chromatograph, Burrell Kromo-Tog, Baird infrared spectrophotometer.

Supplementary Information

The Ph.D. program is new and our first students will complete their studies sometime during 1963.

A new science building will be constructed soon. The present science building, Devlin Hall, will be renovated and remodeled to be shared by the chemistry and geology departments. Extensive new research laboratories will be constructed in space vacated by the biology and physics departments.

The majority of graduates in recent years have attended graduate schools. Among the graduate schools which the students have attended are: Massachusetts Institute of Technology, Harvard, Illinois Institute of Technology, Purdue, California at Los Angeles, Catholic University, New Hampshire, Pennsylvania State, Pennsylvania, Tufts, Notre Dame.

Financial assistance. Graduate assistantships have stipends of \$1800 to \$2000 for the academic year with remission of tuition and fees.

CANISIUS COLLEGE

Faculty

Raymond Annino, Ph.D., Oklahoma State, electrochemistry.

James Crowdle, D.Sc., Fordham, organic chemistry.

Ronald E. Erickson, Ph.D., Iowa, organic mechanisms.

Paul J. McCarthy, S.J., Ph.D., Clark, coordination chemistry.

W. John McDonnell, M.A., Toronto, analytical chemistry.

Joseph B. Muenzen, S.J., Ph.D., Fordham, perfume chemistry.

Austin V. Signeur, M.S., Canisius, analytical chemistry.

Walter J. Stahrr, M.S., Canisius, inorganic chemistry.

Richard E. Stanton, Ph.D., Notre Dame, theoretical physical chemistry.

† Herman A. Szymanski, Ph.D., Notre Dame, infrared spectroscopy and gas chromatography.

Current Research

Normal coordinate analysis of the vibrational frequencies of some simple metal coordination complexes, NMR investigation of some diamagnetic Schiff base chelates.

Electro-analytical methods of analysis involving polarography.

Literature analysis for new group frequencies in infrared spectroscopy.

Study of the mechanistic paths in the reduction of organic compounds at electrodes.

Studies of fast temperature changes and column packing materials in gas chromatography.

Relative rate studies of the organic chemistry of ozone with emphasis on ozone as a possible nucleophile.

Theoretical estimates of bond strengths in small molecules, electron capture by neutral molecules.

Reaction of arsenic trichloride with various materials including acids, organic compounds, etc.

Research Equipment

Fisher-Gulf vapor partitioner, Perkin-Elmer gas chromatograph, Sargent polarograph, potentiometric unit, KBr press, Polaroid camera and slide unit, Mettler electric balance, Spectronic 20, microdistillation apparatus, hydrogenator, ozonator.

Supplementary Information

Three institutes are conducted each year, one each in gas chromatography, nuclear magnetic resonance, and infrared spectroscopy.

Financial assistance. The graduate assistantships provide \$1000 per year.

CREIGHTON UNIVERSITY

Faculty

† Donald J. Baumann, Ph.D., Iowa State, unusual oxidation states.

Rosemary Gross, B.S., Creighton, chromatography of steroids.

Stanley Gross, M.S., Creighton, electrochemistry.

Christopher L. Kenny, Ph.D., Columbia, radiation chemistry.

K. H. Takemura, Ph.D., Illinois, organic syntheses.

D. M. Zebolsky, Ph.D., Kansas State, metal-ion complexes.

Current Research

Stabilization of unusual oxidation states of metal ions by complex ion formation.

Quantitative separation of adrenocortic steroids by chromatographic methods.

Fast methods for trace analysis of elements in steel, chemical separation of Pb^{210} from Bi^{210} .

Determination of conductances of certain complex ions.

Thermodynamic and kinetic studies of the formation of metal ion complexes.

Synthesis of azasteroids.

Research Equipment

Ultraviolet, infrared and visible spectrophotometers, electron microscope, computer.

Supplementary Information

The "Honors Section" in general chemistry initiated several years ago allows selected students at the end of first semester to take an enriched course during the second semester.

A seventh member will join the staff in the Fall of 1963 with a Ph.D. in the field of physical-organic chemistry.

The department expects to be housed in new facilities along with the departments of physics and biology by the Fall of 1965. Facilities are being planned to double the present enrollment in the department's course offerings.

Of the eighteen graduates of the M.S. program during the past four years, one has earned the M.D. degree, one has been awarded the Ph.D., and ten additional graduates are currently engaged in doctoral studies.

UNIVERSITY OF DETROIT

Faculty

Richard W. Balek, Ph.D., Chicago, biochemistry.

Edgard F. Bertaut, Ph.D., Carnegie Institute of Technology, inorganic chemistry.

† Everette L. Henderson, Ph.D., Iowa State, inorganic chemistry.

Jon Kabara, Ph.D., Chicago, biochemistry.

Donald J. Kenney, Ph.D., Iowa State, inorganic chemistry.

John A. McLean, Jr., Ph.D., Illinois, inorganic chemistry.

James I. Salach, biochemistry.

Anton Szutka, Ph.D., Pennsylvania, analytical chemistry; radiochemistry; chemical instrumentation.

Walter Wagner, D.Sc., Vienna, analytical chemistry.

Current Research

Analytical chemistry. Selective precipitating reagents, non-aqueous conductance.

Biochemistry. Cholesterol studies, cancer research.

Inorganic chemistry. High temperature silicate reactions, inorganic polymers.

Organic chemistry. Organic polymers, mechanisms.

Research Equipment

Equipment valued at \$150,000 is available for current research needs.

Supplementary Information

The total value of research grants held at present is \$200,000.

FAIRFIELD UNIVERSITY

Faculty

John A. Barone, Ph.D., Purdue, organic chemistry.

Salvatore Carrano, M.S., Boston College, inorganic chemistry.

† Gerald F. Hutchinson, S.J., M.S., Holy Cross, inorganic chemistry.

Jerome Perez, Cand. Ph.D., Fordham, physical chemistry, radiation chemistry.

Robert E. Varnerin, S.J., Ph.D., Catholic University, physical chemistry, free radical chemistry.

Myron V. Weinberg, Ph.D., Maryland, reserpine chemistry.

Current Research

Organic chemistry. Trifluorinated pyrimidines and purines. Dr. Barone.

Physical chemistry. Free radical reactions. Fr. Varnerin. Oxidation processes initiated by ozone in the gas phase, radiation chemistry. Mr. Perez.

Research Equipment

Two Beckman Gas chromatographs, Perkin-Elmer automatic recording double beam null infrared spectrophotometer, Perkin-Elmer 505 spectrophotometer, Bausch and Lomb 1.5 meter stigmatic grating spectrograph, L and N microphotometer, two Beckman DU spectrophotometers, four Coleman flame photometers, Spinco electrophoresis apparatus, Chromac precision chromatograph.

Supplementary Information

Research projects are currently supported by grants from the AEC, NSF, NIH, and the United States Air Force.

FORDHAM UNIVERSITY

Faculty and Research Fields

Michael Cefola, Ph.D., New York University, analytical chemistry. Chelate chemistry, non-aqueous titrations, radiochemistry.

Donald D. Clarke, Ph.D., Fordham, biochemistry. Neurochemistry, neurotoxic factors, amino acid metabolism, amine incorporation into proteins, citric acid cycle.

Robert D. Cloney, S.J., Ph.D., Catholic University, physical chemistry. Quantum chemistry, molecular orbital calculations.

Frederick J. Dillemath, S.J., Ph.D., Fordham, physical chemistry. Kinetics and mechanism of hydrocarbon oxidation, isotope exchange reac-

tions, determination of ionization constants, mass spectroscopic methods for determination of reaction rates.

Richard W. Franck, Ph.D., Wisconsin, organic chemistry. Degradation and synthesis of natural products, synthesis of gibberellic acid.

Philip S. Gentile, Ph.D., Brooklyn Polytechnic Institute, inorganic chemistry. Chemistry in non-aqueous solvents, coordination chemistry, high temperature reactions.

Douglas J. Hennessy, Ph.D., Fordham, organic chemistry. Thiamin chemistry, mechanism of insecticide action, reaction mechanisms, synthesis of labelled DDT analogs for toxicity and metabolic studies.

† Emil J. Moriconi, Ph.D., Fordham, organic chemistry. Ozonolysis and chemistry of ozonides, stereochemistry, small ring alicyclic and aza-cyclic compounds, reaction kinetics and mechanisms.

Bartholomew Nagy, Ph.D., Pennsylvania State, analytical chemistry. Geochemistry, X-ray diffraction, silicates, organic geochemistry.

Frederich F. Nord, Ph.D., Karlsruhe Technische Hochschule, biochemistry. Enzymology, mold chemistry, lignin chemistry, organic reaction mechanisms, fermentation, proteins and polymers, pigment and colloid chemistry.

William F. O'Connor, Ph.D., Columbia, organic chemistry. Coal tar aromatics, diphenic acid derivatives, industrial chemistry.

Norman O. Smith, Ph.D., New York University, physical chemistry. Equilibrium and thermodynamics of solid solutions and hydrates; clathrates, polymorphism, calorimetry, solubility of gases under pressure.

Leo K. Yanowski, Ph.D., Fordham, analytical chemistry. Use of organic reagents and complexes in analytical chemistry.

Research Equipment

Perkin-Elmer model 21 infrared spectrometer, Perkin-Elmer infrared spectrophotometer, Cary model 15 recording spectrophotometer, Perkin-Elmer Spectracord, Beckman DU spectrophotometers, A-60 NMR spectrometer, F & M model 500 gas chromatograph, GE X-ray diffraction unit, Norelco X-ray diffraction unit, Zeiss petrographic microscope, Bendix digital computer, Tracerlab and Nuclear Chicago α, β, γ -neutron counters, Spinco ultracentrifuge, Tiselius electrophoresis apparatus, Polarad Automatic titration apparatus, Jarrell-Ash spectrometer, Farrand No. 1 Mass spectrometer, low and high pressure and micro-hydrogenation apparatus, Sargent Model XV recording polarograph, Beckman oxygen analyzer, Bausch and Lomb refractometer, Stanton thermobalance.

Supplementary Information

The total value of research grants received in 1962 was \$273,551. Support was received from the AEC, NSF, NASA, Research Corporation, United

States Air Force, United States Public Health Service, Petroleum Research Fund, New York Health Association, and the Esso Corporation. Research grants valued at \$415,456 are pending. The average number of publications per year is thirty.

Financial assistance. Graduate assistantships provide \$1600 to \$2000 plus tuition for ten months, and are renewable. Duties comprise twelve hours a week of work, assisting in undergraduate laboratories, etc. Half-assistantships are also available, entailing six hours of such work, with one-half the stipend and tuition remission. Research assistantships are restricted to students working toward the Ph.D. and provide \$2400 to \$2800 for twelve months. Tuition fees are paid by the student. During the second year the student may hold a half graduate assistantship and a research assistantship. Research assistantships are also renewable. Duties consist of research on a sponsored project.

GEORGETOWN UNIVERSITY

Faculty

† Louis C. W. Baker, Ph.D., Pennsylvania, chemistry and structure of heteropoly and isopoly electrolytes.

John J. Burns, S.J., Ph.D., St. Louis, phase studies in borohydride systems.

William L. Clinton, Ph.D., St. Louis, theoretical chemistry.

Joseph E. Earley, Ph.D., Brown, kinetics and mechanisms of aqueous inorganic reactions.

Arthur A. Espenscheid, Ph.D., Georgetown, analytical chemistry.

Soma Kumar, Ph.D., Maryland, intermediary metabolism of fats and ketone body metabolism, radioactive tracers.

Michael T. Pope, D.Phil., Oxford, structural inorganic chemistry.

Jacinto Steinhardt, Ph.D., Columbia, physical chemistry of protein polymers.

Peter F. Wilson, Ph.D., Georgetown, analytical chemistry.

William W. Zorbach, Ph.D., McGill, synthesis of biologically active glycosides.

Current Research

Research topics in organic, inorganic, analytical, theoretical, and physical chemistry include: intermediary metabolism of fats and ketone body metabolism; physical chemistry of protein polymers; chemistry and structure of heteropoly and isopoly electrolytes, coordination complexes; magnetochemistry, radioactive tracers, chemistry of specialized ion-exchangers; reactions of boron hydrides and Lewis bases, ionization reactions of decaborane; electron transfer and nucleophilic substitution reactions, O¹⁸

exchange in aqueous solution, kinetics and mechanisms of aqueous inorganic reactions; phase studies in borohydride systems; partial synthesis of physiologically active glycosides, emphasizing cardiac glycosides and "fraudulent" nucleosides, chemistry of deoxysugars, steroid chemistry; Jahn-Teller theorem and group theoretical considerations of polyatomic molecules, development of new approaches to many electron theory, derivation of potential energy functions from exact adiabatic molecular quantum mechanics; organic mechanisms; instrumental analysis.

Research Equipment

Electronic computer, mass spectrograph, gas chromatograph, two recording spectrophotometers, five manual visible and ultraviolet spectrophotometers, Infracord spectrophotometer, proportional and scintillation counters and scalers, polarograph.

Supplementary Information

Part time graduate programs will be drastically reduced by 1963. Anticipated expansion of the graduate program will be concerned with full time students.

Recent changes in the curriculum are markedly increasing the number of undergraduates majoring in chemistry. Fifteen to twenty students per year is the present projection for 1966.

Financial assistance. There is one undergraduate scholarship given by the Allied Chemical and Dye Corporation. Graduate teaching fellowships provide \$2300 for the academic year plus free twelve-month tuition. Additional summer fellowships provide \$920. Pre-doctoral research fellowships provide stipends up to those of teaching fellowships for the academic year, or usually \$3220 plus tuition for the full year, including one month of vacation.

Advanced placement. The department strongly recommends that prospective chemistry students refrain from taking advanced placement courses in high school chemistry and take instead advanced placement courses in mathematics, and also take advanced language courses, most especially German. The department feels that for chemistry majors, the university is much better equipped to provide all of the chemistry courses.

COLLEGE OF THE HOLY CROSS

Faculty

Olier L. Baril, Ph.D., Clark, hydrocarbons, sugar analysis, chelates.

Richard B. Bishop, M.S., Holy Cross, polymers and copolymers, petrochemical raw materials.

George J. Charest, M.S., Holy Cross, analytical chemistry.

Bernard A. Fiekers, S.J., Ph.D., Clark, structural chemistry.

† Joseph A. Martus, S.J., Ph.D., Clark, chelation.

Paul D. McMaster, Ph.D., Clark, biophysics, organic synthesis.

William F. O'Hara, Ph.D., Virginia, thermodynamics, solution calorimetry, ionization of weak acids.

Robert W. Ricci, Ph.D., New Hampshire, photochemistry, kinetics.

James J. Tansey, M.A., Toronto, physical chemistry.

Andrew Van Hook, Ph.D., New York University, crystallization, kinetics.

Current Research

Organic chemistry. Phototropism, synthetic problems, azeotropic mixtures, evaluation of Symogi's reagent.

Polymer chemistry. Ziegler catalysts, epoxy resins.

Physical chemistry. Ion exchange chromatography, thermodynamic study of ionization of related phenols.

Research Equipment

Beckman IR-5 spectrophotometer, Beckman GC-2A chromatograph, Beckman Model B spectrophotometer, Barclay flame spectrophotometer, two Braun electrolytic units, Parr hydrogenation apparatus, special fractionating column.

Supplementary Information

During the summer of 1963 the third NSF-sponsored summer institute for high school chemistry teachers will be held.

The student affiliate chapter of the American Chemical Society publishes the student magazine "Cross and Crucible".

Sixty-six graduates of the department have gone on for the Ph.D. degree. Of these thirty-two have entered college or university teaching.

JOHN CARROLL UNIVERSITY

Faculty

Vincent C. Anselmo, Ph.D., Kansas, inorganic chemistry.

John A. Carrabine, M.S., John Carroll, inorganic chemistry.

† Richard J. Gaul, Ph.D., Massachusetts Institute of Technology, organic chemistry.

Dominic J. Hunt, Ph.D., St. Louis, inorganic chemistry.

Frederick N. Miller, S.J., A.B., St. Louis, inorganic chemistry.

Robert V. Nook, M.S., John Carroll, physical chemistry.

Thomas Richert, M.S., John Carroll, inorganic chemistry.

Edmund B. Thomas, Ph.D., St. Louis, analytical chemistry.

William M. Weaver, Ph.D., Purdue, organic chemistry.

Kenneth V. Yorka, Ph.D., Wisconsin, organic chemistry.

Current Research

Analytical chemistry. Instrumental and automatic methods with emphasis on polarography and gas-liquid partition chromatography; application of operational amplifiers to analytical instrumentation. Dr. Thomas.

Isolation and purification of manganese sulfate from manganese ores; preparation of primary analytical standards; preparation of magnesium sulfate from dolomite. Fr. Miller.

Inorganic chemistry. Hot atom chemistry of phosphorus in its oxy-anions; synthesis and kinetics of hydrolysis of condensed phosphorus oxy-anions. Dr. Anselmo.

Physical properties of solutions of surface-active agents; measurement of coordinating tendencies of metal salts by high vacuum techniques; structures of coordination compounds of some borohydrides; spectrochemical study of the structures and stabilities of complex ions; influence of substituents on the stabilities of amine cobalt (III) halides. Dr. Hunt.

Organic chemistry. Utilization of acrylonitrile in organic syntheses; chemistry of heterocyclic systems containing the tautomeric thioamide grouping; preparation and chemical reactions of the sulfones obtained by the oxidation of five and six-membered heterocyclic compounds; anomalous behavior and the kinetics of the acid-catalyzed hydrolysis of 2-thiazoline-2-thiols and related systems; structural and synthetic studies related to natural products. Dr. Gaul.

Synthesis of aliphatic nitro compounds; kinetics of ambient anion alkylations of lithium nitrite; study of non-aqueous solutions of electrolytes and their application to chemistry; preparation and synthetic applications of tertiary-alkyl organo-metallic compounds. Dr. Weaver.

Synthesis of steroids; displacement reactions of benzyl and aromatic halides. Dr. Yorka.

Research Equipment

Beckman IR-5A spectrophotometer, Aerograph A-90-P chromatograph, Coleman Model 29 automatic nitrogen analyzer, radiation scaler counting system, Dow Recordomatic titrator, Bausch and Lomb Spectronic 505, Fisher-Gulf vapor partitioner, Sargent Model V oscillometer, Fisher Coulomatic titrimeter, Parr medium pressure stirred hydrogenator, Rudolph Model 62 polarimeter.

Supplementary Information

The department has issued nine publications since January, 1960.

LE MOYNE COLLEGE

Faculty

† Robert J. Conan, Jr., Ph.D., Fordham, surfaces and liquid state.

Clifford J. McGinn, Ph.D., Syracuse, optical activity and solutions.

John O'Brien, S.J., M.S., Fordham, inorganic chemistry.

George A. Pearse, Jr., Ph.D., Iowa, chelating agents in analytical chemistry.

Clarence C. Schubert, S.J., Ph.D., Princeton, ion and field microscopy.

Current Research

Studies in field emission microscopy, resolutions by means of diastereo azeotropes, vapor pressure of non-ideal solutions, studies on special electrochemical cells, synthesis of organic analytical reagents, thermochemical properties of molecules and hybridization, reagents in spectrophotometry.

Research Equipment

Field emission microscope, Spectronic 505 recording visible and ultraviolet spectrometer, Perkin-Elmer spectrophotometer, Sargent recording polarograph.

Supplementary Information

The department and the college itself are coeducational.

LOYOLA COLLEGE

Faculty

Henry C. Freimuth, Ph.D., New York University.

† Edward S. Hauber, S.J., M.S., Holy Cross.

Melvin P. Miller, Ph.D., Princeton.

Walter A. Patrick, Ph.D., Göttingen.

Norbert Zaczek, Ph.D., Carnegie Institute of Technology.

LOYOLA UNIVERSITY (CHICAGO)

Faculty and Research Fields

Frank P. Cassaretto, Ph.D., Loyola (Chicago), inorganic chemistry. Preparation of Grignard solutions, preparation of aryl boron compounds.

John L. Huston, Ph.D., California, inorganic chemistry. Isotopic exchange reactions in non-aqueous solvents, oxide mobilities in non-aqueous solvents, strength of Lewis acids.

Bruno Jaselskis, Ph.D., Iowa State, analytical chemistry. Preparation of inorganic esters, inorganic gas chromatography, orthotellurate reactions.

Edward C. Lim, Ph.D., Oklahoma State, physical chemistry. Substitution effects on the electronic spectra of organic molecules; delayed fluorescence of organic dyes; fluorescence lifetime of organic compounds at low temperatures; quantum yields of photoluminescence; charge-transfer studies in two-component systems.

† Raymond P. Mariella, D.Sc., Carnegie Institute of Technology, organic chemistry. Substituted picrates of hydrocarbons and amines; synthesis of polynitriles.

Charles R. McCoy, Ph.D., Northwestern, physical chemistry. Oxidation of mercury and mercurous compounds.

Carl E. Moore, Ph.D., Ohio State, analytical chemistry. Synthesis of ion exchange resins; synthesis of sodium aryl borates; precipitation at high temperatures and pressures.

Harvey W. Posvic, Ph.D., Wisconsin, organic chemistry. Acidity of aldiminium salts.

John F. Reed, Ph.D., Washington, physical chemistry. Kinetics of the pyrolysis of $CF_3 I$; sodium diffusion flame reactions.

James W. Wilt, Ph.D., Chicago, organic chemistry. Ring size effects in the neophyl rearrangements; chemistry of 1-substituted norbornenes; Hunsdiecker reaction; radical reactivity of bridgehead positions.

Research Equipment

Perkin-Elmer Infracord spectrophotometer, Bausch and Lomb refractometer, other equipment of the more usual nature.

Supplementary Information

Biochemistry is a separate department with its own faculty which works in conjunction with the school of medicine.

The chemistry department issued some thirty publications since January, 1960.

The department has granted fifty-six M.S. degrees in the period 1954–1963. It has also granted eleven Ph.D. degrees in the period 1959–1963. Twenty-seven graduates receiving the B.S. degree between 1952–1962 have received Ph.D. degrees at other institutions. Approximately two-thirds of the B.S. graduates go on for the master's degree, and one-half for the doctorate.

LOYOLA UNIVERSITY (LOS ANGELES)

Faculty and Research Fields

† Romeo P. Allard, Ph.D., Notre Dame.

Roderick MacLeod, Ph.D., Stanford, physical organic chemistry. Stereo-

chemistry and mechanisms as applied to the organomagnesium compounds.

Joseph Schwartz, Ph.D., Chicago, physical chemistry. Molecular orbital calculations; effect of steric factor on thermodynamic properties of molecules.

Research Equipment

ALWAC III—E Digital Computer

Supplementary Information

For the past six years senior chemistry majors have presented papers at the regional meeting of the Student Affiliates of the American Chemical Society. Papers presented are the result of research work in the laboratory or, in rare cases, in the library.

LOYOLA UNIVERSITY (NEW ORLEANS)

Faculty and Research

Anthony DiMaggio, Ph.D., Louisiana State, intermediary metabolism of cold-blooded animals.

William Franklin, Ph.D., Iowa State, organic synthesis.

† H. R. Jolley, S.J., Ph.D., Princeton, physical chemistry of aqueous electrolytes.

Mary Macdonald, Ph.D., Johns Hopkins, physical chemistry of colloids, diffusion of ions through membranes.

Winston deMonsabert, Ph.D., Tulane, complex ions.

Robert Petterson, Ph.D., Southern California, synthetic organic methods and mechanisms, methods of synthesizing nitrogen-containing heterocyclics.

Research Equipment

Infrared spectrophotometer, various ultraviolet and visible spectrophotometers, gas chromatographs precision fractionating equipment, radioactive counting equipment.

Supplementary Information

Special undergraduate programs. Course requirements for the Honors Program are the same as for the regular ACS approved curriculum. However, to get the honors degree, a student must: (1) earn an overall B average in his chemistry courses, (2) do satisfactory work on an independent project each semester, beginning with the second semester of freshman year, (3) present a seminar to the assembled Department each year beginning with sophomore year, (4) complete a thesis in his senior year.

A one semester course in freshman chemistry has been introduced for superior students in place of the normal two semester course. Ten per cent of incoming freshmen qualified for this course in 1962.

The chemistry curriculum emphasizes early training in physical chemistry which begins in sophomore year, a solid grounding in physics and mathematics, and a wide choice of advanced electives in chemistry for seniors.

The department cooperates with nearby high schools in allowing their superior students to take college courses for credit during the academic year or during the summer.

MARQUETTE UNIVERSITY

Faculty and Research Fields

† Raymond A. Bournique, Ph.D., Ohio State, analytical chemistry. Application of chelation in analytical chemistry, study of some gravimetric procedures, spectrophotometric methods.

Daniel T. Haworth, Ph.D., St. Louis, inorganic chemistry. Borazine chemistry, boron hydrides metal carbonyls, mechanism of inorganic reactions, inorganic syntheses.

Clifford Haymaker, Ph.D., Marquette, organic chemistry. Silicon analogs of organic reactions, new derivatives for identification of organic substances.

Norman E. Hoffman, Ph.D., Northwestern, synthetic organic chemistry and gas chromatography.

Herman L. Karl, M.S., Marquette, water treatment for scale prevention.

Scott L. Kittsley, Ph.D., Western Reserve, partially miscible liquid systems.

John R. Koch, Ph.D., Wisconsin, fats and waxes, electrets effect of NaBH_4 on starches.

Joseph D. McGrath, M.S., Illinois.

Kenneth Miller, M.S., Marquette, synthesis of organic acids; chemistry of thiophene, 2,2' bithienyl.

Walter Stricks, Ph.D., Vienna, electroanalytical chemistry, anti-radiation drugs.

John G. Surak, Ph.D., Marquette, radiation chemistry. Radiochemical studies, reactor chemistry, biophysical chemical studies, biochemical analysis.

Research Equipment

Perkins-Elmer infrared spectrophotometer, Beckman DU spectrophotometer, five polarographs (one recording), two gas chromatographs, con-

siderable equipment of more usual nature for work in amperometry, potentiometry, refractometry, flame photometry, fluorimetry, etc.

Supplementary Information

A Ph.D. program is presently under consideration.

Financial assistance. Graduate teaching assistantships pay \$1800 to \$1900 plus tuition for ten months service, and permit a course load of six to eight semester hours.

REGIS COLLEGE

Faculty

Louis Gachic, M.S., Denver, infrared analysis.

William T. Miller, S.J., Ph.D., Berkeley, fatty acids from tubercle Bacillus, polynuclear hydrocarbons.

† Francis J. Ozog, Ph.D., Northwestern, toxicology and forensic chemistry.

Current Research

Synthesis of various fatty acids and their methyl esters.

Gas liquid chromatography of sympathomimetic amines.

Thin layer chromatography and its applications to toxicology.

Synthesis of condensed ring polynuclear hydrocarbons.

Research Equipment

Infrared spectrophotometer, ultraviolet spectrophotometer, preparative gas chromatograph, and analytical gas chromatograph.

ROCKHURST COLLEGE

Faculty

† Thomas E. Sullivan, Sc.D., Massachusetts Institute of Technology, chemical engineering, process design and development.

Oscar L. Wright, Ph.D., Missouri, organic synthesis.

James D. Wheeler, S.J., M.A., St. Louis, pharmaceutical chemistry.

Current Research

Organic syntheses, utilization of ion exchange resins in nitration of aromatic substances in non-aqueous media.

Research Equipment

Emission spectrophotograph, DU spectrophotometer, gas chromatograph, Abbé refractometer.

Supplementary Information

A research program was initiated this year for selected seniors who are studying the nitration of aromatics in the presence of ion-exchange resins. Each selected participant receives \$150 per semester, the support coming from the college. NSF support will be available to continue the program through the summer.

Another Ph.D. is to be added to the staff during the summer of 1963.

ST. JOSEPH'S COLLEGE

Faculty

Joseph N. Bartlett, Ph.D., Pennsylvania, analytical chemistry.

George J. Beichl, Ph.D., Pennsylvania, inorganic chemistry.

† Joseph A. Feighan, Ph.D., Pennsylvania, radiochemistry, physical chemistry.

Robert P. Koob, Ph.D., Pennsylvania, organic chemistry.

Hsi Lin, Ph.D., Pennsylvania, organic chemistry.

Current Research

Analytical chemistry. Paper, column and thin layer chromatographic separation of organic mercurials and other medicinals.

Inorganic chemistry. Reactions of diborane with inorganic compounds, reaction of CCl_4 amines systems.

Physical chemistry. Adsorption of gases on single metal crystals, heterogeneous catalysis.

Radiation chemistry. Effect of cobalt-60 radiation on amino acids, effect of radiation on solid catalysts.

Radiochemistry. Use of tracers in mechanisms studies with emphasis on heterogeneous catalysis in gas phase reactions.

Research Equipment

A 1000 curie cobalt gamma radiation source, recording scintillation spectrometer, Infracord IR spectrometer, three gas chromatographs, Leeds & Northrup speedomax recorders, high vacuum equipment, Beckman DU spectrophotometer.

Supplementary Information

A junior-senior program for chemistry majors consists of one semester of chemical literature, one semester of seminar, and two semesters of senior research. If the student's interests are known, part of the chemical literature assignments and final literature search are related to his field of interest. Senior research studies are taken under the direction of individual faculty members on problems of interest to them.

In the last ten years the department has placed better than fifty per cent of its majors in graduate schools. The M.S. program, completing ten years of operation, has grown from thirty to a high of ninety-nine students. The program draws from all of the local industrial laboratories.

Research and study contracts and grants have been obtained from NIH, AEC, the Air Force, Research Corporations, Army Ordnance, and the ACS.

Financial assistance. Graduate teaching assistantships provide \$1800 plus full remission of fees. Teaching assistants are responsible for ten to twelve hours of laboratory and recitation supervision in the undergraduate division. Graduate research assistantships pay \$1800 plus full remission of fees and entail work on research projects under the direction of the faculty.

ST. LOUIS UNIVERSITY

Faculty

† Kenneth H. Adams, Ph.D., Chicago, theoretical organic chemistry.

Hugh B. Donahue, Ph.D., Kansas, medicinal chemistry.

Leo F. Hohnstedt, Ph.D., Chicago, inorganic chemistry.

William J. Hufker, Ph.D., St. Louis, organic chemistry.

Earl Murphy, Ph.D., St. Louis, general chemistry, teaching of high school chemistry.

Paul E. Peterson, Ph.D., California Institute of Technology, theoretical organic chemistry.

Cecil J. Raw, Ph.D., Natal, physical chemistry, molecular dynamics.

Bernard Rice, Ph.D., Chicago, physical chemistry, molecular structure.

George F. Svatos, Ph.D., Notre Dame, inorganic chemistry.

George M. Tipton, S.J., Ph.D., St. Louis, analytical chemistry.

Current Research

Analytical chemistry. Products of oxidation of dithizone.

Inorganic chemistry. Nickel complexes of trialkyldiphosphines from the point of view of preparation, structure, and bonding relationships; reactions of boron halides and B-trichloroborazines with aliphatic and aromatic amines.

Organic chemistry. Solvolysis of tetraphenylethylene dichloride; deamination of aryl-substituted 2-aminophenols; effect of substituent groups on kinetics and mechanism of pinacol rearrangement; rates of addition of trifluoroacetic acid to acyclic, cyclic, and bicyclic olefins; isomerization of trifluoroacetates in media of high acidity; kinetics of acid-catalyzed dehydration of aryl-substituted ethanols; synthesis of compounds and possible interests in central nervous system depressants and antispasmodics.

Physical chemistry. Collisional transport of energy and momentum in high temperature gas systems; hydrogen bonding in trifluoroacetic acid

solution as studied by Raman spectroscopy and other physical measurements; molecular structure and bonding of the monomers and dimers of the group III halogen compounds; construction of equipment for high temperature Raman spectroscopy of gases.

Research Equipment

Perkin-Elmer Model 21 infrared spectrophotometer, Bausch and Lomb ultraviolet-visible spectrophotometer, Beckman DU spectrophotometer, General Electric X-ray spectrophotometer, Lane-Wells Raman spectrometer, Sargent recording polarograph, F & M model 609 gas chromatograph, electron microscope, IBM 505 Computer.

Supplementary Information

In addition to the regular M.S. program twenty students are currently enrolled in the program leading to an M.S. (Teaching) degree.

In the honors program independent study under a tutor may replace up to ten semester hours of formal course work, and an experimental thesis replaces the library thesis.

New building. Construction is scheduled to start this spring on a new chemistry building. The building of 44,000 sq. ft. floor space and an estimated cost of \$1.43 million will provide graduate instructional and research facilities and laboratory space for the upper division laboratory courses. It is one unit of a science complex costing \$5.5 million and providing facilities also for the physics department and the institute of technology.

ST. PETER'S COLLEGE

Faculty

Thomas N. Dodd, Ph.D., Columbia, analytical chemistry.

† George J. Hilsdorf, S.J., M.S. Canisius, physical chemistry.

Perry Y. Jackson, Ph.D., Chicago, physical chemistry.

Arthur G. Kehoe, S.J., M.S. Boston College, inorganic chemistry.

James A. Pegolotti, Ph.D., UCLA., organic chemistry.

Supplementary Information

Students achieving three or better in the advanced placement test are given credit for the usual freshman course, although for chemistry majors an additional check is made on laboratory experience.

The advanced placement class at St. Peter's Prep attends laboratory sessions at the college on Saturday mornings.

UNIVERSITY OF SANTA CLARA

Faculty

† Joseph F. Deck, Ph.D., Kansas, heterocyclic syntheses.
Francis Koenig, S.J., Ph.D., St. Louis, boron hydrides.
Robert J. Pfeiffer, Ph.D., Cornell, phosphonium salts.
William F. Sheehan, Jr., Ph.D., California Institute of Technology,
molecular structure.

Current Research

Synthesis of quinolizinium salts; an empirical theory of long-range bonding in molecules; phosphonium salts.

Research Equipment

Electronic computer.

SEATTLE UNIVERSITY

Faculty

† Ernest P. Bertin, S.J., Ph.D., Notre Dame, radiation chemistry.
Walter R. Carmody, Ph.D., Catholic University.
Clair A. Marshall, S.J., M.S., Fordham.
Richard E. Neve, Ph.D., Oregon.
Vincent S. Podbielancik, Ph.D., Washington, polarography.
David H. Read, Ph.D., Notre Dame, heterocyclics.
Bernard M. Steckler, Ph.D., Washington, organo-phosphorus compounds.

Current Research

Formation and characterization of unstable species in gamma-irradiated hydrocarbon glasses at 77° K. Fr. Bertin.

Heteroatom analogs of benzene. Dr. Read.

Phosphorus in delocalized pi electron systems. Dr. Steckler.

Mercury chloride film anode. A Study of the ability to oxidize organic compounds. Dr. Podbielancik.

Upgrading freshman laboratory experiments to conform to the present text level.

Research Equipment

Infrared spectrophotometer, gamma source, neutron source, nuclear detection equipment, polarograph, vapor phase chromatograph.

Supplementary Information

The graduate students listed in the table are almost exclusively high school teachers, and receive full support from the NSF summer institute program. (See under physics for details of this program.)

SPRING HILL COLLEGE

Faculty

John V. Deignan, S.J., Ph.D., Fordham, biochemistry, organic chemistry.

Roberta Hill, M.S., Tennessee Tech, organic chemistry.

Francis J. Kearley, Ph.D., Vanderbilt, organic chemistry.

† William J. Rimes, S.J., Ph.D., Louisiana State, analytical chemistry.

George O. Twellmeyer, S.J., M.S., St. Louis, inorganic chemistry.

Current Research

Vapor-liquid equilibria, coordination compounds of tungsten.

Research Equipment

No major items of research equipment. The usual collection of spectrophotometers and ordinary equipment are available to students and faculty for research.

WHEELING COLLEGE

Faculty

† Joseph A. Duke, S.J., Ph.D., Fordham, biophysics of enzymes.

Robert L. Grob, Ph.D., Virginia, gas chromatography.

Jack L. Pinkus, Ph.D., Southern California, heterocyclics.

Current Research

Analytical chemistry. Synthesis of analytical reagents for quantitative determination of trace amounts of boron in biological materials. Dr. Grob.

Biochemistry. Specific binding sites of enzymes, enzyme mechanism in studies using synthetic substrates. Fr. Duke.

Organic chemistry. Synthesis of certain heterocyclic compounds as intermediates in the preparation of compounds of physiological interest, potential anticancer and carcinogenic agents. Dr. Pinkus.

Research Equipment

Nuclear laboratory, polarographic and gas chromatographic equipment, ultraviolet and infrared spectrophotometers.

Supplementary Information

Students assist in the laboratories which are part of the NSF Science Workshop for high school science teachers.

In addition to recognizing incoming students with advanced placement rating, the department runs an advanced placement program for gifted high school students.

The college is coeducational.

Curriculum. Through an NSF senior faculty fellowship, the educational philosophy and curriculum offerings of outstanding schools in the East (viz, Dartmouth, Carnegie Institute of Technology) and West (viz, California Institute of Technology, Pomona, Riverside) were studied and the principles learned were incorporated into the curriculum. The number and variety of chemistry courses offered were minimized, and in their place, a program was created of relatively few courses which are more intensive in scope and presentation.

The traditional divisions of chemistry into separate branches have been decreased in emphasis, although the traditional course titles are used, and a conscious effort has been made to regard the sciences as a totality. The chemistry curriculum comprises four basic courses (general-qualitative, organic, analytical, physical) and three advanced (advanced analytical, advanced organic, advanced inorganic). In the laboratory assignments of the advanced courses a continuous effort is made to introduce the "research project" approach, i.e., "open-end" experiments, which force the student to integrate his lectures and experimental work.

In the four classes thus far graduated from the college there have been twenty-two chemistry majors of whom eight have attended graduate schools (Massachusetts Institute of Technology, Wisconsin, Virginia, West Virginia, Pittsburgh, Duquesne) on fellowships or assistantships. Five of these graduates have devoted their talents to secondary school science teaching, while seven others have accepted positions in research or industrial laboratories of the Ohio Valley.

Chemistry for Industry. The chemistry department runs a continuous program entitled Chemistry for Industry. Its purpose is to give chemists and engineers of the Ohio Valley an opportunity to meet and discuss topics of common interest with experts in fields associated with industrial chemistry.

XAVIER UNIVERSITY

Faculty and Research Fields

Harvey A. Dube, Ph.D., Iowa State, physical chemistry. Starch chemistry, physical chemistry of polymers, heats of combustions.

† Richard J. Garascia, Ph.D., Cincinnati, organic chemistry. Organic arsenicals, polynuclear aromatic hydrocarbons.

Robert G. Johnson, Ph.D., Iowa State, organic chemistry. Hunsdiecker reaction, heterocyclic compounds, carcinostatic compounds.

Joseph J. Klingenberg, Ph.D., Cincinnati, inorganic chemistry. Zirconium mandelates, chelate chemistry.

Richard T. O'Neill, Ph.D., Carnegie Institute of Technology, physical chemistry. Hydrogen bonding effects, infrared absorption spectroscopy.

Theodore C. Thepe, S.J., M.S., John Carroll, physical chemistry. Radiochemistry, electrochemistry.

Research Equipment

Beckman IR-7 Infrared Spectrophotometer, Beckman DU visible and ultraviolet spectrophotometer, F & M Model 500 gas chromatograph.

Supplementary Information

A program similar to the NSF undergraduate participation program is available for one student under the terms of a Petroleum Research Fund type B grant.

Graduate assistantships carry a stipend of about \$1800 for nine months with full remission of tuition and fees.

MATHEMATICS

BOSTON COLLEGE

Faculty

Paul T. Banks, M.A., Boston College.

† Stanley J. Bezuska, S.J., Ph.D., Brown, teacher training.

Gerard G. Bilodeau, Ph.D., Harvard, orthogonal polynomials, integral transforms.

Armand Brumer, M.A., Princeton, homological algebra.

John F. Caulfield, S.J., M.A., Boston College.

Samuel S. Holland, Ph.D., Harvard, lattice theory.

Louis O. Kattsoff, Ph.D., Pennsylvania, logic and foundations of mathematics.

Margaret J. Kenney, M.A., Boston College.

Joseph F. Krebs, M.A., Boston College.

Archille J. Laferriere, M.A., Boston College.

Robert J. LeBlanc, M.A., Boston College.

Rene J. Marcou, Ph.D., Massachusetts Institute of Technology, applied mathematics.

Rose Ring, Ph.D., Brown, applied mathematics.

Paul J. Sally, M.A., Boston College and Brandeis, group representations.

John P. Shanahan, Ph.D., Johns Hopkins, differential equations.

Joseph A. Sullivan, Ph.D., Indiana, analysis.

Maurice K. Walsh, M.Ed., Boston College.

Research Equipment

IBM 1620 computer.

Supplementary Information

Special undergraduate programs. The senior honors student is likely to have had the following courses: freshman year, introduction to calculus (two semesters); sophomore year, calculus (two semesters) and modern algebra (two semesters); junior year, number theory and projective geometry (one semester of each); senior year, complex variables and lattice theory (two semesters of each). There are also honors courses in mathematics for those not majoring in mathematics, as well as an undergraduate independent study program during the summer.

The department has an advanced placement program, but encourages

† Chairman of the department.

qualified students to enter special honors sections rather than omitting courses entirely.

Financial assistance. Graduate teaching fellowships pay \$2000 plus tuition for six hours per week teaching. Assistantships pay \$1500-2000 for twelve hours per week.

CANISIUS COLLEGE

Faculty

Robert A. Haus, S.J., M.S., Notre Dame.

June M. McCartney, M.A., Buffalo.

Thaddeus D. Pozniak, Ph.D., Ottawa.

† Robert F. Tidd, Ph.D., Buffalo.

Richard L. Uschold, M.S., Notre Dame, Cand. Ph.D., Buffalo.

CREIGHTON UNIVERSITY

Faculty

† Alvin K. Bettinger, M.A., Wisconsin.

Bernard J. Hasbrouck, S.J., M.A., St. Louis.

Gerald A. Hutchison, Ph.D., UCLA, complex variables.

John N. Mordeson, Ph.D., Iowa State, algebra.

Edward A. Sharp, S.J., M.A., St. Louis.

Clarence M. Wagener, S.J., M.S., St. Louis.

Current Research

Complex variables, Dr. Hutchison. Algebra, Dr. Mordeson.

Research Equipment

Electronic computer.

Supplementary Information

Financial assistance. Grants-in-aid are available for one semester, subject to renewal for a second semester.

Graduate program. A program leading to a master's degree will be initiated for the 1963-64 school year. There will be nine full-time staff members by then. The library has over 2000 volumes of well selected material in every major field of mathematics, and subscribes to thirty-two journals.

UNIVERSITY OF DETROIT

Faculty

Thomas F. Davis, M.A.T.M., Detroit, elementary mathematics education.

- James B. Eckstein, M.A., Detroit, secondary mathematics education.
 Harry R. Emery, M.A., Detroit, computers.
 Natalie Frazis, M.A., Wayne State.
 Joseph R. Gillis, M.A., Detroit.
 Cletus F. Hartmann, S.J., M.S., Loyola (Chicago).
 Robert G. Kane, M.A., Detroit.
 Marc A. Laframboise, M.S., Michigan, secondary school teaching.
 James F. Lanahan, M.S., Michigan, statistics.
 William F. Lucas, M.S., Detroit, modern algebra.
 J. A. Mansour, M.A., Detroit.
 Gerald E. Merkle, Ph.D., Wayne State, numerical analysis.
 Edward D. McCarthy, M.A., Pennsylvania State, applied mathematics.
 † Lyle E. Mehlenbacher, Ph.D., Michigan, differential equations and teacher training.
 Gerald E. Meike, M.A., Detroit, foundations of mathematics and meta-mathematics.
 Abraham Nemeth, M.A., Columbia, Braille mathematics.
 Maryjo Marx Nichols, M.A., Detroit.
 Nora Pernavs, M.A., Wayne State.
 Emily C. Pixley, Ph.D., Chicago, number theory, the Waring problem.
 Mary Louise Ramsey, M.A., Detroit.
 Bill V. Ritchie, Ph.D., Purdue, algebra.
 Peter J. Roddy, M.A., Detroit.
 C. V. Stanojevic, D.Sc., probability and statistics and ergodic theory.
 Everett M. Steinbach, M.A., Detroit.
 Donato T. Teodoro, M.A., Detroit.
 Florence G. Tetreault, M.A., Michigan, statistics.

Research Equipment

IBM 1620 computer, Burroughs E-101 computer.

Supplementary Information

Besides the regular master's degree program there is a program leading to a master's degree in the teaching of mathematics. Sixty-five candidates are currently participating in the latter. This is in addition to an NSF institute for teachers.

FORDHAM UNIVERSITY

Faculty

- Michael I. Aissen, Ph.D., Stanford, analysis.
 Robert T. Craig, Ph.D., Ohio State, algebra.
 Frank B. Crippen, M.A., Columbia, algebra.

- Peter M. Curran, M.A., Columbia, algebra.
 Rev. Henry DeBaggis, Ph.D., Notre Dame, analysis.
 Paul Koosis, Ph.D., California (Berkeley), analysis.
 Nosup Kwak, Ph.D., Duke, analysis.
 † Charles J. Lewis, S.J., Ph.D., Brown, analysis.
 Joseph Lynch, S.J., Ph.D., New York University, analysis.
 Guillermo Owen, Ph.D., Princeton, game theory.
 Robert Vivona, M.A., Fordham.

Supplementary Information

Financial assistance. The stipend for the graduate teaching fellowships is \$1500 and for the assistantships \$1300. There is also an undergraduate research and independent study program supported by the NSF for three years. Further, twelve students are supported for eight weeks at \$60.00 per week during the summer, and eighteen students at \$150.00 for the academic year.

GEORGETOWN UNIVERSITY

Faculty

- A. Kadir Aziz, Ph.D., Maryland, partial differential equations.
 Witold Bogdanowicz, Ph.D., Warsaw, functional analysis.
 Jean E. LeBel, Ph.D., Toronto, integral equations.
 Richard F. McCoart, Ph.D., North Carolina, number theory.
 † Malcolm W. Oliphant, Ph.D., Catholic University, measure theory.
 Anne E. Scheerer, Ph.D., Pennsylvania, probability.
 Choy-tak Taam, Ph.D., Harvard, functional analysis and ergodic theory.

Current Research

Ergodic transformations, almost periodic functions, linear spaces, partial differential equations and classical polynomials.

GONZAGA UNIVERSITY

Faculty

- Francis J. Altman, S.J., M.S., Gonzaga.
 Gerald E. Bergum, M.S., Notre Dame, group theory.
 John F. Firkins, M.S., Miami, topological spaces.
 Gregorio J. Fuentes, Lic., Madrid, probability.
 Raymond Murphy, M.S., Notre Dame, applied mathematics.
 Jerome J. Murray, S.J., M.S., St. Louis, complex functions.
 † Donald R. Ryan, M.S., Gonzaga, relaxation methods.

George M. Simoneau, S.J., M.S., Gonzaga.
 Yozo Takeda, M.S., Missouri, analytic functions.

Research Equipment

Analog computers are available, and since the university is a member of the Western Data Processing Association, UCLA, there is access to an IBM 7090 computer.

Supplementary Information

The master's program in applied mathematics was initiated in the fall of 1960 and has matured rapidly.

COLLEGE OF THE HOLY CROSS

Faculty

Daniel G. Dewey, M.A., Kansas, algebra.
 William E. Hartnett, Ph.D., Kansas, measure theory.
 John J. MacDonnell, S.J., Ph.D., Catholic University, analysis.
 † Vincent O. McBrien, Ph.D., Catholic University, algebraic geometry.
 John R. McCarthy, M.A., Boston College, probability.
 James H. Nestor, M.A., Boston College, mathematical education.
 Peter Perkins, M.A., Dartmouth, logic and foundations of mathematics.
 Patrick Shanahan, Ph.D., Indiana, algebraic topology.

Supplementary Information

Special undergraduate programs. Upper division courses are offered in algebraic topology and abstract algebra and there is an undergraduate research program in algebraic geometry, topology, and analysis.

LE MOYNE COLLEGE

Faculty

Frederick J. Carter, M.A., Detroit.
 Thomas S. Frank, Ph.D., Syracuse, modern analysis, group theory.
 † Leon Maltby, M.S., Syracuse.
 Charles F. McCain, M.S., Detroit.
 James B. Munz, M.A., Syracuse.

LOYOLA COLLEGE (BALTIMORE)

Faculty

Joe C. Bradley, B.S., Texas A & M.
 John Higinbotham, M.A., Loyola (Baltimore), mathematics for liberal arts students.

Martin G. Horak, M.S., Notre Dame, programming.

John T. Johnson, B.S., McCoy, statistics.

Francis J. Kammel, M.A., Georgetown, algebra.

† Bernard J. Weigman, Jr., Ph.D., Notre Dame.

Research Equipment

Analog computer.

LOYOLA UNIVERSITY (CHICAGO)

Faculty

Richard J. Driscall, Ph.D., differential equations.

Robert B. Reisel, Ph.D., modern algebra.

† Charles H. Rust, S.J., Ph.D., infinite series.

Supplementary Information

The undergraduate enrollment in mathematics has increased considerably over the last five years. From an annual number of ten to fifteen graduating mathematics majors, the number has risen to thirty-five for last year.

Financial assistance. The graduate teaching fellowships pay \$1800 a year plus tuition.

Special undergraduate program. In the honors program two extra courses are required, one in class and one with a tutor. The honors program was supported last year by the NSF.

All mathematics majors must complete courses in differential equations, infinite series, advanced calculus, modern algebra, and geometry. Two extra courses are available in probability and statistics.

LOYOLA UNIVERSITY (LOS ANGELES)

Faculty

Artur Grigori, Ph.D., Tübingen, vector analysis.

Edward R. Linneman, M.A., Notre Dame, group theory.

Reginald Murphy, Ph.D., New York University, mathematical education.

Clarence J. Wallen, S.J., Ph.D., St. Louis, topology.

† Berthold R. Wicker, Ph.D., Iowa, orthogonal polynomials.

Current Research

Mathematics at the secondary school level; filters as applied to limit theory.

Research Equipment

A digital computer is available in the engineering department.

LOYOLA UNIVERSITY (NEW ORLEANS)

Faculty

† John F. Keller, S.J., M.S., St. Louis, numerical analysis, computer research.

Lewis T. Todd, M.A., Tulane, geometry.

Harry T. Fleddermann, Ph.D., Louisiana State, probability and statistics.

Ray H. Witham, B.A., Illinois College, analysis.

Bernard A. Tonnar, S.J., M.S., Catholic University, history of mathematics.

Research Equipment

An IBM 1620 computer center will begin functioning in September, 1963.

Supplementary Information

In-service institutes are conducted by the department for elementary and secondary school teachers of mathematics.

MARQUETTE UNIVERSITY

Faculty

Clemens Hanneken, Ph.D., Illinois, Galois theory and metabelian groups.

Lester J. Heider, S.J., Ph.D., Michigan, rings of continuous functions.

† John E. Kelley, Ph.D., Michigan, topology.

Willard Lawrence, M.S., Marquette, statistics (Ph.D. thesis).

Edward P. Merkes, Ph.D., Northwestern, continued fractions.

James E. Simpson, Ph.D., Yale, functional analysis.

Earl Swokowski, Ph.D., Wisconsin, ring theory.

Joseph Talacko, D.Sc., Czechoslovakia, statistics.

Research Equipment

IBM 1620 computer.

Supplementary Information

Graduate assistantships pay \$1800 plus tuition for one year. Several graduate students have NSF summer grants.

REGIS COLLEGE

Faculty

† Frederick T. Daly, S.J., M.S., St. Louis, non-linear differential equations.

Hugh M. Edgar, Ph.D., Alberta, number theory.

Martin Hatcher, M.S., St. Louis, teaching methods in the undergraduate curriculum.

William S. Levings, Ph.D., Colorado School of Mines, algebra.

ROCKHURST COLLEGE

Faculty

Ruu Chang, M.S.

† William C. Doyle, S.J., Ph.D., St. Louis.

Quentin C. Smith, M.S., Harvard.

ST. JOSEPH'S COLLEGE

Faculty

John J. Costello, M.A., Virginia, information theory, algebra, and applications of probability theory.

Samuel S. Ensor, M.A., Lehigh, statistical analysis.

Brian E. Gaffney, B.S., St. Joseph's, non-destructive testing by acoustical methods.

C. Frederick Koehler, S.J., M.A., Boston College, symbolic logic and theory of sets.

William W. Kuhn, B.S., Drexel, analysis.

† John S. O'Connor, S.J., M.S., Massachusetts Institute of Technology, nuclear physics.

Vincent G. Ryan, M.A., Villanova, numerical analysis.

Research Equipment

An IBM 1620 computer is under consideration.

Supplementary Information

The mathematics major was introduced in September, 1961, and the graduating class from that initial group is expected to number ten.

ST. LOUIS UNIVERSITY

Faculty

John J. Andrews, Ph.D., probability.

John F. Daly, S.J., Ph.D., algebra and topology.

Edwin G. Eigel, Jr., Ph.D., computer analysis and number theory.

John D. Elder, Ph.D., number theory.

Raymond W. Freese, Ph.D., geometry.

† Francis J. Regan, Ph.D., analysis and probability.

Waldo A. Vezeau, Ph.D., statistics.

Current Research

Algebra, geometry, analysis, probability and statistics, topology, number theory, computer analysis.

Research Equipment

IBM 1620 computer.

Supplementary Information

There is an NSF-supported program for gifted high school mathematics students, as well as an NSF in-service institute for high school teachers.

ST. PETER'S COLLEGE

Faculty

Kenneth T. Burke, M.A., New York University, complex variables.

Alessandro C. Calianese, M.S., Notre Dame, analysis.

Robert I. Canavan, S.J., Ph.D., New York University, partial differential equations, boundary value problems.

James B. Collins, C.E., Cooper Union, engineering education.

B. Melvin Kiernan, M.A., Brown, groups.

William E. Kruse, M.A., Columbia, mathematics education.

† Francis J. McMackin, Ph.D., Columbia, mathematics education.

Francis A. Varrichio, M.A., Brown, numerical analysis and computer mathematics.

Research Equipment

A computer is available on a part-time basis.

Supplementary Information

Two programs are currently under study: the feasibility of numerical analysis-computer courses and the development of a mathematical laboratory.

Special undergraduate programs. In the honors program each student has a special faculty consultant. Outside reading is required both in the academic year and during the summer vacation period. Special comprehensive oral and written examinations are required of honors students before graduation. An independent study program for mathematics majors

is also under the supervision of the faculty. College credits are awarded for such study if it is judged by examinations and observation that the student has progressed sufficiently.

UNIVERSITY OF SAN FRANCISCO

Faculty

John D. Brillhart, Cand. Ph.D., California, theory of numbers.
 Edward J. Farrell, Cand. Ph.D., Stanford, mathematics education.
 † John E. Fischer, S.J., Ph.D., St. Louis, algebra.
 Thomas E. Frayne, Cand. Ph.D., California, symbolic logic.
 Nand Kishore, Ph.D., California, analysis.
 Thomas J. Saunders, S.J., M.A., Gonzaga, analysis.
 George D. Sullivan, Ph.D., California, mathematics education.
 David J. Walsh, S.J., M.A., Gonzaga, teaching methods.

Research Equipment

An IBM 1620 computer is under consideration.

Supplementary Information

Qualified high school seniors attend early morning classes at the university and receive a waiver on the course or courses if they later attend San Francisco University. If they go elsewhere a transcript of their passing the course is sent to the university of their choice.

UNIVERSITY OF SCRANTON

Faculty

† Edward F. Bartley, M.A., Columbia, secondary curriculum.
 Bernard J. Johns, M.A., Bucknell.
 Edward R. Powers, S.J., M.A., Weston, teaching methods.
 Joseph G. Savulis, M.A., Fordham.
 Ronald L. Sinzduk, M.A., Fordham.

SEATTLE UNIVERSITY

Faculty

Thelma M. Chaney, Ph.D., Washington, functional analysis and semi-groups.

Chu Chiu Chang, M.A., Washington, numerical analysis, computers.

† Theodore S. Chihara, Ph.D., Purdue, orthogonal polynomials, problems of moments.

Burnett R. Toskey, Ph.D., Washington, algebra, especially commutative rings.

Mary B. Turner, Ph.D., Chicago, number theory.

Andre L. Yandl, M.A., Washington, topology.

Supplementary Information

The university offers an NSF summer institute leading to a master's degree in science teaching. (For details see under the Seattle entry for physics.)

Undergraduate program. The normal requirements for the B.S. degree are a year of modern advanced calculus and a year of linear and abstract algebra. A year of additional work is selected from offerings in differential equations, number theory, modern geometry, complex variables, probability and topology. Two degree programs are offered leading to A.B. and B.S. degrees, respectively. The B.S. program is a professional program designed to prepare students for graduate work. Of the nine students who have earned this degree, all have gone on to graduate work, one with an NSF fellowship and most of the others with assistantships.

PHYSICS

CANISIUS COLLEGE

Faculty

Daniel F. Dempsey, Ph.D., Notre Dame, trajectories of particles in electric, magnetic and gravitational fields.

David G. Keiffer, Ph.D., Notre Dame, electron spin resonance.

Austin C. McTigue, Ph.D., St. Louis, seismology of western New York.

† James J. Ruddick, S.J., Ph.D., St. Louis, radiation dosage.

Current Research

Study of free radicals in cell division by electron spin resonance, particle focusing.

Research Equipment

Electron spin resonance spectrometer.

Supplementary Information

Advanced placement is rarely allowed in physics. It is preferred that a student take advanced placement in mathematics. Separate classes are maintained for juniors and seniors.

UNIVERSITY OF DETROIT

Faculty

William M. Baker, M.S., Detroit, electrical measurements and instruments.

Gerhard A. Blass, Ph.D., Leipzig, theoretical physics.

Nancy J. Bow, M.S., Detroit, solid state physics.

Roy C. Crane, M.S., Detroit, electronics and optics.

Henry C. Gelin, S.J., Ph.D., Catholic University, electronics and ultrasonics.

Vincent A. Hagarman, S.J., Ph.D., Texas, X-ray spectroscopy.

† Daniel L. Harmon, Ph.D., Indiana, acoustics.

Francis R. Kendzioriski, Ph.D., Cornell, modern physics.

John W. Then, Ph.D., Cornell, experimental electromagnetics.

† Chairman of the department.

Current Research

Solid state. Determination of the electrical conductivity of semiconductors as a function of wavelength of incident X-rays. Growth of crystals from the vapor phase.

X-ray. Transmission of X-rays through a thin target from a point source.

Instrumentation. Design of a magnetic field stabilizer and a high frequency power supply.

Development of electric current through friction.

Research Equipment

Infrared spectrometer, polarizing microscope, optical spectrograph and densitometer, X-ray diffractometer and two-crystal spectrometer, crystallographic apparatus, source of microsecond high power pulse, furnaces for crystal growing, crystal polishers, ILS metallographic outfit.

FORDHAM UNIVERSITY

Faculty

Joseph I. Budnick, Ph.D., Rutgers, ferromagnetism and superconductivity.

Frederick L. Canavan, S.J., Ph.D., Catholic University, experimental nuclear physics.

Victor F. Hess, Ph.D., Graz, (Nobel laureate in physics), cosmic rays and atmospheric electricity.

William P. Hurley, M.S., Fordham, optics.

J. Joseph Lynch, S.J., Ph.D., New York University, geophysics, seismology.

† Joseph F. Mulligan, S.J., Ph.D., Catholic University, molecular and solid state physics.

Ralph Peters, M.S., Pennsylvania State, spectroscopy.

Joseph Shapiro, Ph.D., Toronto, nuclear and elementary particle theory.

Alfons Weber, Ph.D., Illinois Institute of Technology, Raman spectra.

Theodore Zegers, S.J., M.S., Fordham, general physics.

Irving I. Zinnes, Ph.D., New York University, quantum field theory.

Current Research

Nuclear physics. Angular correlation of successive gamma rays especially under the influence of extra-nuclear fields.

Molecular spectra. Rotational and rotation-vibrational spectra of polyatomic molecules, especially the Raman spectra of gases.

Theoretical physics. Excited states and the fine structure of atoms; the

theory of nuclear forces and nuclear structure; quantum field theory and the theory of elementary particles.

Solid state. Low temperature nuclear magnetic resonance and superconductivity.

Research Equipment

Bendix G-15 computer, Wadsworth 21 foot grating spectrograph, large plane grating spectrograph, Bausch and Lomb medium quartz prism spectrograph, Moll microphotometer, Mann comparator, nuclear magnetic resonance spectrometer with associated cryogenic and electronic equipment, gamma ray scintillation spectrometer. It is often possible for students to make use of the facilities of the Brookhaven National Laboratories for thesis research.

Supplementary Information

Special undergraduate program. Fordham has no advanced placement program because of an NSF-sponsored experimental program for freshman and sophomore years. This program drops the usual general physics course for physics majors, concentrating instead on a rigorous course in analysis through advanced calculus in freshman year, with advanced topics in analysis and intensive mathematical physics beginning in sophomore year. In addition, in sophomore year both physics and mathematics majors take intensive courses in mechanics and electricity and magnetism which are mathematically rigorous and are based on the advanced mathematics taught in freshman year. Part of the NSF funds for this program will provide for the publication of course notes which will be made available to other colleges and universities.

Advanced courses in geophysics are available to graduate students during their second and third years of graduate studies.

Financial assistance. Fordham has been authorized to award three NDEA Fellowships per year to graduate students accepted for work leading to the doctorate. In addition, the university will waive tuition costs in order to allow the student who participates in this program to devote himself exclusively to full-time graduate work.

Teaching assistants receive stipends ranging from \$1500 to \$2000 for the academic year in addition to the remission of tuition of approximately \$700. The research assistantships pay upwards of \$2000 for the academic year.

GEORGETOWN UNIVERSITY

Faculty

Marcelo Alonso, Ph.D., University of Havana, theoretical physics.

Charles L. Beckel, Ph.D., Johns Hopkins, molecular theory.

Richard D. Boyle, Ph.D., University of Virginia, theoretical physics.

Edward J. Finn, Ph.D., Georgetown, acoustics.

Ralph S. Henderson, Ph.D., Harvard, microwave absorption, field theory.

† William J. Thaler, Ph.D., Catholic University, ultrasonics, biophysics, infrared spectroscopy.

Matthew P. Thekaekara, S.J., Ph.D., Johns Hopkins, spectroscopy.

Paul A. Traedo, Ph.D., Michigan, nuclear physics (accelerators).

Misri L. Vatsia, Ph.D., Florida State, phase telescope (turbulence).

Current Research

Solid state. Thermal equilibrium of spacecraft surfaces.

Ultrasonics. Relaxation phenomena in halogen vapors.

Biophysics. The physical properties of bone.

Phase telescope. Turbulence studies by light diffraction.

Molecular theory. Vibrational and electronic states of molecules (molecular orbital theory).

Spectroscopy. UV and visible studies of electrodeless discharge tubes. IR spectra of the planets.

Microwaves. Absorption spectroscopy.

Research Equipment

Burroughs E 101 computer, Beckman IR2T spectrophotometer, Jarrell-Ash recording spectrophotometer, neutron howitzer, CW gas laser, recording densitometer-comparator, recording hot-wire anemometer, space physics research chamber including solar simulator, vacuum chamber and liquid nitrogen-cooled shroud. The department will soon acquire a 5 watt AGN nuclear reactor and a 3-6 Mev accelerator.

Supplementary Information

Certain courses offered by the astronomy department are accepted for credit in the physics department.

Financial assistance. The NSF cooperative fellowship for graduate students is on a competitive basis with other departments. The graduate teaching assistantships offer a stipend of \$2300 per year and tuition is waived. Stipends for research assistants depend on qualifications.

JOHN CARROLL UNIVERSITY

Faculty

E. F. Carome, Ph.D., Case Institute of Technology, acoustics.

D. H. Green, Ph.D., Case Institute of Technology, nuclear physics.

F. A. Gutowski, S.J., Ph.D., Catholic University, acoustics.

J. L. Hunter, Ph.D., Catholic University, acoustics.

† L. J. Monville, S.J., Ph.D., St. Louis.

H. C. Nash, Ph.D., Case Institute of Technology, solid state physics.

W. F. O'Hearn, M.S.E.E., Notre Dame, M.S., John Carroll, semiconductors.

K. S. Ozawa, M.S., John Carroll.

G. H. Reiling, Ph.D., Missouri, electronics.

N. A. Roughton, M.S., John Carroll.

J. Trivisonno, Ph.D., Case Institute of Technology, solid state physics.

Current Research

Continuum mechanics, architectural acoustics, ultrasonic propagation in free field and in wave guides, velocity and absorption of ultrasound in liquids, ultrasonic pulse-echo determination of elastic constants, growth and temperature dependence of the properties of single crystal Ga, W, and Mo, mechanical vibrations and shock, magnetoacoustic absorption, optical properties of thin films and coatings.

Research Equipment

LGP 30 computer, Burrows 205 computer, ARL 1.5 meter spectrograph, Bausch and Lomb quartz spectrograph, GE XRD-5F X-ray spectrograph, Harvey Wells 30 kg electromagnet, Sperry ultrasonic attenuation comparator, Calidyne variable frequency 600 shaker, ultrasonic tank for diffraction and absorption studies.

Supplementary Information

At the undergraduate level the department offers a major in electronics and a major in physics teaching as well as a major in physics.

Evening college program. A five year program is available to the part time, evening college student. The program offers all of the necessary courses in chemistry, mathematics, and physics but no liberal arts courses. If at a later time the liberal arts course requirements can be satisfied, the B.S. degree will be granted.

Financial assistance. Teaching and research assistantships offer a stipend of \$1800 for 9 months and tuition is waived. Some assistantships extend over a 12 month period.

LE MOYNE COLLEGE

Faculty

† Robert O. Brennan, S.J., Ph.D., Catholic University, theoretical physics.

Merrell Crandall, Cand. Ph.D., Syracuse, molecular beams.

Charles McCain, M.S., Detroit, electricity and magnetism, electronics, optics.

James Welter, M.S., Notre Dame, mechanics and thermodynamics.

Supplementary Information

Advanced Placement. In order to obtain advanced placement and advanced credit applicants are required to obtain a score of three or better in the CEEB tests for advanced placement.

LOYOLA COLLEGE (BALTIMORE)

Faculty

Elmo L. DiBiagio, M.S., Princeton, soil mechanics.

† James L. Gumnick, Ph.D., Notre Dame, physical electronics.

Larry K. Haines, M.A., Johns Hopkins, nuclear physics.

Howard R. Peiffer, Ph.D., Pennsylvania State.

Frederick Volland, M. Ed., Maryland, engineering drawing.

Bernard J. Weigman, Jr., Ph.D., Notre Dame, acoustics, physical electronics.

Leslie Wolsey, B.S., Michigan, circuit analysis, communication theory.

Current Research

Properties of thin films, photoelectric, thermionic and field emission.

Research Equipment

Analog computer, X-ray spectrometer, wind tunnel, high-vacuum system, photo-elasticity unit, metallograph, radioisotope laboratory.

Supplementary Information

The department also has a major in engineering physics.

LOYOLA UNIVERSITY (CHICAGO)

Faculty

Albert C. Claus, Ph.D., California Institute of Technology, X-ray diffraction.

Abraham Hoffer, Ph.D., Chicago, crystal structure.

John M. Melchioris, M.A., Gonzaga.

Theodore G. Phillips, Ph.D., Chicago, theoretical physics.

J. Donald Roll, S.J., Ph.D., Fordham, nuclear physics.

Current Research

Special methods for growing crystals.

Research Equipment

Electron microscope, nuclear physics laboratory. X-ray diffraction equipment will soon be added.

LOYOLA UNIVERSITY (LOS ANGELES)

Faculty

James Albertson, S.J., Ph.D., Harvard, theoretical physics.
† Charles R. Coony, S.J., M.A., Gonzaga, general physics.
Eugene Kinsey, Ph.D., Virginia, magnetic fluids.
Thomas T. Taylor, Ph.D., California Institute of Technology.
Hanford Weckbach, S.J., M.A., Gonzaga.

Supplementary Information

The physics major program is of recent origin and is designed exclusively for those who plan to pursue graduate studies. There are presently twenty-five students in this program.

LOYOLA UNIVERSITY (NEW ORLEANS)

Faculty

† Francis A. Benedetto, S.J., Ph.D., Fordham, modern physics.
Carl H. Brans, Ph.D., Princeton, relativity.
James C. Carter, S.J., Ph.D., Catholic University, theoretical physics.
Henry A. Garon, M.S., Notre Dame, electronics.
Karl A. Maring, S.J., Ph.D., St. Louis, optics.
Lawrence J. Strohmeyer, M.S., New York University, theoretical physics.

Current Research

New mathematical methods in general relativity. Dr. Brans.
Growth and study of crystals, low temperature physics.

Research Equipment

Seismograph, Collins helium liquefier, two X-ray diffraction units, crystal growing ovens, Bitter-Reed electromagnet, high vacuum systems. The department has an "instrument loan contract" with the Office of Naval Research.

Supplementary Information

The department has a special undergraduate research program in solid state physics sponsored by the NSF for selected sophomores, juniors and seniors.

MARQUETTE UNIVERSITY

Faculty

Edgar D. Berners, Ph.D., experimental nuclear physics, scattering.

Carl E. Edmund, M.S., nuclear emulsions.

Arpad E. Elo, M.S., atomic spectroscopy, Raman and Zeeman spectroscopy.

Richard W. Fink, Ph.D., nuclear spectroscopy.

† Lawrence W. Friedrich, S.J., Ph.D., St. Louis, solid state experimental physics and paramagnetism at low temperatures.

Jack B. Greene, Ph.D., Pittsburgh, theoretical solid state, electronic energy bands.

Frank G. Karioris, M.S., crystal structures of aerosols from exploding wires, biophysics.

Kiuck Lee, Ph.D., Florida, pear-shaped nuclei, theoretical nuclear physics.

Current Research

Nuclear theory, energy levels derived from various potential wells, models based on pear-shaped deformation of the nucleus. Dr. Lee.

Aerosols from exploding wires. Dr. Karioris.

Construction of cryostat for low temperature Raman spectra. Mr. Elo.

Nuclear spectroscopy. Dr. Fink.

Research Equipment

IBM 1620 computer, three scanning microscopes for nuclear emulsions, magnet and associated equipment for magnet studies at liquid helium temperature, GE XRD X-ray spectrometer and associated equipment.

Supplementary Information

Graduate teaching assistantships offer a stipend upwards of \$1800 and tuition is waived. Graduate research assistantships offer a stipend upwards of \$1600 and tuition is waived.

REGIS COLLEGE

Faculty

† Joseph V. Downey, S.J., M.S., St. Louis.

Robert Whitaker, M.S., St. Louis.

Supplementary Information

While the objective of the physics department is to prepare the student for graduate work in physics, no physics major is actually conferred. In-

stead it is recommended that the student who is preparing for graduate work should major in mathematics and take only the fundamental courses in physics which, like the mathematics, are the common requirement for any field of physics in which he may later choose to specialize.

ROCKHURST COLLEGE

Faculty

James P. Coughlin, M.A., Columbia.

† Charles N. Hamtil, Ph.D., St. Louis, group theory and field theory.

John J. Hill, Cand. Ph.D., St. Louis, nuclear magnetic resonance.

Sung K. Park, A.B., Rockhurst.

Research Equipment

The department expects to acquire a scintillation spectrometer and nuclear magnetic resonance equipment. See under chemistry department of Rockhurst College for other equipment which physics uses in common with chemistry department.

Supplementary Information

The department has undergraduate research participation in the Lagrangian formulation of classical mechanics, special relativity and field theory.

ST. JOSEPH'S COLLEGE

Faculty

Robert C. Bowe, M.S., University of Pennsylvania, electricity and magnetism.

Charles R. Connell, B.S., Drexel, hydrodynamics.

Thomas P. Foley, M.S., University of Pennsylvania, ferromagnetics.

Brian E. Gaffney, B.S., St. Joseph's, acoustic non-destructive testing.

Howard J. Heim, S.J., A.B., Woodstock, ultrasonics.

J. Richard Houston, M.S., University of Pennsylvania, transport phenomena in metals and semiconductors.

William W. Kuhn, B.S., Drexel, analysis.

William A. MacNamara, Jr., M.S., University of Pennsylvania, magnetic computer cores.

† John S. O'Connor, S.J., M.S., Massachusetts Institute of Technology, nuclear physics, gamma ray spectra.

S. R. Pollack, Ph.D., University of Pennsylvania, solid state tunnelling.

John P. Waldron, Ph.D., Notre Dame, photoelectric effect, optical reflectivity in metals.

Current Research

Electron magnetic resonance, microwave techniques, isotope technology.

Research Equipment

Five curie plutonium beryllium source, two scintillation spectrometers, propane bubble chamber, Clarendon 4 inch magnet, oven for solid state samples, Westinghouse machine for motor-generator studies. Expected acquisitions include a Varian 4 inch magnet and mass spectrometer, extensive nucleonics laboratory.

Supplementary Information

St. Joseph's and various corporations and government agencies have a cooperative plan for a student to obtain a B.S. in electronic physics. Beginning with their third year students enrolled in the cooperative program for electronic physics alternate, term by term, between academic study at the College and industrial work at one of the dozen corporations and government agencies which are participating in the plan.

ST. LOUIS UNIVERSITY

Faculty and Research Fields

William A. Barker, Ph.D., St. Louis, production and detection of nuclear orientations; the applications of the thermodynamics of irreversible processes to problems in the solid state; nuclear magnetism; application of relativistic wave equations to solid state physics.

Alexander V. Bushkovitch, Ph.D., Pennsylvania, theory of pressure broadening in microwave spectroscopy; Fermi-Thomas statistical method in molecular theory; theory of beta and gamma decay; group theory methods in quantum mechanics; quantum field theory; elementary particle theory.

Zenebius V. Chraplyvy, Ph.D., Lemberg, approximate forms of two-body relativistic wave equations; negative energy states in relativistic wave equations; scattering theory.

Robert M. Delaney, Ph.D., St. Louis, low energy neutron scattering; temperature measurements in plasmas using neutron scattering; quantum theory of fields.

Vincent P. Jacobsmeier, S.J., Ph.D., St. Louis, solid state physics and physical electronics, photoelectric emission, photoconductivity, semi-conducting properties of boron, nuclear and electron paramagnetic resonance.

James F. McGee, Ph.D., Stanford, X-ray microscopy, electron optics, X-ray diffraction, X-ray phenomena of the solid state, radiation damage, missile guidance and control analysis, servo-mechanisms.

H. U. Rhoads, M.S., St. Louis, electron microscopy, thin films, liquid structure studies, physics of viruses.

Arthur G. Rouse, Ph.D., Iowa State, decay of photoluminescence, cathodoluminescence, photoconductance; thermal and radiative aspects of luminescence.

† Alfred H. Weber, Ph.D., Pennsylvania, neutron, electron and X-ray scattering; beta and gamma ray spectroscopy; electron optics; plasma physics; physics of viruses.

Research Equipment

Two beta ray spectrometers, electron microscope, electron and X-ray diffraction apparatus, X-ray reflection microscope, two quartz optical spectrographs, Hall coefficient magnet, Varian EPR and NMR spectrometer with associated low temperature system, IBM 1620 digital computer. Thesis research at Argonne National Laboratory is possible. The department expects to acquire a 3 Mev deuteron cyclotron as a gift from Stanford University.

Supplementary Information

The graduate research and teaching assistantships offer a stipend of \$2500 for a nine month period.

The department actively cooperates in the program of the Associated Midwest Universities of the Argonne National Laboratory which includes participation in the Midwest Accelerator (12.5 Bev synchrotron) group and with the Marshall Space Flight Center at Huntsville, Alabama.

ST. PETER'S COLLEGE

Faculty

† Cornelius C. Galvin, M.Sc., National University of Ireland, ionization.
James J. Grant, M.S., Rensselaer Polytechnic Institute, theoretical physics.

Po Lee, Ph.D., Southern California, plasma physics.

V. Madhyastha, M.S., Bombay, theoretical physics.

John Sein, M.S., Yale, theoretical physics.

Current Research

Plasma physics, gaseous discharge through a metallic capillary.

Research Equipment

Well-equipped nuclear laboratory including a subcritical reactor.

Supplementary Information

Undergraduates participate in the NSF-sponsored plasma physics research.

UNIVERSITY OF SAN FRANCISCO

Faculty

Ronald V. Alves.

Philip S. Applebaum, M.A., California.

Edward J. Farrell, M.S., Stanford.

Cornelius A. Pulskamp, Ph.D., California.

George Saphir, Ph.D., California, atomic and nuclear physics, quantum mechanics.

† Karl J. Waider, M.A., California, electricity and magnetism, electronics.

Current Research

Atomic and nuclear physics, electronics.

Research Equipment

Electron microscope, nuclear and electronics laboratories.

Supplementary Information

The department also has a major in electronic physics.

SCRANTON UNIVERSITY

Faculty

Johannes G. Gschwendtner, Ph.D., Vienna, meteorology, hydrology.

† Joseph P. Harper, Ph.D., Texas, nuclear physics.

Eugene A. McGinnis, Ph.D., Fordham, optical and molecular spectroscopy.

William F. Radle, Ph.D., Catholic University, nuclear physics.

Current Research

Effect of heat, pressure, and neutron bombardment on crystals determined by X-rays; beta ray scattering.

Research Equipment

Neutron howitzer (5 curies Pu), Philips X-ray spectrometer, Baird-Atomic infrared spectrophotometer, Nuclear-Chicago recording gamma ray spectrometer, alpha, beta, and neutron counters.

Supplementary Information

The department also has a major in physical electronics.

SEATTLE UNIVERSITY

Faculty

Thomas Cheng, M.S., St. Bonaventure's.

† James J. Cowgill, S.J., Ph.D., Notre Dame.

Shu-Koo Kao, Ph.D., Carnegie Institute of Technology, high energy nuclear physics.

Harry Kinerk, Ph.D., Palermo.

Paul Luger, S.J., M.S., Fordham, radiation physics.

Current Research

Half-life measurements, cloud chamber studies.

Research Equipment

Recording electrometer, Gammacell 220 cobalt-60 radiation facility, subcritical reactor. An IBM 1620 computer will be acquired in the Fall of 1963.

Supplementary Information

During the summer a program is offered leading to the degree of Master of Science in Natural Sciences for high school teachers. Forty-five hours are required for the degree, twenty-five in one field and twenty in the other two fields of physics, chemistry, and mathematics. The twenty master's students listed in the table are taking part in this program. These students receive NSF stipends.

SPRING HILL COLLEGE

Faculty

Louis J. Eisele, S.J., M.S., St. Louis, seismology.

Vernon H. Head, M.S., Harvard.

† Walter J. Rhein, S.J., Ph.D., Texas, neutron physics.

Current Research

Seismograph recording for the United States Coast and Geodetic Survey, the study of local microseisms.

Research Equipment

Nine seismographs.

XAVIER UNIVERSITY

Faculty

Edward A. Bradley, S.J., M.S., seismology, geophysics, topography of the Antarctic.

† John B. Hart, M.S., modern physics.

William Marcaccio, M.S., electricity and magnetism, computers, optical-radio satellite tracking.

Boris Podolsky, Ph.D., theoretical physics.

Leo J. Vollmayer, S.J., M.S., general physics.

Frederick G. Werner, Ph.D., nuclear theory, foundations of quantum mechanics.

Current Research

Study of the inner ear using an analog computer.

Theoretical study of the foundations of quantum mechanics.

Visco-elastic constants of high polymers from measurements of the mechanical impedance of an oscillating sphere.

Seismological studies involving the Cincinnati Arch.

Theoretical study of relativistic electrodynamics.

Research Equipment

Optical pumping laboratory, analog computer, seismological station, neutron howitzer, visco-elastometer.

Supplementary Information

Xavier plans a graduate program in theoretical physics with emphasis on interdisciplinary studies involving the philosophy, mathematics, chemistry, and biology departments.

The average of eight seniors who took the graduate record examination was in the 89th percentile with three of the eight in the 99th percentile.

Financial assistance. NSF undergraduate research projects are usually available each summer. These pay \$60 per week for a period of ten weeks.

ASTRONOMY

GEORGETOWN UNIVERSITY

Faculty

† Francis J. Heyden, S.J., Ph.D., Harvard, stellar photometry, spectroscopy.

Carl C. Kiess, Ph.D., California, spectroscopy, planetary physics.

Sidney Reed, Ph.D., Catholic University, astrophysics.

Vera C. Rubin, Ph.D., Georgetown, galactic structure, stellar dynamics.

John Vinti, Ph.D., Massachusetts Institute of Technology, celestial mechanics.

Raymond H. Wilson, Ph.D., Pennsylvania, practical astronomy.

Current Research

Planetary atmospheres. Spectroscopic studies with high dispersion spectrographs for determination of the chemical constitution of planetary atmospheres, principally of Mars, Jupiter and Venus. Father Heyden and Dr. Kiess.

Galactic structure. Determination of galactic features by a study of the space distribution, radial velocities and proper motions of O and B type stars. Dr. Rubin.

Spectrophotometry. Luminosity and spectral classification by microdensitometer tracings of Schmidt objective prism plates.

Faint lines in the solar spectrum. Measurement and classification of faint lines in the spectrum of the sun. Father Heyden.

Photometry. Use of narrow-band interference filters to determine parameters for luminosity and spectral classification of early type supergiant stars. Father Heyden.

Extra-galactic nebulae. Photometric studies by microdensitometer tracings of extra-galactic nebulae. Dr. Rubin.

Research Equipment

A 12 inch refracting telescope, a 5 inch refracting telescope; three astrographic cameras, two of 3 inch aperture and 63 inch and 21 inch focal length respectively, and one of 5 inch aperture and 35 inch focal length; two Wadsworth type spectrographs. Societe Genevoise comparator, a type 29C Telereader and a type 8A Telecordex, Burroughs E101 electronic computer, Littrow mounting prism spectrograph.

† Chairman of the department.

Supplementary Information

The program for an undergraduate major in astronomy was begun in the Fall of 1962.

GEOLOGY

BOSTON COLLEGE

Faculty

Emanuel G. Bombolakis, Ph.D., Massachusetts Institute of Technology, structural geology and rock mechanics.

George D. Brown, Jr., Ph.D., Indiana, paleontology, micropaleontology, stratigraphy.

Peter J. Gielisse, Ph.D., Ohio State, equilibrium studies in metamorphic rocks.

Hugo N. Halpert, M.S., Michigan, soil mechanics.

† James W. Skehan, S.J., Ph.D., Harvard, regional tectonics.

Current Research

Surface mapping along the line of an eight mile long bedrock tunnel and correlation with the subsurface which has already been mapped.

Synthesis of available data both published and unpublished on the regional tectonics of widely scattered regions of the world.

Microscopic study of the petrology and petrography of igneous and metamorphic rocks.

Astogenetic studies of widespread and easily recognized species of trepantomatous bryozoa to obtain information concerning their zoarial histories.

Experimental studies in rock mechanics and regional tectonics.

Research Equipment

One field vehicle with seismic equipment and one field truck for geologic studies, micro-chemical laboratory, Frantz magnetic separator, Felker Dimet diamond saw, laboratory jaw crusher and rock pulverizer, complete set of sieves for partial differentiation, 5 petrographic microscopes, one set of SIE field seismic units, one Askania magnetometer, 2 electrical resistivity units, straining frame for testing rocks under compression, polariscope for photoelectric stress analysis.

Supplementary Information

The general geology course in physical and historical geology is divided into two separate classes, one for the general science requirement and the other for honors students and geology majors.

Students enrolled in the NSF undergraduate research participation program assist in the projects listed above under "Current Research."

It is possible for students to use the facilities of the Weston Observatory, the geophysics laboratory of Boston College, the headquarters of the Weston Geophysical Engineers and the Weston Geophysical Research Companies.

ST. LOUIS UNIVERSITY

Faculty

† Victor T. Allen, Ph.D., California, sedimentary petrography, alumina ores, ceramic clays.

Charles B. Belt, Ph.D., Columbia, trace elements in ores.

Kenneth G. Brill, Ph.D., Michigan, paleontology, stratigraphy, petroleum geology.

Albert J. Frank, Ph.D., St. Louis, mineralogy, crystallography.

Current Research

Construction and description of symmetry models of principal space groups.

Cooperative project with Hawaii Agricultural Experiment Station on the genesis of Hawaiian bauxite.

Cooperative projects with Missouri Geological Survey concerning water resources on geologic maps and reports on geology of St. Louis city and county; also Burlington-Keokuk formations in the upper Mississippi valley.

Atomic absorption spectrophotometer studies of Zn, Pb and other elements in ores.

Cooperative study with the department of geophysics on paleomagnetism of rocks.

Research Equipment

Atomic absorption spectrophotometer for trace elements, Philips X-ray diffraction apparatus, Frantz isodynamic separator, Frantz polish surface equipment for ore minerals, 5-axis universal stage, petrographic and sedimentation equipment.

Supplementary Information

This is the only Catholic university in the country with a curriculum in geological engineering which is accredited by the Engineers Council for Professional Development.

For two consecutive years seniors in geology have won first prize in the national essay contest sponsored by the Institute of Mining Engineers, New York.

GEOPHYSICS

BOSTON COLLEGE

Faculty

Richard J. Holt, M.S., Boston College, statistical analysis of seismic events, propagation of seismic waves through overburden material.

Robert O. Hutchinson, M.S., Boston College, geomagnetism.

† Daniel Linehan, S.J., M.S., Harvard, application of seismic techniques to engineering problems, evaluation of seismic instrumentation, structural studies from seismic evidence, earthquake resistant engineering.

Paul F. Twitchell, M.S., Boston College, dynamical and statistical modeling of atmosphere, relationship of meteorological parameters to other geophysical disciplines.

Current Research

Regional seismicity studies through telemetered signals from New England network of seismic substations.

Investigation of correlations between geomagnetic, telluric current and atmospheric electrical phenomena.

Evaluation of seismic instrumentation compared with a world-wide standardized seismic system.

Collection of ionospheric data from satellite radio signals detected by a tripartite antenna array.

Cooperative program with the United States Coast and Geodetic Survey in operation of a world-wide standardized seismic system for recording and analyzing of local and teleseismic events.

Research Equipment

World-wide standardized seismic system, IBM 1620 computer, Benioff long and short period seismic system, universal torsion magnetometer, total field rubidium vapor magnetometer.

Supplementary Information

Assistantships are granted on a ten month basis, September to June, and provide a maximum stipend of \$2000. It is also possible to obtain either a partial or total remission of tuition. These assistantships are limited to one ten month period.

ST. LOUIS UNIVERSITY

Faculty

Victor J. Blum, S.J., Ph.D., St. Louis, dean, Institute of Technology.

Chi-Fung Chow, M.S., St. Louis, severe storms.

† Ross R. Heinrich, Ph.D., St. Louis, air and ground vibrations.
Leonard C. Jones, Ph.D., St. Louis, atmospheric radiation and instrumentation.

Carl Kisslinger, Ph.D., St. Louis, generation of seismic waves.

Emil J. Mateker, cand. Ph.D., St. Louis, exploration geophysics.

Clifford Murino, Ph.D., St. Louis, analysis of meteorological data from satellites.

Otto W. Nuttli, Ph.D., St. Louis, shear waves.

Albert J. Pallman, Ph.D., Cologne, atmospheric turbulence.

William V. Stauder, S.J., Ph.D., University of California, mechanism for earthquakes.

Stanislaw Vincenz, D.Sc., University of London, mechanism of earthquakes.

Current Research

Seismology. Studies of earthquake mechanisms and explosion-generated seismic waves.

Tectonophysics. Studies of regional earthquake structure.

Geomagnetism. Studies of rock paleomagnetism in cooperation with the department of geology.

Meteorology. Analysis of radiation data from satellites, studies of meso-scale atmospheric pressure variations, electromagnetic radiation.

Research Equipment

IBM 1620 computer, field stations for seismology, electron microscope, magnetometers, seismometers, specialized vibration equipment, automatic curve analyzer and card punch, magnetic tape for analysis of low frequency spectra, gravimeters.

Supplementary Information

In addition to the graduate students listed in the table, there are 16 special graduate students.

In addition to the departmental teaching and research assistantships, the following types of financial aid are available: Continental Fellowship Grant, Sinclair Fellowship Grant, Shell Fellowship Grant, NASA Trainee Fellowships.

Special undergraduate programs. In addition to the programs leading to the B.S. in geophysics and the B.S. in meteorology, undergraduate programs

are offered in the Geophysical Engineering Institute of Technology and the Professional Meteorology Institute of Technology.

Special graduate program. In addition to the programs leading to the M.S. and Ph.D. in geophysics and the M.S. in meteorology, there is a program with no thesis requirement leading to the M.S. in professional geophysics.

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JESUIT COLLEGES AND UNIVERSITIES IN THE UNITED STATES

Boston College
Chestnut Hill 67, Mass.

Canisius College
2001 Main St.
Buffalo 8, N.Y.

Creighton University
Omaha 31, Neb.

University of Detroit
4001 W. McNichols Rd.
Detroit 21, Mich.

Fairfield University
Fairfield, Conn.

Fordham University
New York 58, N.Y.

Georgetown University
Washington 7, D.C.

✓ Gonzaga University
Spokane 2, Wash.

College of the Holy Cross
Worcester 10, Mass.

John Carroll University
University Heights
Cleveland 18, Ohio

LeMoyne College
LeMoyne Heights
Syracuse 3, N.Y.

Loyola College
4501 N. Charles St.
Baltimore 10, Md.

Loyola University
6525 Sheridan Rd.
Chicago 26, Ill.

Loyola University
7101 W. 80th St.
Los Angeles 45, Calif.

Loyola University
6363 St. Charles Ave.
New Orleans 18, La.

Marquette University
1131 W. Wisconsin Ave.
Milwaukee 3, Wisc.

Regis College
W. 50th and Lowell Blvd.
Denver 21, Col.

Rockhurst College
5225 Troost Ave.
Kansas City 10, Mo.

St. Joseph's College
Philadelphia 31, Pa.

St. Louis University
St. Louis 3, Mo.

St. Peter's College
2641 Hudson Blvd.
Jersey City 6, N.J.

✓ University of San Francisco
San Francisco 17, Calif.

University of Santa Clara
Santa Clara, Calif.

✓ Scranton University
333 Wyoming Ave.
Scranton 3, Pa.

Seattle University
Broadway and Madison
Seattle 22, Wash.

Spring Hill College
Mobile 22, Ala.

Wheeling College
316 Washington Ave.
Wheeling, W. Va.

Xavier University
Victory Pkwy.
Cincinnati 7, Ohio

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Weston College, Weston, Massachusetts

OFFICIAL REPORTS AND NOTICES

Notice of Annual Meeting

The thirty-eighth annual meeting of the American Association of Jesuit Scientists (Eastern States Division) will be held at Boston College beginning on Tuesday evening, August 27 and continuing until Thursday, August 29, 1963.

Very Reverend Michael P. Walsh, S.J. has invited the members of the Association to Boston College to help celebrate in a fitting way the Centennial of Boston College.

Titles for planned papers should be sent to the President, Rev. James W. Skehan, S.J., Chairman, Department of Geology, Chestnut Hill 67, Massachusetts by the sectional chairman before July 25th. A proposed special feature of the meeting will be a panel or open forum discussion of the topic "The Future of Jesuit Scientific Education and Research." Information concerning the meeting including details of travel facilities to and from Boston will be mailed to each member of the AAJS before August 1, 1963.

JAMES W. SKEHAN, S.J., *President*