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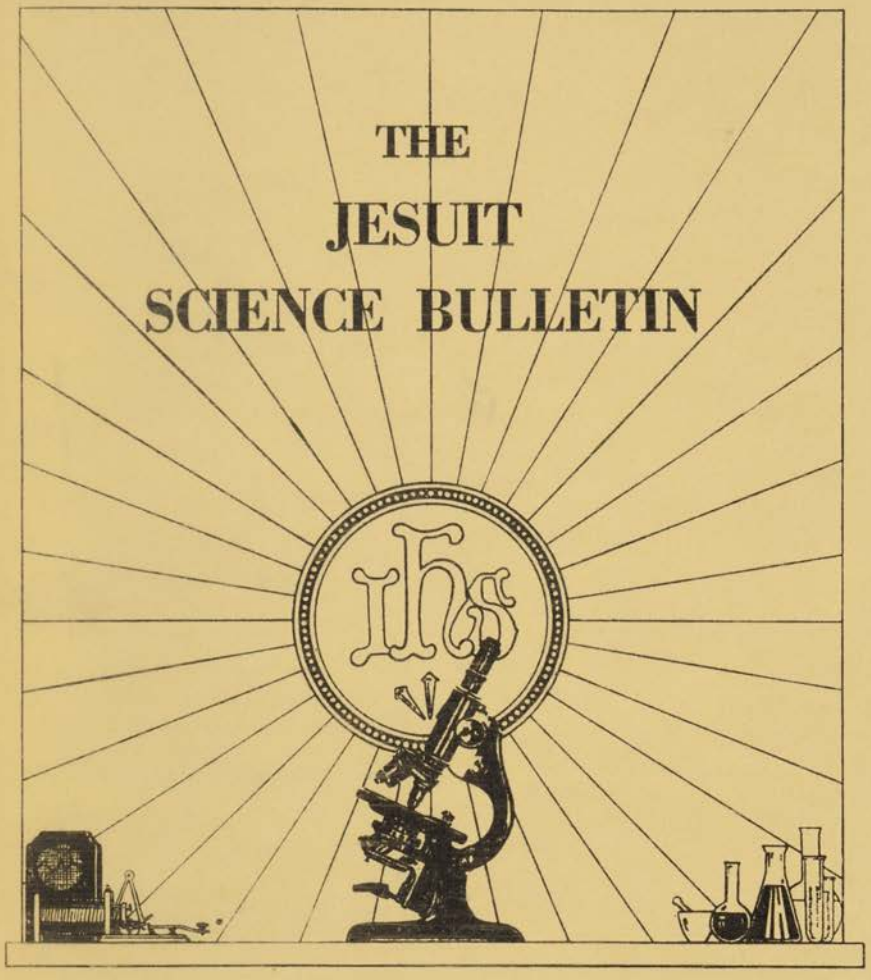
THE JESUIT SCIENCE BULLETIN



AMERICAN ASSOCIATION OF JESUIT SCIENTISTS

(Eastern States Division)

Vol. XXXIV NOVEMBER 1956 No. 1

A. M. D. G.

BULLETIN

of the

American Association of Jesuit Scientists

Eastern States Division

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PROCEEDINGS

OF THE

THIRTY-FIRST ANNUAL MEETING

August 26, 27, and 28, 1956

GEORGETOWN UNIVERSITY

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Vol. XXXIV **NOVEMBER 1956** **No. 1**

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Bulletin of the American Association of Jesuit Scientists

EASTERN STATES DIVISION

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NOTICE TO AUTHORS

Manuscripts are to be submitted to associate editors of the appropriate section and *may* be submitted directly to the editor in chief. Clear manuscript, preferably typed, with wide margin to the left, with double spacing between lines, is desirable. Please try to follow the typographical style of the most recent issue of the Bulletin. Line drawings should be submitted on Bristol board, or similar material, and done in India ink. Figure number should be written on this in pencil. Titles for drawings, with figure numbers, should be typed on a separate sheet. Please try to minimize footnotes. Appended references and bibliographies, clearly so marked, should be done in the style of the A.A.A.S. publication, *Science*.

Program

31st Annual Meeting — Georgetown University

Sunday, August 26, 1956

4.30 P.M. Meeting of the Executive Council
Student Activities Room, Old North II

5.30 P.M. Preprandial Assembly, Maguire Dining Room

6.00 P.M. Dinner. Maguire Dining Room

7.00 P.M. Georgetown University Forum, Television
Washington Club Lounge, New North

8.00 P.M. GENERAL SESSION. McNair Lecture Hall, New North

Address of Welcome

VERY REVEREND EDWARD B. BUNN, S.J.
President of Georgetown University
Address: Some Noted Jesuit Scientists
REV. JOHN P. DELANEY, S.J.
President of the Association

9.00 P.M. *Haustus* Assembly
Lawn of the Georgetown Observatory

Monday, August 27, 1956

7.30 A.M. Breakfast. Maguire Dining Room

9.00 A.M. MEETINGS OF THE SECTIONS:
Biology: in Healy I
Chemistry: in Healy I
Mathematics: in Healy I
Physics: in basement of the Healy Bldg.

11.30 A.M. Luncheon. Maguire Dining Room

12.20 P.M. INSPECTION VISITS. DEPARTURE
National Institutes of Health
Naval Research Laboratory

5.30 P.M. *Address: The National Science Foundation*
Dr. Raymond Seegar
NSF Program Dir., Physics and Astronomy

6.30 P.M. Buffet Dinner
Lawn of the Georgetown Observatory
Dr. Seegar, Guest of Honor

Tuesday, August 28, 1956

7.30 A.M. Breakfast. Maguire Dining Room

9.00 A.M. MEETINGS OF THE SECTIONS
Election of Officers. Unfinished Business

10.00 A.M. FINAL GENERAL SESSION
Business Meeting. Election of Officers

12.15 P.M. Dinner. Maguire Dining Room

PROGRAM OF THE SECTIONS

The Biology Section REV. ROCHE G. BELMONTE, S.J., CHRMN.

The Anatomy of Chromosomes and Genes
Rev. Joseph P. Lynch, S.J., LeMoyne College

Genetics in a Liberal Arts Program
Rev. Michael P. Walsh, S.J., Boston College

A Mutating Theory
Rev. James A. McKeough, S.J., Fordham University

Pioneers, Opportunists or Scientists
Rev. Anthony J. MacCormack, S.J., College of the Holy Cross

The Chemistry Section REV. JOSEPH A. DUKE, S.J., CHRMN.

Importance of Degerearcy in Molecule Formation:
I. Donald I. MacLean. II. Robert C. Cloney
Catholic University of America

Nuclear Magnetic Resonance
Paul J. McCarthy, S.J., Woodstock College

Vapor Phase Chromotography
Rev. George J. Hilsdorf, S.J., St. Peter's College

Infrared and Structural Determination
Rev. Clarence J. Schubert, S.J., Fordham University

Molecular Orbital Study of Be_4. A Research Report
Robert C. Cloney, S.J., Catholic University of America

Muscle Protein Research. A Research Report
Rev. Joseph A. Duke, S.J., Georgetown University

The Mathematics Section REV. JOHN F. CAULFIELD, S.J., CHRMN.

Linear Operators
Rev. Charles J. Lewis, S.J., Fordham University

Axiomatic Structure for Algebra
Rev. Stanley J. Bezuszka, S.J., Boston College

What is a Moore-Smith Sequence?
Frederick A. Homann, S.J., St. Louis University

Consistency
Rev. Walter J. Feeney, S.J., Weston College

Levi-Civita's Concept of Relative Parallelism
Frederick A. Homann, S.J., St. Louis University

The Physics Section REV. ROBERT B. MACDONNELL, S.J., CHRMN.

Rare Gas Lines as Wavelength Standards
Rev. Matthew Thekaekara, S.J., Johns Hopkins University

An Introduction to Recoupling Theory
Frank R. Haig, S.J., Catholic University of America

Optical Methods in Nuclear Magnetic Resonance Spectroscopy
Rev. Joseph F. Mulligan, S.J., Fordham University

Carbon-Nitrogen Double Bond in the Infra-Red Spectrum
Rev. James J. Devlin, S.J., Boston College

Effect of Ultrasonics on Visibility
Rev. Joseph L. Murray, S.J., Cranwell Preparatory School

Concept of Negative Absolute Temperatures
Rev. Robert O. Brennan, S.J., LeMoyne College

Pulsed Van de Graff Accelerators
Rev. William G. Guindon, S.J., Boston College

The Shell Model of the Nucleus
James C. Carter, S.J., Woodstock College

FIRST GENERAL MEETING

The thirty-first annual meeting of the American Association of Jesuit Scientists, Eastern States Division, was called to order by the president, Rev. John P. Delaney, at 8:00 *p.m.* on the 26th of August at Georgetown University. The site of the meeting was McNair Lecture Hall in Old North.

Fr. Delaney introduced Very Rev. Edward B. Bunn, S.J., President of Georgetown University, who cordially welcomed the members of the Association in behalf of himself and the community.

The minutes of the previous meeting at Fordham University were approved as presented in the BULLETIN.

Fr. Delaney commented briefly on a discussion of the Jesuit Science BULLETIN by the Executive Council in their afternoon session, informing the members that certain changes were in prospect. Comments and suggestions on the BULLETIN by any of the members were welcomed and could be given to the members of the Executive Committee.

The following committees were appointed by the president: committee on resolutions, Rev. James P. McCaffrey, chairman; Rev. Joseph F. Mulligan and Rev. Howard J. Heim; committee on nominations, Rev. Francis J. Heyden, chairman, Rev. Michael P. Walsh, and Rev. Thomas J. Smith.

The Presidential Address was given by Fr. Delaney on the subject: Some Noted Jesuit Scientists. In this talk Fr. Delaney called attention to the many significant contributions to scientific knowledge and achievement, past and present, by illustrious Jesuit scientists and emphasized the great scientific tradition of the Society through the four hundred years of its existence.

The secretary asked that the new members attending the convention for the first time, submit their names and addresses, so that they might be added to the roll of members and receive the BULLETIN.

Fr. Mulligan requested from the President a more detailed account of the discussion of the Executive Council relative to the proposed changes in the BULLETIN. Fr. Delaney then invited Fr. Heyden who had assisted him at the Executive meeting to explain the proposed changes. Fr. Heyden's remarks, in summary, were as follows:

1. The format of the BULLETIN would remain the same.
2. Technical articles would not be published in the BULLETIN, the authors are urged rather to publish these papers in the journals dealing with their respective fields.

3. News items of general interest to all members of the Association would be asked from each science department in the several Colleges and Universities. It is hoped in this way to further interest in and appreciation of the scientific work sponsored and supported by Jesuit schools in the eastern states region. Examples of such material would be: names of faculty members, Jesuit and laymen; information of grants received, summaries of research programs in progress, graduate facilities and enrollment, etc.
4. Articles of genuine interest to the members of the Association that might not otherwise be published should be printed in the BULLETIN.
5. Obituaries of deceased members of the Association should be printed in the BULLETIN.

Fr. Delaney adjourned the meeting at 8:50 p.m.

FINAL GENERAL SESSION

The final general session of the AAJS (ESD) was called to order by Fr. Delaney at 10:15 a.m. on August 28th in McNair Lecture Hall.

Fr. Delaney announced that the editor of the BULLETIN, Rev. John J. McCarthy, had requested to be relieved of this office due to several other duties he has been required to undertake. In acceding to this request, Fr. Delaney expressed the heartfelt thanks of the members of the Association to Fr. McCarthy for his many years of labor in behalf of the BULLETIN. It was then formally moved, seconded and unanimously passed that the Association express its deep appreciation to Fr. McCarthy for his generous labors.

Fr. Delaney announced the appointment of Rev. Bernard A. Fiekers as the new editor of the BULLETIN. In response to Fr. Delaney's request, Fr. Fiekers briefly outlined his own views about the BULLETIN, his plans to improve the BULLETIN along the lines suggested by Fr. Heyden and closed with an appeal to all the members to support the new plans by contributing the necessary copy.

The Treasurer's report was read by Fr. O'Conor. It was moved, seconded and passed that the treasurer's report be accepted as read.

Brief discussions followed on several points in connection with the BULLETIN. The question was raised about the usefulness of devoting one issue of the BULLETIN to abstracts of papers already presented. Fr. Duke inquired about the possibility of publishing the convention program in the issue prior to the convention. Fr. Heyden, as program chairman of the present convention, pointed out several

difficulties involved in trying to arrange a program several months in advance.

The report of the resolutions committee was presented by Fr. McCaffrey:

1. Be it resolved that the AAJS (ESD) express its gratitude to Rev. Edward B. Bunn, S.J., President of Georgetown University, to Rev. Joseph J. McGovern, S.J., Georgetown's Father Minister and to the Georgetown community for their cordial reception and generous hospitality during the convention.

2. Be it resolved that the Association express its gratitude to Rev. John P. Delaney, S.J., President, and to Rev. Francis J. Heyden whose great generosity contributed so much towards making this meeting so enjoyable and profitable.

3. Whereas this Association has on the deaths of Rev. James J. Deeley, Rev. Joseph J. Molloy and Rev. Frederick R. Frohnhoefer lost three of its devoted members, be it resolved that this Association express its profound regret at this loss, and that the members commend to God the soul of these Jesuit scientists.

4. Whereas, in the death of Rev. James B. Macelwane, Jesuit science in the United States has lost one of its greatest lights, be it resolved that this Association express its profound regret at this loss, and that the members commend to God the soul of this great Jesuit scientist.

5. Be it resolved that the secretary of the Association be instructed to send a copy of these resolutions to Rev. Father Rector and Father Minister of Georgetown, a copy of the resolution on Fathers Deeley, Frohnhoefer and Molloy to their nearest relatives, and a copy of the resolution on Father Macelwane to the Rev. Provincial of the Missouri Province and to the President of St. Louis University.

(signed) JAMES P. MCCAFFREY, S.J. (c)
JOSEPH F. MULLIGAN, S.J.
HOWARD J. HEIM, S.J.

Fr. Heyden, reporting for the committee on nominations, announced that Rev. Gerald F. Hutchinson, S.J. of Fairfield University had been nominated for the office of President. It was moved, seconded and passed that the nominations be closed. Fr. Hutchinson was unanimously elected. In his absence Fr. Delaney continued to preside.

Fr. Beining moved that the Association express its esteem of the work of Fr. P. H. Yancey, S.J. of the New Orleans Province in behalf of the Albertus Magnus Guild. This motion was seconded and passed unanimously.

There being no further business to discuss, Fr. Delaney adjourned the meeting at 11:00 a.m.

Respectfully submitted,

GEORGE L. DRURY, S.J.
Secretary, AAJS (ESD)

LETTER FROM THE VERY REVEREND JOSEPH P. FISHER, S.J., PROVINCIAL OF THE MISSOURI PROVINCE, S.J., ACKNOWLEDGING THE RESOLUTION ON THE LATE REV. JAMES B. MACELWANE, S.J.

September 14, 1956

Jesuit Science Association

Dear Fathers:

I am grateful for the resolution expressing regret for the death of Father Macelwane passed by the members of the Jesuit Science Association at their 1956 meeting. He was a great scientist and a great Jesuit. It is becoming that his memory be kept fresh.

We had thought of the possibility of erecting a memorial to Fr. Macelwane in the form of a badly needed building for the Institute of Technology, which he founded and in which he was vitally interested. But we find that although Father Macelwane was highly respected, it is difficult to interest many in such a memorial.

If the Jesuit Science Association ever contacts anyone who expresses himself interested in doing something for a permanent memorial in honor of Fr. Macelwane, the man's desire could be fulfilled in the above manner.

Sincerely yours in Christ,

(signed) JOSEPH P. FISHER, S.J.

PRESIDENTIAL ADDRESS

SOME NOTED JESUIT SCIENTISTS

Rev. John P. Delaney, S.J.,
Loyola College, Baltimore

The opening of the annual meeting of Jesuit scientists usually offers occasion for a paper on some recent advances of special interest to the speaker. But in this anniversary year the four hundredth of Jesuit science, a brief review touching on a few highlights of these four hundred years, might be more interesting.

This review might be presented partially in reverse, to begin with our lately lamented Jesuit scientist, Father James Bernard Macelwane, S.J., widely renowned scholar and humble priest.

James Bernard Macelwane, 1883-1956. Native of Ohio, Father Macelwane did undergraduate studies at St. Louis University and continued there to the M.A. and M.S. degrees. Later study at the University of California, Berkeley, led to the Ph.D. in 1923 and to his appointment as assistant professor of seismology at Berkeley and at the Lick Observatory. Returning in 1925 to St. Louis University as Professor of Geophysics, Father Macelwane began a tenure of thirty years of brilliant achievement. Dean of the Graduate School, organizer and Dean of the School of Technology, organizer and inspiration of the Jesuit Seismological Association and of the Eastern Section, Seismological Society of America, author of several treatises and of 133 technical papers to scholarly journals, active member in over twenty learned societies and holding office in many of these, Father Macelwane was a dynamo of productive scholarship. He was appointed to the Research and Development Board, Department of Defense, to the Scientific Advisory Board USAF, to the Committee on Institutional Research Policy of the American Council on Education, by Presidential appointment to the National Science Board of the National Science Foundation, and to Chairmanship of the U. S. Technical Panel on Seismology and Gravity for the International Geophysical Year. Member of the National Academy of Sciences, many other honors came to Father Macelwane:—honorary degrees, medals, and distinguished lectureships.

Father Macelwane's professional affiliations include: Research and Development Board (Panel chairman), American Association for the Advancement of Science (fellow and past vice-president), Geological Society of America, American Geographic Society, American Physical Society (fellow), Seismological Society of America (past president), Jesuit Seismological Association (many years president), American Meteorological Society, American Geophysical Union (president),

Mining and Metallurgical Engineers, Missouri Academy of Science (past president), St. Louis Academy of Science (past president), Optical Society of America, National Research Council, National Academy of Sciences, Societa Meteorologica Italiana, Society of Exploration Geophysicists, American Association of Petroleum Geologists and the Sigma Chi.

His published books include the following items: Theoretical Seismology (two volumes, with Fr. F. W. Sohon, S.J.), Physics Laboratory Manual (five volumes with Father Shannon), When the Earth Quakes, Compendium of Meteorology, and the Internal Constitution of the Earth (joint author). References: American Men of Science. Contemporary editions; Who's Who in America. Contemporary editions; Transactions of the American Geophysical Union, *37* (no. 2), Apr. 1956; Science, *123* (no. 3208), June 22, 1956.

Other recent losses to Jesuit science merit mention, Father Paul McNally, noted for his many successful eclipse expeditions ranging from Russia to the far Pacific; also Father Pierre Teilhard de Chardin, celebrated paleoanthropologist who well merited a full page obituary in *Science*.

So many living associates add lustre to Jesuit science that selection for mention is difficult, but notable are Father Bernard Hubbard, Alaskan explorer, recalling the exploits of Pere Marquette and other Jesuit explorers, and noted also for his publications in geology, ethnology and paleoanthropology, covering the migration of nations from Asia to America. Notable also is Father E. Gherzi, now at New Orleans, for a lifetime Director of the Zikawei Observatory, Shanghai, member of the Pontifical Academy of Science; also Father Frank Heyden, who was commissioned to the unprecedented task of directing sixteen eclipse expeditions along the path of totality in 1954 and eleven such expeditions in 1955; also Father Repetti, for many years seismologist, the Manila Observatory where he published a wealth of data and, best of all, a valuable history of the Observatory; and Father Henry M. Brock who has trained so many Jesuit scientists and also contributed invaluably to Jesuit science in his scholarly entries of famous Jesuit Scientists written for that greatest monument in English to Catholic scholarship, the *Catholic Encyclopedia*.

Such numbers of notable Jesuit scientists come to mind that it might seem their number is out of all due proportion. Remarkably that is absolutely true, and it has been the demonstrable truth since St. Ignatius directed the opening of the first Jesuit colleges four hundred years ago.

Johann Poggendorf, the encyclopedic biographer of scientists

nearly a century ago, a notable scientist himself and over fifty years editor of Poggendorf's *Annalen,* published his biographical dictionary of 8,847 notable scientists, their lives and labors, the list extending from remote antiquity down to 1863. More than 10% of these notable scientists were Catholic clergymen, as Fr. John Schreiber, S.J. pointed out, and of these Catholic clergymen over 45% were Jesuits. Therefore in the comparatively short space of 400 years the numbers of notable Jesuit scientists comprise a sizable proportion of the notable scientists of all recorded history. References: Poggendorf, J., Biographisches Handbuch zur Geschichte der exakten Wissenschaften; Sommervogel, Bibliotheque de la Companie de Jesu.

Impressive as are the numbers of Jesuit scientists cited by Poggendorf, and their scientific attainments, the contributions of the Jesuit bibliographers Augustin and Aloysius de Backer and Carlos Sommervogel have accumulated such a wealth of historical research as to appear almost inexhaustible. This field of research, the history of science, is wide open, inviting further research and much translation, such work as Father Louis J. Gallagher has given us on *The Journals of Father Mathew Ricci.* In a recent number of The *Jesuit Educational Quarterly,* Father Joseph E. Mulligan has indicated the unlimited opportunities for research available in the new and growing field of the history of science, where Jesuit scholars with facility in languages, especially Latin and Greek, enjoy advantages closed to others. One such simple project, involving no language difficulty, might be a bibliography or summary of works of Jesuit scientists cited in the writings of the late George Sarton and in *Isis and Osiris,* periodicals edited by Sarton, devoted to the history of science. Even elementary students take fascinating interest in such simple projects, as did the Loyola College student when he found that the Jesuit scientists Grimaldi, Kircher and Scheiner, and others, were cited hundreds of times, in modern Physics texts, for example, Grimaldi cited sixteen times in Mach's *Principles of Physical Optics.*

Christopher Clavius, 1538-1612. Clavius, Professor of Mathematics, Roman College, was highly esteemed by Tycho Brahe, Johann Kepler and Galileo, his life-long friend. Often called the Euclid of the 16th century, he published numerous writings, which he reissued at the end of his life in five huge volumes. In his *Geometrica Practica* (1604) he anticipated by nearly thirty years Vernier's method of subdividing measuring scales. So probably the vernier, used so universally today on so many instruments, should have been named after Clavius. The chief contribution of Clavius was his development and profound exposition of the Gregorian calendar.

Father Clavius was the author of *Astrolabium* (Rome, 1593) two selections from which were translated by Prof. Ginsburg, Yeshiva College, N. Y. for his *Source Book in Mathematics.*

Matteo Ricci, 1562-1610. Father Ricci had studied under Father Clavius at the Roman College and his eminence in the sciences, especially cartography, mathematics and astronomy won him hospitality and great honor at the royal court in Peking, the first Christian missionary ever admitted to China after so many others, even Xavier, had failed. Ricci's scientific contributions, maps of the world and of the heavens, his translation of European mathematics and especially Euclid into Chinese, his introduction of European astronomy and astronomical instruments and clocks into China, brought Christianity into high repute. His maps of China gave Europe the first detailed study of Chinese geography. References: China in the Sixteenth Century. The Journals of Father Matthew Ricci, translated by the Rev. Louis J. Gallagher, S.J., Random House; The Encyclopedia Britannica, 9th ed., Edinburgh (excellent account).

Buonaventura Cavalieri, 1598-1647, highly admired by Galileo and cited in his greatest and final work, *Two New Sciences*, first introduced the use of logarithms into Italy, and was the first to derive the expression for the focal length of a lens having unequal radii of curvature. His *method of indivisibles* is to be reckoned as a precursor of the infinitesimal calculus. "Speaking of the effects produced by the mirrors of Archimedes . . . if any doubt had remained, the book which Father Buonaventura Cavalieri has recently published on the subject of the burning glass and which I have read with admiration would have removed the last difficulty." Reference: Galileo, Two New Sciences, translated by Crew and Salvio, Dover, New York.

Christopher Scheiner, 1575-1650. Father Scheiner, discoverer of sun-spots and faculae, began his research on the sun while teaching mathematics at Ingoldstadt. He was the first to apply the projection method for study of the solar image, and while Galileo questioned his priority in sun-spot discovery there is little question of Scheiner's priority in publication of his findings. After sixteen years of solar observations Scheiner published his famous masterpiece *Rosa Ursina* (1626). References: Catholic Encyclopedia, Sommervogel, and de Bacher.

Francesco Maria Grimaldi, 1613-1663. Father Grimaldi, Professor of Mathematics in the Jesuit college at Bologna, famous for his discovery of diffraction, made important studies of falling bodies

with Father Riccioli and with him also made more accurate measurements of the meridian arc. A studious observer of the moon's surface, he contributed his lunar map to Riccioli's *Almagestum novum*, a map still used by modern astronomers. More important than any of these researches was his famous *Physicomathesis de lumine, coloribus et iride*, in which he set forth fundamental discoveries anticipating much of the work of Newton, Huygens, Young and Fresnel. Grimaldi was the first to study diffraction, which he so named, and other experiments illustrating the wave of nature of light. He concluded that light was periodic, could not be material, and that in certain adjuncts "light plus light gave darkness." His work is cited in many modern texts. References: Cajori, History of Physics, MacMillan; Rosenberger, pp. 131-2, Part II.; Sommervogel; and L. Koch, Jesuitenlexikon, Paderborn.

Giovanni Batista Riccioli, 1598-1671. After teaching Philosophy and theology, Father Riccioli was assigned to study astronomy which was so much discussed at the time due to the discoveries of Kepler and the new theories of Copernicus. Riccioli's studies were admirably presented in his famous *Almagestum novum, astronomiam veterem novamque complectens* (2 vols. Bologna, 1651), considered the most important literary work of the Jesuits in the seventeenth century. Riccioli's lasting contribution to astronomy was his detailed telescopic study of the moon in collaboration with Father Grimaldi whose lunar map was inserted in *Almagestum novum*, presenting a nomenclature still applied in lunar topography. References: The Catholic Encyclopedia; Walsh, James J., Catholic Churchmen in Science (second series); Sommervogel; Delambre.

Gaspar Schott, 1608-1666. After studies in Rome under Father Kircher, Father Schott taught physics for the rest of his life at Augsburg and came to be regarded as one of the most learned men of his time. A friend of Otto von Guericke, he published the first description of von Guericke's famous air pump. His four-volume work on mathematical problems and physics experiments went through many editions, as also his many other works. He published also *Pantometricum Kircherianum* and he edited the *Itinerarium extaticum* of Kircher. References: The Catholic Encyclopedia, Sommervogel.

Athanasius Kircher, 1601-1680. After six years as lecturer in physics, mathematics and oriental languages in the Roman College, Father Kircher devoted the remaining years of his long life to research and writing. He was especially interested in the subterranean

forces of Messina, Etna, Stromboli and Vesuvius, where he entered the cone after the violent eruption of 1630 in preparation for his masterful work *Mundus Subterraneus* later published in two volumes. This work enjoyed high repute, probably the first printed book on geophysics and vulcanology, and it continued to be the standard geological treatise of the seventeenth century.

No less epoch-making was Father Kircher's collection of antiquities, and his *Museum Kircherianum* which still attracts visitors to the Roman College. He was adept in decyphering heiroglyphics and contributed valuable studies in comparative philology.

Such encyclopedic knowledge attracted vast correspondence. Besides many volumes of this correspondence, still extant, Father Kircher published over forty volumes on such subjects as magnetism, light, sound and music, and invented a counting machine, pantometer, magic lantern and Aeolian harp. References: Sommervogel; Koch, Jesuiten-Lexikon, Paderborn; Mather and Mason, Source Book in Geology, McGraw-Hill.

Geronimo Saccheri, 1661-1733. Father Saccheri, pioneer of non-Euclidean geometry, taught in several Jesuit colleges in Italy. He is a most important authority on this discipline and his name stands at the head of its literature. Some of his works were translated from Latin by Professor Manning of Brown University, by Professor Halstead and others. Reference: Smith, Source Book of Mathematics, McGraw-Hill Publ. Co.

Ruggerio Giuseppi Boscovich, 1711-1787, Dalmatian Jesuit, mathematician, astronomer and natural philosopher, published numerous dissertations on such subjects as *The Transit of Mercury* (1737), *the Various Effects of Gravity* (1741), and he shared with Euler the honor of having submitted the correct solution of a prize problem. His plans were followed for strengthening the weakening dome of St. Peter's, for draining the Pontine Marshes, for precise meridian arc measurements, and in 1757 he successfully urged the abrogation of the Index decree against the Copernican system. He engaged in precise surveys of Brazil, Equador and the Papal States. To the enlarged edition of his *Theoria Philosophiae Naturalis* (1763), his publisher added a catalogue of Father Boscovich's sixty-six previous treatises. After work in Vienna, England, France, Poland and Turkey, and as Director of Optics for the French Marine, he published in 1785 his last important work on optics and astronomy in five volumes. His *Theoria Philosophiae Naturalis* (Vienna, 1758), an exposition of his molecular theory of matter, was translated into English by J. M.

Child (Chicago, 1923). He was one of the first Europeans to accept Newton's Theory of Gravitation. His *Carmen de Solis ac Lunae Defectibus* was translated into French in 1779, and the narratives of his journey, Turkey to Poland, appeared in French in 1772, in German in 1779 and in Italian in 1784. ~~He determined the Mason-Dixon line.~~ References: Sommervogel, Bibl. de la C. de J., Brussels, 1890; L. Koch, Jesuitenlexikon, Paderborn; Catholic Encyclopedia; Encyclopedia Brittanica, 9th ed.; (Mason-Dixon) Phil. Transactions, vol. 58 (1768).

James Curley, 1796-1889. Father Curley taught Physics at Georgetown for forty-eight years. After planning and superintending the building of Georgetown Observatory he continued for nearly half a century as its first Director. His determination of the longitude of Washington, though not in agreement with the determination by the Naval Observatory, was later accepted as the more correct. He wrote the *Annals of the Observatory of Georgetown College*, New York, 1852. Reference: Catholic Encyclopedia.

Francesco de Vico, 1805-1848. Professor of mathematics and astronomy, Roman College, and Director of the Observatory, and for short time Director of the Georgetown Observatory. Father de Vico was a frequent contributor to scientific publications who corresponded with celebrated astronomers and he was a charter member of Italian Society of Science. He was principally famous for his discoveries of new comets, and six times he was awarded the gold medal offered by the King of Denmark to the first discoverer of a new telescopic comet. One of these medals is preserved in the museum at Georgetown University.

In addition to his comet discoveries, (at least one named after him) de Vico made the important discovery that spots on Venus could be observed by day and he contributed new data on this planet's period of revolution. References: Sommervogel; Catholic Encyclopedia.

Angelo Secchi, 1818-1878. After a brief stay at Georgetown Observatory, Father Secchi designed and built a new Observatory for the Roman College with new instruments. Revision of Struve's catalogue of double stars, verification of 10,000 of these and publication, studies of Saturn, Jupiter and its satellites, and Mars, pioneer studies of the spectra of Uranus and Neptune, micrometric maps of the moon so exact that the Royal Society distributed photographic copies to astronomers, these achievements culminated in brilliant studies of

the sun as published in the famous *Le Soleil*, Paris, 1870. Secchi's eclipse expedition to Spain in July 18, 1860 first established photographically that the corona and prominences were real solar features. He invented the heliospectroscope and discovered the five spectral types of stars. He was first to organize systematic observation of earth currents, and won fame for his meteorograph, sensation of the Paris Exposition, 1867, for which he received a Grand Prize of 100,000 francs and the Cross of the Legion of Honor, conferred by Napoleon III in presence of the Emperors of Russia and Austria and Kings of Prussia and Belgium.

Father Secchi wrote *Electrical Rheometry* for *Smithsonian Contributions to Knowledge* III, 1852, was noted for geodetic study on the Appian Way, and for his treatise on kinetic energy. References: Shapley and Horwarth, Source Book in Astronomy; Cath. Encycl.; Schreiber and Rigge, Jesuit Astronomy, Popular Astronomy, vol. 12, (1904).

Joannes Georg Hagen, 1847-1930. After eight years as director of Georgetown observatory Father Hagen in 1906 became director of the Vatican observatory. His most important publications were *Synopsis of Higher Mathematics* and his *Atlas Stellarum Variabilium*.

His *Atlas* filled a long-felt want, supplying observers with reliable data. Beginning in 1899, the *Atlas* consists of 250 charts, with the magnitudes and positions of stars, and comparison stars, plotted with great care and exactitude. Reference: Jesuit Astronomy, Schreiber and Rigge.

Ferdinand Verbiest, 1623-1688. About a half century after Father Ricci's brilliant scientific achievements in China, another Jesuit, Father Verbiest, attained equal renown for his eloquence and scientific attainments. In 1664 the Emperor ordered a public test to prove the merits of European astronomy as compared to that of the Chinese. Verbiest, and a bitter Chinese adversary, were each commissioned to calculate in advance the shadow of a gnomon at noon on a certain day, secondly the absolute and relative positions of the sun and planets on a given date, and finally the moment of a lunar eclipse. The test proved a triumph for Verbiest, resulting in great prestige for Christianity in China and benevolence for Verbiest. On request of the Emperor, Verbiest presented him with six elaborately ornamented instruments constructed in brass under Verbiest's direction, a quadrant of six feet radius, a celestial globe of six feet radius, an azimuth compass of six feet diameter, a sextant of eight

feet radius, two armillary spheres, zodiacal and equinoctial, each six feet radius, all exemplifying the mechanical and mathematical skill of Verbiest. These instruments in 1900 were still mounted on a tower of the imperial palace where Verbiest had installed them two and a half centuries previously. Reference: Cath. Enc.

Franz Xavier Freiherr Von Wulfen, 1728-1805. The inscription on a statue to Fr. von Wulfen describes him as "equally great as priest, scholar and man." Though a teacher of physics and mathematics in many Jesuit colleges in Europe, his scholarly researches in Botany through fifty years won for him high acclaim with botanists throughout the world. He pioneered in exploring the Austrian Alps, in discovering and naming many new flora and in illustrating them with excellent plates. The *genus Wulfenii* memorializes his many contributions to botany. His wide interests and valuable treatises in mineralogy are also memorialized in the term *Wulfenite* the yellow lead ore. Remarkably, besides his contributions to botany and mineralogy Fr. von Wulfen also contributed research in zoology. References: Catholic Encyclopedia; Koch, Jesuiten-Lexikon, Paderborn.

Joseph Epping, 1835-1894. After some years as professor of mathematics and writer of textbooks at Quito, Ecuador, Father Epping returned to his native Germany. While teaching astronomy and mathematics at Exaeten he published a scholarly critique of the Kant-Laplace nebular hypothesis, and won renown for his work, in collaboration with Father Strassmaier, in discovery of a key to Babylonian astronomical observations and tables, an invaluable contribution to astronomy. A recent scholarly study entitled *Astronomical Cuneiform Texts* by O. Neugebauer, London (1955) has been dedicated to the three Jesuit Fathers who pioneered in the study of Babylonian astronomy, J. N. Strassmaier, J. Epping, F. X. Kugler. References: Koch, Jesuiten-Lexikon, Paderborn; Catholic Encyclopedia; Science, *123*, no. 3185.

Franz Paula von Schrank, 1747-1835. In 1809 the Munich Academy of Science selected Father Schrank to membership and appointed him director of the newly established botanical garden to which he devoted the rest of his life. Remarkable for his activity as a writer in botany, he published over forty original works and about two hundred dissertations and shorter studies. References: Catholic Encyclopedia; Sommervogel, Bibl. des ecrivains de la compagnie de Jesus, 1889, de Backer.

This sweeping survey of some noted Jesuit Scientists hardly suggests the wealth of learning and research contributed through 400 years by the Sons of St. Ignatius.

Through the years they have founded and maintained hundreds of observatories throughout the world, astronomical, meteorological, seismological, and accumulated tomes of data on eclipses, variable stars, earthquakes. They devised new scientific instruments, the pantograph, the vernier, the equatorial mounting, the magic lantern later developing into the stereopticon, the motion picture projector, and the photo enlarger. Fr. Wulf's ingenious quartz fibre electrometer, is valuable in cosmic ray studies. The Jesuit Relations, in 73 volumes, is rich in scientific contributions.

More than all this, Jesuit Scientists trained other scientists, and notable among Jesuit alumni was the great Rene Descartes. Well may Jesuit scientists be proud of their contributions to the advancement of science. References: Burke-Gaffney, Kepler and the Jesuits, Bruce, 1944; Schreiber and Rigge, Jesuit Astronomy, Popular Astronomy, *12*, 9, 94, 303, 375 (1904).

Biology

The Place of Genetics in a Liberal Arts Program. Rev. Michael P. Walsh, S.J. The relationship of genetics to every other branch of biology was discussed in detail. It was also shown how important a course in genetics is to future psychologists and medical students. The integration of genetics with philosophy and theology was discussed by presenting a number of problems that are related to these fields and that require some knowledge of genetics. It was strongly emphasized that genetics, perhaps more than any other branch of biology, offers a student, through laboratory work and problem studies, an opportunity to develop a spirit of scientific inquiry and a familiarity with the scientific method.

It was urged, therefore, that a good segment of the general biology course to non-science majors, should cover the field of genetics and that in every curriculum for majors in biology, there should be at least a lecture course in genetics, not merely for the factual knowledge it would give, but for the cultural value it has.

A Mutating Theory in Biology. Rev. James A. McKeough, S.J. The purpose of this paper was to present in a general way some of the available knowledge of the chemistry of chromosomes and to mention a temporary theory that may reconcile position of effects (Goldschmidt) and the corposcular gene of linear arrangement (Morgan). Two principal compounds have been identified in the chromosomes—proteins and nucleic acid. The latter are of two principal types—desoxyribonucleic acid, DNA, which is found only in the chromosomes and ribonucleic acid, RNA, which is found mainly in the cytoplasm, but traces do appear in the chromosomes. After considering the chemical structure of RNA, we then took up the problem of gene-duplication, which is based on recent tracer work on the reproduction of bacterial viruses. Others explain the gene-reproduction in terms of the spatial structure of DNA (two helical chains wound around a common axis and held together by hydrogen bonds between specific pair of bases). Perhaps the best way to reconcile the schools of thought on the theory of the gene is to consider it now as a restricted point with a broad field of action. Both Morgan and Goldschmidt have definite and clear scientific evidence for their positions; it is only in the light of more biochemical data that we can arrive at an adequate gene theory.

Pioneers, Opportunists or Scientists? Rev. Anthony J. MacCormack, S.J. This title covers a series of papers, concerned with one aspect of a difficult problem. This problem is the modern *Freedom of Science*. The aspect is the alleged historical foundation for the belief of many that this Freedom of Science begins with the "revolt of the pioneers against Authority", authority being commonly understood as the Church and/or Scholasticism.

Generally, five men are credited with such an origin due to their investigations, principles and theories in the 150 years between the Fabrica of Vesalius in 1543 and the *Principia* of Newton in 1687. The vast social force known today as Science originates then with Vesalius, Galileo, Descartes, Harvey, Newton; each of these contributing uniquely.

Hence, our purpose is to estimate, historically, this question, "Were these men such pioneers, with their spirit turning science into its critical social influence of today?" In general, our answer is there was no such "birth" of science but merely a change in the form of science.

The first investigated will be Veralius. For, due to recent historical work, it appears he is misplaced. Certainly he was not a pio-

neer; dubious, he was a scientist; and, most likely, he was an opportunist only. He was a pioneer in the minor sense of his textbook, *Fabrica,* being a refreshing change from the dry, arid ones of the so-called Scholastics. (Scholasticism does not consist in *blindly* following the masters). His philosophy was conservative and traditional; the *Fabrica,* an attempt to enhance his revered Galen. He was not a scientist, for he never contributed anything, then or after the publication of *Fabrica,* to scientific investigation. He was, by no means, the first publicly to dissect the human body. That honor belongs to the great medieval master, Mondino dei Luzzi, 1275-1326. His practice was continued by many of his pupils (consider the magnificent medical schools of Northern Italy). He was an opportunist, for the wide reception of his book seems to have made him Imperial Physician. That, he was content to be for the remaining twenty years of his life.

Chemistry

The Importance of Degeneracy in Molecule Formation, I, II. Donald I. MacLean, S. J. and Robert D. Cloney, S.J. The statement was made, explained and illustrated how the removal of degeneracy from the electronic ground states of atoms is able to explain the existence of stable molecules, the reactivity of radicals and of molecules having degenerate ground states, the formation of activated complexes and finally the existence of free radical mechanisms.

A Molecular Orbital Study of Be_4. Robert D. Cloney, S.J. A search is being made for a tractable qualitative description of a molecule, defined here in the broad sense of atomic nuclei plus electrons, stable or not. It was shown how the study of Be_4 is a key calculation in determining the reliability of the above mentioned qualitative description.

Nuclear Magnetic Resonance. Paul J. McCarthy, S.J. The general theory and fundamental equation of nuclear magnetic resonance theory were discussed briefly. The use of NMR for the determination of nuclear moments and the calibration of high magnetic

fields was mentioned, and its application to chemical problems was treated in greater detail. Among these problems are the study of hydrogen bonding, molecular rearrangements, and the qualitative and quantitative analysis of mixtures. Of chief importance in the study of all these problems is the determination of "chemical shifts." The measurement of the displacement or shift in the signal of a particular isotope from the position it occupies in some standard substance can tell a great deal about the electronic environment of the isotope in the molecule in question and also about the structure of the molecule as a whole.

Vapor Phase Chromatography. Charles J. Thoman, S.J. The principles underlying vapor phase chromatography were outlined; the two possible methods of separating the components of a mixture, namely adsorption and partition (solubility difference), and the two for the subsequent recovery, namely displacement and elution. The usual pairings in the overall process are partition-elution, prevalent in America, and adsorption-displacement, more common in England, though the Czech school of Janak favors adsorption-elution. Since Fr. Hilsdorf gave a thorough description of the partition-elution technique, the rest of the discussion was devoted to the adsorption-displacement method and to a comparison of the advantages inherent in each. A few particular uses, determination of trace amounts and the separation of closely boiling or difficultly separable mixtures, were also mentioned. Reference was made to an article describing construction of a gas chromatography apparatus for school use at a relatively low cost; this article, or rather letter, is Chem. Eng. News, May 14, 1956, page 2350, and refers to an original article by James and Martin, Biochem. J., 50, 679-90 (1952).

Muscle Protein Research. Rev. Joseph A. Duke, S.J. At Georgetown University a grant from the Public Health Service was awarded Professor Shizuo Watanabe and Fr. J. A. Duke for muscle protein research. This study will serve to amplify similar studies being pursued at the Naval Medical Research Institute where these two investigators are Guest Scientists. Dr. Watanabe is interested in the role of trace quantities of magnesium in muscle and will investigate its effect on the usual chemical reactions associated with muscle protein. Fr. Duke will study the effect of transmitting energy selectively to certain parts of the muscle protein molecule and measureing the rates of reaction which are produced by this process.

Dr. Watanabe is rapidly attaining international prominence in

the field of muscle research and will devote his time entirely to his research.

The project is fortunate, too, in having a pre-doctoral fellow, Mr. Robert Moddess, who will assist in the study. Mr. Moddess is an honors graduate from Loras College, Dubuque, Iowa.

Recent Developments in the Chemistry of Viruses. William J. Schmitt, S.J. Tobacco Mosaic Virus, both the common and various mutant strains, has been degraded to inactive fractions of native protein and ribonucleic acid. From these the virus has been reconstituted. In addition hybrid viruses have been prepared whose symptoms and progeny accord with the nucleic acid fraction, while the immunological reaction is that of the protein coat. This is the first case of in vitro production of a virus from inactive components.

Mathematics

Axiomatic Structure for Algebra. Rev. Stanley J. Bezuszka, S.J. The type of postulational reasoning prevalent in plane geometry can be introduced into algebra. Various approaches are possible, each one on a different level of rigor so that the teacher has a wide choice. In general, the natural number system is developed along the lines of the Peano Postulates or some other convenient set of assumptions. The rest of the real number system is introduced by definitions.

In high school, it is doubtful whether the students possess the mathematical acumen to understand either the process or appreciate the principles involved in the axiomatic approach to Algebra. On the college level, the postulational method is becoming increasingly more popular and a large number of standard text books begin the study of calculus on this foundation.

Personal experience with the method on the college freshman level is still too recent and inconclusive for generalizations. This much can be said: for the better students, the postulational approach provides a solid beginning for their mathematical growth. For the others, insufficient skill in the ordinary manipulative requirements of algebra prevents them from thoroughly following the underlying concepts or grasping the nature of a mathematical structure.

What is a Moore-Smith Sequence? Frederick A. Homann, S.J. A Moore-Smith sequence is a generalized classical sequence. To facilitate exposition of the proposition the idea of generalization is discussed as well as its purposes. The concept of a classical sequence as a function on the linear order of integers is then introduced. A Moore-Smith sequence, as a function on certain types of partial orders, is then seen to be a generalization of the classical sequence. Examples are given, and among others, an application is made to integration theory.

Levi-Civita's Concept of Relative Parallelism. Frederick A. Homann, S.J. Parallel vector fields along a curve C immersed in Euclidean 3-space are studied, and necessary and sufficient conditions for such fields exhibited. Parallel fields in a 3-dimensional Euclidean manifold are also considered.

Surfaces immersed in E^3 are introduced, and surface vector fields along a curve C in the surface defined. Then parallel vector fields along C are defined in analogy with parallel vector fields along a curve immersed in E^3. This is Levi-Civita's parallelism relative to a given curve. The basic properties of such parallelism are indicated, as well as the relation to the Gaussian curvature of the surface.

Other approaches to relative parallelism are also mentioned.

Consistency. Rev. Walter J. Feeney, S.J. An axiom system is consistent if it does not imply contradictory statements. Consistency is a prime requisite for any axiom system. Hence, given a system of axioms A, a proof that A is consistent is always desirable. If the number of statements deducible from A is not finite, then consistency cannot be proved by examining all pairs. In this case recourse is usually had to the method of models. A model M of an axiom system A is a system of objects chosen and assigned as meanings of the undefined terms of A in such a way that the axioms of A are satisfied. If M is taken from a certainly consistent theory, then the construction of M constitutes a proof of the consistency of A. In any case the construction of M proves the relative consistency of A, i.e., A is consistent if the theory containing M is consistent. An inner model is a model M whose elements form a subsystem of some model of A. If it follows from A that a statement S holds for M, then the axiom system A' obtained by adjoining S to the axioms of A as an additional axiom is consistent if A is consistent. The method of inner models, which Gödel used to prove the relative consistency of the axiom of choice and the generalized continuum hypothesis, can be illustrated from elementary group theory.

Physics

Rare Gas Lines as Wavelength Standards. Rev. M. Thekaekara, S.J. The spectral lines of rare gases have been used extensively in the past as wavelength standards. The higher the degree of accuracy aimed at, the more important it is to know the dependence of wavelengths on the discharge conditions. Xenon has been investigated extensively in connection with this problem. The dependence of the wavelengths on the ion density and the pressure of the gas has been shown to vary considerably with the upper levels from which the lines originate. The observed shifts in the wavelengths can be explained by the relatively simple assumption of quadratic Stark effect due to the ions. The changes in line profiles illustrate the transition from the phenomena explainable by the Weisskopf collision theory to the Holtsmark statistical theory. A general theory applicable to all cases seems to be an adaptation to the quadratic Stark effect case of the Spitzer theory of Balmer lines. Studies made on krypton confirm that the general features of the theory are applicable to other rare gases. The results are of considerable importance in the definition of the absolute standard of length, the meter, in terms of spectral wavelengths.

An Introduction to Recoupling Theory. Frank R. Haig, S.J. Any coupling of angular momentum vectors will result in a state vector in Hilbert space. A suitably executed rotation of axes then allows the first coupling scheme to be expressed in terms of any other desired scheme. Hence arise the recoupling coefficients as elements of the necessary unitary transformation matrices.

Optical Methods in Nuclear Magnetic Resonance Spectroscopy. Rev. Joseph F. Mulligan, S.J. One difficulty in the experimental observation of nuclear magnetic resonance in atoms is the weakness of the signal due to the fact that the amount of energy absorbed by atoms going from a lower nuclear spin state to a higher one is almost equal to the amount radiated by atoms going from the higher spin state to the lower. Since the probabilities for absorption and forced emission are equal, and since the number of atoms in the two spin states is almost the same due to the small energy difference between them, the net energy absorption is small and falls to zero

in a short time as the populations of the two spin states become equalized. In 1951 Kastler (Paris) proposed an optical means of overcoming this difficulty. The atoms are bathed with circularly-polarized visible radiation which will excite them to a higher electronic state. They will then decay spontaneously to the original ground electronic state. Because of the selection rules for the transitions in the presence of a magnetic field, however, more atoms will return to the lower nuclear spin state than were originally excited from it. Hence the effect of the optical absorption and re-emission is to continually pump atoms from the higher nuclear spin state back to the lower. This method of "optical pumping" thus provides a convenient method for intensifying the nuclear magnetic resonance signal.

Carbon-Nitrogen Double Bond in the Infra-Red Spectrum. Rev. James J. Devlin, S.J. The study of the C=N group in polyatomic molecules needs a great deal of further study. A Baird double beam Infrared Absorption Spectrophotometer was used for the study of six guanidine and twenty-three oximes which have the C=N group. The guanidines correlated with previous work. The oximes have confirmed previous limited studies and indicated a complexity which it is hoped will be revealed by studies of other compounds.

The Concept of Negative Absolute Temperatures. Rev. Robert O. Brennan, S.J. Attention is called to a paper by Norman F. Ramsey in the *Physical Review, 103*, 20, in which it is shown that a negative absolute temperature can be consistently defined for a system of nuclear spins in a magnetic field. The negative temperatures are "hotter" than positive temperatures. The sequence in increasing hotness is plus 0°, plus infinity, minus infinity to minus 0°.

The introduction of negative temperatures makes some precisions necessary in some of the statements of the Second Law of Thermodynamics. Cf. art. cit.

Pulsed Van de Graaff Accelerators. Rev. William G. Guindon, S.J. The Van de Graaff accelerator, decreased in size by pressurized construction, is a versatile, reliable instrument of moderate cost. It may accelerate positive ions (as protons or deuterons) to energies of several *Mev;* neutrons of closely controlled energies may thus be generated and used in further nuclear bombardments. For certain neutron experiments it is essential to know when they were produced; this can be determined if the positive ion beam strikes the target in short pulses of accurately known length and

repetition rate. Post-acceleration modulation of the beam, as at Los Alamos, in many cases leads to a very high neutron background when the beam is off the target. Preacceleration ion-source modulation complicates the crowded interior of the high voltage terminal, and the possibilities of observing the ion pulse externally. The Cosmotron at Brookhaven is fed by a pulsed Van de Graaff, turned on and off by a light beam; this mechanism cannot produce the millimicrosecond pulses desired for neutron work. Both Brookhaven and Oak Ridge have groups which now sweep the low energy ion beam rapidly across the entrance slit of the accelerator column. When the bursts of accelerated ions strike the target, generating neutrons, an electrical timing pulse is produced; the neutrons traverse a measured path and produce another pulse. The elapsed time gives the neutron velocity and energy. This time-of-flight mechanism may be used for studying a variety of neutron interactions.

The Shell Model of the Nucleus. James C. Carter, S.J. It was noticed long ago that there is a high degree of radioactive stability connected with "magic numbers" of neutrons or protons in a given nucleus. The shell model postulates that, just as atomic stability can be explained in terms of electronic shells, nuclear stability can be explained by a shell-like structure. It is assumed that all the nucleons (protons and neutrons) in a nucleus move in a central field of force. Such an assumption is completely unjustified, because there is no source of such a field inside the nucleus as e.g., the nucleus itself is in the atom. This central force is a simple harmonic oscillator force. In addition, a force is assumed which is dependent on the interaction of the spin angular momentum of each particle with its orbital angular momentum. This is the spin-orbit force. The Mayer-Jensen model adds that the total angular momentum of the nucleus (J) is zero if the number of neutrons and the number of protons is even; that J is the angular momentum of the last particle if the number of either type of particle is odd; and that the result is somewhat more complex if the number of both neutrons and protons is odd. The theory has had a surprising degree of success in accounting for a great diversity of nuclear data. There still remain, however, important nuclear properties, e.g., magnetic moments, where the theory is inadequate.

News Items

Boston College — Department of Physics

The month of July, 1956, saw a new form of science education arrive on the Chestnut Hill campus when nearly 60 teachers of high-school science came for a three-week Workshop. From July 9th to July 27th a crowded schedule of lectures, laboratory sessions, and field trips filled the days of a Jesuit priest, a Xaverian brother, and fifty-five sisters from many different congregations. Most of the participants came from Massachusetts, but states as far away as North Carolina and Minnesota had their representatives.

Most of the morning sessions consisted of a long lecture, often with demonstrations, to the whole group on some current topic; subjects ranged from astronomy to earth-quakes, from the atomic nucleus to cell-division. The lecturers included staff members of Boston College departments, and several from Holy Cross. In the afternoons biologists, chemists and physicists met separately for more detailed discussion and laboratory sessions. One complete day, devoted to geophyics, was spent at the Boston College Observatory at Weston. One afternoon field trips to plants of the H. P. Hood Co., A. D. Little Co. and General Radio Co. were conducted; on another an instrument show was put on by representatives of several instrument makers. A lunch on the last afternoon attended by lecturers and participants in the Workshop made a pleasant conclusion to three busy weeks.

Encouraged by the many favorable comments, and motivated by the necessity of doing our part to help high-school science teachers in their very important work, Boston College plans to run an improved Workshop next summer too, possibly with the assistance of the National Science Foundation. Tentative dates are July 8-26, 1957. Since the objective to assist high-school teachers who are called upon to teach science in which they are not sufficiently prepared, persons who have attended the 1956 Workshop will not be eligible next year.

Two members of the Department of Mathematics have been appointed to the computer programming group at the new IBM Computation Center which commences at MIT this fall. A new addition to the Faculty, Dr. W. E. Perrault, will be a Research Associate, and a graduate student, Mr. J. A. Riley, a Research Assistant. They will prepare research problems for the computer, and advise other faculty

members on the use of the machine. Joining with about two dozen others, half from MIT, half from the other universities of New England, they will be part of the scientific staff of the latest type of high-speed computer, an IBM 704, capable of 40,000 additions per second.

The Computation Center is made possible through the munificence of the late Mr. Thomas Watson, president of IBM, which is presenting the instrument to MIT for the use of the colleges of New England. IBM is also providing, in addition to the funds for the programming staff, a wing for the Center on MIT's new K. T. Compton Memorial Physics Laboratory.

As a participant in the program, Boston College will have easy access to the machine, both for faculty research and for training students in the latest techniques of machine computation. Preliminary training courses were given this summer and will continue until the machine is installed, in the early spring of 1957. Planning for this joint project has been carried out by a committee of representatives of the various interested institutions. Boston College is represented by Fr. William G. Guindon, S.J., Chairman of the Department of Physics.

Holy Cross College — Department of Chemistry

Recent departmental publications include: no. 86, A. VanHook and R. A. Rousseau, Crystallization of Sugar, a Bibliography, La Sucrerie Belge, 75, 217-225 (1956), and no. 87, F. P. Fehlner, Growing Crystals, A Survey of Laboratory Methods, J. Chem. Educ., 33, 449-451 (1956). Both of these were produced in connection with work on senior theses. The latter, originally intended for publication in our departmental magazine, the Hormone, was prompted as a general reply to the many inquiries that come into this department for suggestions as to crystallization exhibits for high school science fairs. Reprints are available on request.

Over a year ago this department acquired from Korean War Surplus a 40-mm Antiaircraft gunnery trainer device 3-D-14-K. This consists essentially of two 16-mm Ampro movie projectors and incidental electronic equipment. The projectors have been modified in part for adaptation to this special device. They are now rendering excellent science movie service in our two lecture halls. It is with the thought that other departments may already possess this item, or may be in a position to obtain it through Departments of Education in their own States. We will stand by to give advice on how to reconvert the item to movie use. This Department has joined the Massachusetts Educational Film Co-operative, through Mr. Reuel K. Rust, Chrmn., Williamstown High School, Williamstown, Mass. Briefly

stated, members are entitled to the use of films from the Audio-Visual Center of the University of Massachusetts, a part of whose rich collection is restricted to members of this co-operative and otherwise difficultly available. The minimum five-year membership allows fifteen 10-minute films (or equivalent) per year, for a whole week at a time, at a cost of less than one dollar per film, postage included.

Staff activities include the following. Father J. A. Martus has been granted a leave of absence for study at the Mass. Inst. Tech. for the Fall semester, 1956-7. This is in preparation for his course in Organic Chemical Mechanisms which he expects to teach during the Spring semester, 1957. Further he now ranks as Associate Professor on our staff. He also represented the department at the conference between high school and college teachers of chemistry, early this summer at Brown University. This conference dealt with College Entrance Board Examinations with particular reference to admission to advanced standing in college chemistry. Fr. Martus chairmanned the second luncheon of the Crusader Chemists held in connection with the Fall meeting of the American Chemical Society at Atlantic City in September 1956.

Father B. A. Fiekers was appointed chairman of the Awards Committee of the Central Mass. Sec. of the Am. Chem. Soc. He presented an illustrated lecture on the gas laws and the states of matter before the Boston College Summer School Science Workshop early in July 1956. He was parochial assistant at St. Joseph's Church, Woods Hole, Mass. during August. He and other staff members, including Father Martus, co-operated with the local celebration of Chemical Progress Week during the last week of April, 1956, by giving conferences on Scientific Manpower in some of the high schools in the county. During the Spring of 1956, Father Martus and Dr. O. L. Baril were active as judges at Science Fairs.

Alumni items that may be of interest follow. Charles F. Turner, B.C.A.B. '46, H.C.M.S. '49 is now assistant manager in liquid propellant applications research, aviation division, of the Olin Mathieson Chemical Corp. in Niagara Falls, N. Y. *Saturday Evening Post* for March 31, 1956 carries a portrait of Dr. James A. Shannon, '25, Director of the National Institutes of Health, and describes the work of Dr. Charles E. Zubrod, '36, of the Cancer Institute.

Father Fiekers collects alumni news items for the department, enters them cumulatively on stencils and, when the page is filled, has them run off for casual distribution of copy to alumni and other friends of the department. This is done by way of enclosure with current correspondence without the burden of regular mailing lists.

The 33rd news sheet has now appeared. This has helped to cement our professional alumni group. Further, a punch card directory of Crusader Chemist alumni is rapidly nearing completion from correspondence thus solicited, as well as with the help of data from the General Alumni Office, soon to appear in the form of a General Alumni Directory.

Of the 52 scholarships awarded in whole or in part to freshmen, '60, fifteen go to A.B. pre-medical students, three each to B.S. Biology and B.S. Chemistry students, and six to students enrolled in B.S. Physics or Mathematics. Scholarship sources include Boston and Worcester H.C. Alumni, the Worcester Ellis Fund, General Motors and Union Carbide and a large number of traditional College Scholarships.

New construction being considered at present includes a Student Union Building and a Science Building. The latter proposes to house the Departments of Chemistry, Mathematics and Physics. Funds and sites are being reconnoitered.

Weston College — Department of Biology

The current semester finds four philosophers and one theologian taking courses in biology. Mr. Edward F. Hallen, Mr. Harold Bumpus, third year philosophers, Mr. James H. McCarthy, second year philosophy, and Mr. Francis Alcina, third year theologian, are studying comparative anatomy. Mr. Richard Cleary, first year philosopher, who comes to us with two years pre-medical work at Tufts University, is taking a special course in protozoology.

Mr. Alcina is a Spanish Jesuit, attached to the Japanese Mission. He expects to obtain his degree in biology, on completion of his theological studies.

By a recent appointment of Reverend Father Provincial, Mr. Hallen and Mr. McCarthy have been designated for the Bagdad Mission.

New additions to the laboratory equipment in recent months include a large incubator, a Beckman pH meter (Model H-2) and a Coleman Junior Spectrophotometer. A Klett colorimeter was also serviced and restored to proper working order. We are indebted to the biology department of Boston College for the loan of a dissecting microscope and special microscope lamp.

This semester Father Drury is beginning a research program in the field of protozoology in collaboration with the Haskins Laboratories, New York city. Dr. Seymour H. Hutner and Dr. John J. McLaughlin, staff members, are directing the program. These studies

will center on the biochemistry and physiology of protozoa, the use of protozoa as analytical tools and assay organisms, and nutritional studies on various protozoan forms. At present a study is being made to determine the presence of inositol in various forms of bacteria and protozoa, using a yeast assay method. From these studies it is hoped that the phylogenetic relationships between these lower and higher forms will be clarified, adding to the extensive biochemical evidence available. Positive results would naturally lead to an evaluation of the metabolic role of inositol in these organisms. *gldSJ*

Directory of American Jesuit Chemists

In May 1956 the Reverend George M. Tipton, S.J. of Regis College in Denver, Colorado, released a 17-page quarto hectographed pamphlet-form directory of Jesuit Chemists in the United States. This is the outgrowth of a meeting between Fathers B. A. Fiekers, A. L. McNeil and G. M. Tipton, S.J. during the Spring 1956 meeting of the American Chemical Society in Dallas, Texas. This listing aims at giving for each entry: name, province, ordination date or scholastic status, degrees held, chemical teaching experience, field of specialization and present position and address.

Of the approximately 112 names listed, 53 are priests and 59 are scholastics. Two college rectors are listed, 24 college professors, 18 high school instructors, 16 engaged in graduate work, 44 in philosophy, theology or tertianship, with 8 whose status is not mentioned. Inorganic chemistry claims 17; high school chemistry 11; analytic 6; organic 7, physical 9; biochemistry 3; and 38 with fields not designated. Seventeen have earned the Doctor of Philosophy degree: two from Catholic University; four each from Clark and Fordham Universities; two from Princeton University; and one each from Ohio State, Northwestern, Stamford, St. Louis and the University of Washington.

The undertaking was motivated by a desire to establish better acquaintance among Jesuit chemists through correspondence and perhaps through occasional meetings. Mutual interests in teaching and research would find their outlet in the provision and exchange of ideas and information of benefit to one or all: more binding energy for our Ignatian nucleus! *bafSJ*

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LEGEND ABS, Abstract of paper; AUTH, Author; BRev, Book Review; MRev, Movie Review; OBIT, Obituary.