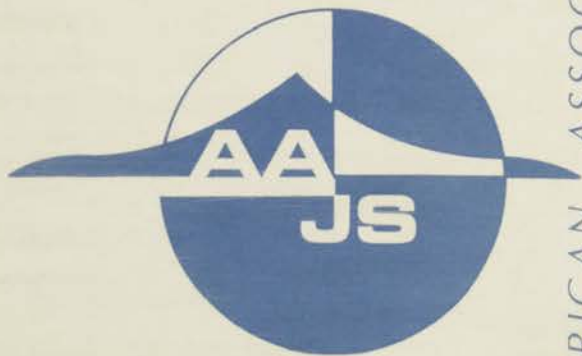


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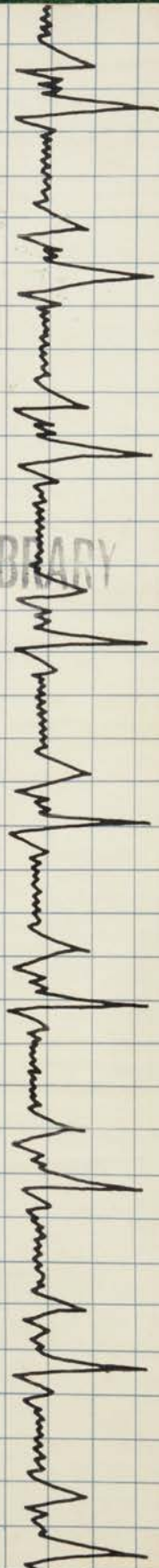
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## *To our readers . . .*

This issue of the BULLETIN is the first in a series of Annual Yearbooks of the American Association of Jesuit Scientists. At three other times during the year Reports of Scientific Activity are published. The yearbook contains the proceedings of the annual meeting of the Association and articles of a more permanent interest. This new publishing schedule is in accord with the September, 1964 revision of the Constitutions.

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The surveys of Jesuit graduate students and of Jesuits with graduate degrees in the natural sciences in theologates, which appear in this issue of the BULLETIN, are a continuation and a revision of such surveys published in past issues of the BULLETIN. It is hoped that these surveys will help in part to bring the membership to an awareness of the current status of Jesuit scientific education in this country. The surveys should also be of assistance to graduate students who are about to enter theology. Plans are now being made to publish a compilation of statistics gathered from the past several years of these surveys. We are grateful to Fr. Timothy E. Toohig, S.J. (*N.E.*) for his preparation of these surveys during the past two years.

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We wish to express our thanks to Fr. Conor Reilly, S.J. and Fr. Thomas F. Mulcrone, S.J. for their articles of historical interest which appear in this issue of the BULLETIN and we would like to suggest that there may be others who are interested in submitting similar articles for publication in the BULLETIN.

## GRADUATE STUDENTS IN THE NATURAL SCIENCES

TIMOTHY E. TOOHIG, S.J.

**Introduction.** The following is a listing by field of study and probable date of completion of studies of all Jesuit students who are pursuing graduate studies in the natural sciences, mathematics and engineering in the Assistency and Canada. This is a continuation of the survey published in the Bulletin of the American Association of Jesuit Scientists (ESD) in June, 1964. The current survey is as of May, 1965. Status changes for the Fall have been incorporated insofar as they were available to the author at the time of publication.

It has been suggested that it would be useful for students of the social sciences to be included in this annual survey. This has been attempted in the current listing, but it may not be complete. We have tried to do as thorough a job as possible working with the province catalogues.

**Format.** Under each entry in the list are given the student's name, his province, degree sought, school at which he is studying, special field of interest and title of dissertation, if available. The listings under "Uncertain" include those for whom it was too early in the program to hazard a reasonable guess as to probable date of completion of studies, and also those from whom responses were not obtained in time for this listing. For the latter group the information given was obtained from province catalogues. The two "pre-Regency" listings are for Scholastics who entered the Society with the degrees listed and are presently in the Juniorate or Philosophy.

The author wishes to thank the special students for their very generous cooperation in the preparation of this survey. A listing including status changes will be prepared in multilith format and made available on request from the author at Woodstock College as of November 1, 1965.

### BIOLOGY AND MEDICINE

1966

- Cassem, Ned H. (*Wisc.*); M.D., Harvard Medical School; Psychiatry.  
Doe, Francis J. (*N.E.*); Ph.D., Brandeis University; Genetics (transformation and photoreactivation in *B-subtilis*), biochemical cytology (protein synthesis in *Drosophila*); "Ribosomal synthesis in the development of *Drosophila virilis*."  
Johnson, Joseph A. (*Md.*); Ph.D., Brandeis University; Ultraviolet effects on DNA, polynucleotides, nucleic acids.

- Riley, Arthur L. (*Mo.*); M.D., Western Reserve University; Cardiovascular; "Effect of ischemia on cardiac and skeletal muscle adenine nucleotides." (Internship, 1967).
- Schwartzkopf, Gary W. (*N.Y.*); M.S., Boston College; Microbiology, Electron transport and photophosphorylation mechanisms in photosynthetic bacteria.
- Shoup, George D. (*Id.*); Ph.D., University of Colorado Medical Center; Cell biology (DNA-RNA synthesis).
- Sim, Benjamin Y. (*Phil.*); M.S., Catholic University of America; Zoology (embryology).
- Tomasulo, Joseph A. (*Buf.*); Ph.D., State University of New York at Buffalo; Histochemistry, electron microscopy.

**1967**

- McDermott, Patrick P. (*N.O.*); Ph.D., Boston College; Iron-bound proteins.
- Ruh, Thomas S. (*Ore.*); M.S., Marquette University; Endocrinology (psychophysiology, animal behaviour).
- Schubeck, Thomas L. (*Det.*); M.S., University of Detroit; Physiology.

**1968**

- Wehman, Henry J. (*Chi.*); Ph.D., Johns Hopkins University; Developmental biology (embryology).

**1969**

- Murgola, Emmanuel S. (*N.Y.*); Ph.D., Yale University; Molecular genetics, regulation of gene activity.

## CHEMISTRY

**1966**

- Schultenover, David G. (*Wisc.*); M.S., Loyola University of Chicago; Organic chemistry; "Ring size effects in the neophyl rearrangement."
- Brawn, Noel M. (*N.E.*); Ph.D., Brandeis University; Organo-metallics.

**1968**

- Keenan, Joseph A. (*Id.*); Ph.D., Clark University; Nuclear chemistry (nuclear spectroscopy).

**Pre-Regency**

- Janis, Joseph M. (*Det.*); M.S., University of Pittsburgh; Bioengineering.

## MATHEMATICS

1966

Vande Velde, J. Richard (*Chi.*); Ph.D., University of Chicago; Algebraic topology.

1967

Deysach, Laurence G. (*Wisc.*); Ph.D., Harvard University; Applied mathematics, mathematical biology.

Linden, Theodore A. (*Det.*); Ph.D., Yeshiva University; Logic and set theory.

Topp, William R. (*Wisc.*); Ph.D., University of Washington; Algebra, foundations of mathematics.

Turgeon, Jean (*Montreal*); Ph.D., University of Toronto; Geometry, topology.

Vasco, Carlos E. (*West Colombia*); Ph.D., St. Louis University; Mathematics for electronics, computers.

## Pre-Regency

Schweitzer, Paul A. (*N.E.*); Ph.D., Princeton University; Algebraic topology.

## PHYSICS

1966

Dubas, M. Steph (*Upper Can.*); Ph.D., St. Louis University; Electron emission, high vacuum technique; "Photoelectric emission from refractory metals."

Manson, Donald J. (*Ore.*); Ph.D., St. Louis University; Plasma physics, geomagnetic particle trapping; "Analysis of artificially-trapped radiation in the earth's magnetic field."

Newton, Victor J. (*N.E.*); Ph.D., Massachusetts Institute of Technology; Theoretical nuclear physics.

Ockersz, J. Rex (*Ceylon*); M.S. (R), St. Louis University; Space physics; "The omni-directional flux densities of trapped particles from Satellite 1958-epsilon measurements made before Argus events."

Voisin, Jacques (*Belg. Mer.*); Ph.D., University of Liege and Syracuse University; Group theory and elementary particles; 1) Mackey's theory and Galilean kinematics: 2) on some properties of zero-mass particles."

1967

Dzamba, Donald G. (*N.Y.*); Ph.D., Columbia University; Astrophysics, space physics.

Mansfield, John E. (*Det.*); Ph.D., Harvard University; Quantum field theory, elementary particles.

McNamee, Peter C. (*N.Y.*); Ph.D., Stanford University; Elementary particles, high energy physics (theoretical).

Wenstrup, Robert S. (*Chi.*); Ph.D., Boston College; Low energy nuclear physics.

### 1968

Alessi, Victor E. (*Md.*); Ph.D., Georgetown University; Solid state.

Kasher, John C. (*Wisc.*); Ph.D., Boston College; space physics.

### Uncertain

Navato, Alfredo R. (*Philip.*); University of Saskatchewan; Radio and ionospheric physics.

Willigan, J. Dennis (*N.E.*); Columbia University and Institute for Space Physics, NASA; Space physics.

### Pre-Regency

Pedrotti, Francis L. (*Mo.*); Ph.D., University of Cincinnati; Solid state; "Optical properties of Cd:Se solid solutions."

## ENGINEERING

### 1967

Carroll, R. Paul (*N.E.*); Ph.D., Case Institute of Technology; Engineering mechanics.

## SOCIAL SCIENCES

### 1966

BIERNATZKI, WILLIAM E. (*Wisc.-Korea*); Ph.D., Anthropology; St. Louis University; Ethnology, social structure, culture change; "Varieties of Korean lineage structure."

### 1967

Merrick, Thomas W. (*Wisc.*); Ph.D. Economics, University of Pennsylvania; Economic growth, econometrics.

### Uncertain

Gallagher, Cormac (*Hibern.*); Psychology, Fordham University.

LaPointe, John (*Quebec*); Anthropology, Columbia University.

Smith, Thomas C. (*N.Y.*); Psychology, Fordham University.

## ADVANCED DEGREES IN THE NATURAL SCIENCES IN AMERICAN THEOLOGATES

TIMOTHY E. TOOHIG, S.J.

**Introduction.** The following listing of Jesuit theologians holding advanced degrees in the natural sciences and mathematics was compiled as of May, 1965. Insofar as the 1965 status changes were available to the author they have been incorporated into the present edition of the survey. As is noted also in the survey of special students in this same issue, a multilithed version of the survey incorporating all the status changes will be prepared and made available on request from the author at Woodstock College as of November, 1965.

**Format.** The list is broken down by theologate, major field, and year in theology. Each individual listing then gives the man's Province, highest degree, school and year of degree, special field of interest, and the title of this dissertation, if available.

### ALMA

#### Chemistry

1st Year:

Cain, William F. (*Calif.*); M.S., University of Detroit, 1965; Inorganic chemistry (transition metals); "Kinetics of aquation of Cis-dibromobis (ethylene diamine) cobalt (III) cation."

#### Mathematics

4th Year:

Koehler, John (*Ore.*); Ph.D., University of Washington, 1962; Algebra, game theory; "The type set of a torsion-free group of finite rank."

#### Physics

4th Year:

Dougherty, Patrick (*Calif.*); Ph.D., St. Louis University, 1962; Plasma physics, neutron physics, applications of digital computers to physics; "Temperature measurements of plasma by neutron scattering."  
Merrifield, Donald (*Calif.*); Ph.D., Massachusetts Institute of Technology, 1962; Molecular quantum mechanics, applications of digital computers to physics; "A configuration interaction study of the electronic states of the water molecule."



## 2nd Year:

Dufner, Andrew J. (*Ore.*); Ph.D., St. Louis University, 1964; Theoretical particle physics, electron polarization scattering; "Electron polarization in the Toptygin theory of multiple scattering."

## 1st Year:

Joncich, Marion A. (*Calif.*); M.S., St. Louis University, 1965; Particle physics (theoretical); "Sommerfeld-Maue approximate solutions for the Dirac equation of the harmonic oscillator problem."

**Engineering**

## 4th Year:

Arenz, Robert J. (*Calif.*); Ph.D., California Institute of Technology, 1964; Solid mechanics, aeronautics and space sciences; "Theoretical and experimental studies of wave propagation in viscoelastic materials."

## AURORA

**Chemistry**

## 2nd Year:

Fritsch, Albert J. (*Chi.*); Ph.D., Fordham University, 1964; Small ring organic, heterocyclic chemistry; "Reactions of halogenated derivatives of 2,3-dimethyl-quinoxaline."

Starshak, Albert J. (*Chi.*); M.S., Case Institute of Technology, 1964.

**Mathematics**

## 1st Year:

Belchak, Aldric C. (*Det.*); M.A., University of Detroit.

**Physics**

## 2nd Year:

Brodbeck, Charles M. (*Chi.*); M.S., Northwestern University, 1964; Solid state physics.

Moran, Martin (*Det.*); M.S., University of Detroit, 1964.

**Philosophy of Science**

## 4th Year:

Sikora, Joseph J. (*Chi.*); Ph.D., University of Notre Dame, 1958; Philosophy of science, astronomy; "Object and method in the philosophy of nature and physical science."

## ST. MARY'S

**Mathematics**

## 3rd Year:

Conlon, Lawrence (*Mo.*); Ph.D., Harvard University, 1963; Differential geometry, Morse-Bott theory; "Spaces of paths on a symmetric space."

## 2nd Year:

Benzinger, Oscar L. (*Wisc.*); M.S., Marquette University, 1964; Algebra; "Survey of quotient rings."

## 1st Year:

Pozsgay, Lawrence J. (*Mo.*); Ph.D., University of Washington, 1964; Foundations of mathematics; "Godel's second theorem for elementary arithmetic."

**Physics**

## 3rd Year:

Marlow, Ransom (*N.O.*); Ph.D., Georgetown University, 1964; Theoretical physics; "A unified Dirac-von Neumann Lagrangian formulation of quantum mechanics."

## WESTON

**Biology and Medicine**

## 3rd Year:

Cleary, Richard C. (*N.E.*); M.S. Johns Hopkins University, 1963; biochemical aspects of developmental biology.

## 2nd Year:

Murray, John T. (*N.E.*) M.D., Georgetown University, 1952; Psychiatry, radiology.

**Mathematics**

## 2nd Year:

Karwin, John J. (*N.E.*); M.A., Boston College, 1964; High school mathematics, philosophy of science.

**Physics**

## 4th Year:

Callahan, William R. (*N.E.*); Ph.D., Johns Hopkins University, 1962; Spectroscopy; "Spectrum of doubly-ionized gadolinium."

## 2nd Year:

O'Brien, Robert F. (*N.E.*); Ph.D., St. Louis University, 1965; Magnetic resonance, solid state physics; "The solid state effect in irradiated alkali halide crystals."

## WILLOWDALE

## Biology

## 3rd Year:

Dundon, Thomas R. (*Wisc.*); Ph.D., St. Louis University, 1963; Cecidology; "Ontogenesis of three pachypsylla galls on coltis."

## 2nd Year:

O'Brien, James F. (*Buf.*); Ph.D., Fordham University, 1965; Cytology (zoological); "A cytological study of the development of the larval midgut of the mosquito *Aedes Aegypti* Linnaeus."

## Chemistry

## 4th Year:

Elder, John W. (*Mo.*); Ph.D., Loyola University of Chicago, 1962; Organic chemistry; "Chemistry of substituted picric acids."

Nemeth, Edward M. (*Det.*); Ph.D., Loyola University of Chicago, 1963; Physical chemistry; "The reactions of alcohol vapors with sodium vapors."

## Physics

## 1st Year:

Lonc, William P. (*Upper Can.*); Ph.D., St. Louis University, 1965; Semiconductor physics; "Magneto-resistance of monocrystalline boron."

## WOODSTOCK

## Biology and Medicine

## 4th Year:

Baumiller, Robert C. (*Md.*); Ph.D., St. Louis University, 1961; Radiation genetics (*Drosophila*), human genetics; "The effects of X-ray induced euploid and near-euploid mutants in heterozygous condition upon developmental stages in *Drosophila Melanogaster*."

Lesseps, Roland J. (*N.O.*); Ph.D., Johns Hopkins University, 1962; Developmental biology; "Electron microscopy of dissociated and reaggregated embryonic chick cells."

Mahowald, Anthony P. (*Wisc.*); Ph.D., Johns Hopkins University, 1962; Developmental cytology and genetics, electron microscopy of developing systems; "Electron microscopy of *Drosophila Melanogaster* embryos: I. Formation of cellular blastoderm; II. Pole cells and the ontogeny of the polar granules."

## 3rd Year:

Fitzgerald, Robert S. (*Det.*); Ph.D., University of Chicago, 1963; Chem-

ical control of respiration; "Ventilatory response to transient perfusion of the carotid chemoreceptors."

2nd Year:

D'Agostino, Angelo (*Md.*); M.S.S., Tufts University, 1953; candidate at Washington Psychoanalytical Institute; Psychoanalysis.

## Chemistry

4th Year:

Salomone, Ramon A. (*N.Y.*); Ph.D., Fordham University, 1963; Organic chemistry; "The synthesis and toxicity of some prolan analogs."

3rd Year:

Lambert, James L. (*N.O.*); Ph.D., Johns Hopkins University, 1963; Organic chemistry, stereochemistry and reaction mechanics; "Homonolate anions."

St. George, John P. (*N.Y.*); Ph.D., Fordham University, 1965; Organic spectroscopy.

1st Year:

Bielefeld, Michael J. (*Wisc.*); Ph.D., University of Pennsylvania, 1965; Theoretical physical chemistry (statistical mechanics and molecular orbital calculations); "SCF-LCAO-MO calculation on pi-electrons of thiophane;" and "Partition function for system of identical interacting particles with many-bodied potential."

Dundon, Robert W. (*Wisc.*); Ph.D., Johns Hopkins University, 1965; Inorganic chemistry (Redox kinetics and coordination chemistry); "Kinetics of Ag(II)-Tl(I) reaction in nitric acid."

## Mathematics

3rd Year:

Bagnato, Robert A. (*N.Y.*); Ph.D., Yeshiva University, 1963; Schwartzien distributions and partial differential equations; "Gevrey classes and hypoellipticity."

Cavey, Edward F. (*Md.*); M.S., Fordham University, 1963.

Sauve, James W. (*Wisc.*); Ph.D., Johns Hopkins University, 1965; Differential equations, Lie groups: "A reduction of the equations of motion of three bodies by the use of Lie groups."

Zimpfer, Charles J. (*Buf.*); M.S., Fordham University, 1963.

2nd Year:

Gafney, Leo J. (*N.Y.*); M.S., Fordham University, 1964; Algebra.

Gilroy, James F. (*Wisc.*); Ph.D., Catholic University of America, 1964; Bio-statistics, non-parametric statistics; "Circular distributions in probability and statistics."

Savary, Louis M. (*Md.*); Ph.D., Catholic University of America, 1964; Mathematical statistics applied to the behavioural sciences; "Probability distributions of the surface of a sphere."

### Physics and Astronomy

#### 4th Year:

Badillo, Victor L. (*Philip.*); Ph.D., St. Louis University, 1963; X-ray crystallography, atmospheric electromagnetism; "The atomic radial density distribution in virus proteins by X-ray scattering."

Coyne, George V. (*Md.*); Ph.D., Georgetown University, 1962; Spectrophotometry, planetary physics, stellar evolution; "Comparative spectrophotometry of selected areas of the lunar surface."

Toohig, Timothy E. (*N.E.*); Ph.D., Johns Hopkins University, 1962; Elementary particle physics (experimental); "The existence and production of the eta and omega mesons."

Zimpfer, Eugene A. (*Buf.*); M.S., Fordham University, 1962.

#### 3rd Year:

Marzolf, John G. (*Buf.*); Ph.D., Johns Hopkins University, 1963; Mössbauer effect, gamma ray resonance scattering, solid state (lattice dynamics); "Single crystal diffraction profiles for monochromatic radiation."

#### 2nd Year:

Dobbins, Robert R. (*N.Y.*); Ph.D., Massachusetts Institute of Technology, 1964; Quantum field theory; "A two-dimensional relativistic field model."

Wong, Maurice, K.F. (*Hib.*); Ph.D., University of Birmingham (England), 1964; Mössbauer effect, solid state, many-body problem, super conductivity, elementary particle theory; "On the Mössbauer effect," and "On the electromagnetic behavior of superconductors."

#### 1st Year:

Millerd, William H. (*Md.*); Ph.D., Johns Hopkins University; Elementary particles (theoretical).

Murray, Thomas E. (*Buf.*); Ph.D., Syracuse University; Solid state physics, anti-ferromagnetism.

Sommerfeldt, Edward E. (*N.O.*); Ph.D., Catholic University of America; Solid state physics, many-body problem; "Ground state energy calculation for  $\text{He}^3$ ."

Tornabene, Hugh (*Ang.*); Ph.D., University of Liverpool (England), 1956; Elementary particle physics (experimental); absorption of negative pions in hydrogen.

Waterbury, James F. (*N.Y.-Philip.*); M.S., Boston College, 1965.

## JESUITS AND THE HISTORY OF SCIENCE

CONOR REILLY, S.J.

The purpose of this paper is to present an introductory study of the contributions of the Society of Jesus to the intellectual movement which we call the scientific revolution. Even a brief study of the better histories of science will show that Jesuits were involved, so some extent at least, in most of the early stages of the scientific revolution. If the study is extended to include the writings, the correspondence and the learned journals of the period, this Jesuit involvement becomes even more evident. In the *Collected Works* of Robert Boyle and of Christian Huygens, and in the correspondence of Isaac Newton, for example, the number of references to Jesuits is extensive. The same may be said of the writings of Descartes, Mersenne, Gassendi and of many other scholars of the period. The *Philosophical Transactions of the Royal Society of London* in the first fifty years of publication contained more than one hundred items of Jesuit interest. These items range from original papers by Jesuits, their letters to the editor, and reviews of their books, to brief references and accounts of their ideas and discoveries. A glance through the volumes of Sommervogel's *Bibliothèque de la Compagnie de Jesu* gives an idea of the very great number of scientific publications by Jesuits during the sixteenth and seventeenth centuries. The impression given by such a survey is that Jesuits of the time constituted a definite force and had an effective influence on the development of scientific studies even in non-Catholic institutions and countries. This influence was undoubtedly due in large measure to the peculiar position of the Society in the field of higher education and to its policy of encouraging scholarship among its members in secular as well as in religious subjects.

Perhaps because this influence was to a large extent indirect, it has not always received due acknowledgement from historians. The task of building up an atmosphere that was favourable to scientific studies, that promoted individual research, that encouraged critical appraisal of the scientific teaching of the past, was of vital importance to the progress of the scientific revolution. This was the type of program in which Jesuits played a distinctive part. It would take far more space than is available here to give all the proofs that would be necessary to substantiate such a statement. In passing we can at least call both Sir Francis Bacon and Robert Boyle, his great admirer, to bear witness to the respect they had for Jesuits as educators and scientists, who, were "worthy promoters of experimental knowledge" and did much to "quicken the state of education." Worthy of mention because of its critical appraisal of the dogmas of the ancients, is the *Conimbricenses*, a commentary on the physical works of Aristotle published in the early seven-

teenth century by the Jesuit faculty of the College of Coimbra. This became a textbook widely used throughout Europe, even by Descartes when a student at Paris. It was listed as a standard text at Oxford at an even later date. Among other well-known Jesuit publications, the *Physico-mathesis de Lumine, Coloribus et Iride* (Bologna 1665) of Francis Grimaldi, S.J., effectively overturned many of the Aristotelian scientific theories.

Undoubtedly the great pioneers of modern science were well aware of the scientific studies being carried on by Jesuits. They read their books, corresponded with them on scientific subjects, visited them in their colleges, and debated with them. The correspondence of Boyle and other members of the Royal Society of London with Fr. Athanasius Kircher, S.J. at the Roman College makes very interesting reading in this regard. It is true that the Jesuits were in general Aristotelian in outlook. However, they presented no unyielding line in their intellectual inclinations. At Paris, for instance, Jesuits showed a definite leaning towards the physics and philosophy of Descartes, while many of their astronomer colleagues there and elsewhere sympathised with Galileo in his cosmological teachings. Indeed, in those days, the clear-cut distinctions we are accustomed to see between the different philosophies of science were seldom explicitly drawn, and so even the new scientists were not above expressing their appreciation of and their indebtedness to the traditional schoolmen.

The story of the English Jesuit Francis Line (1595–1675) illustrates this point. Line was professor of physics and mathematics at the College of the English Jesuits in exile, at Liège, Flanders, for most of his active life. He had been, of course, trained in the scholastic mode, yet he became a friend of many of the more advanced of his contemporaries. He spent a lot of his time taking part in scientific controversies, in the approved manner of the seventeenth century scholar. He sided with Christian Huygens in his controversy about the "Squaring of the Circle" with Gregory St. Vincent, S.J.; he wrote a book against Robert Boyle's pneumatic theories; he disputed with Isaac Newton in the pages of the *Transactions of the Royal Society* about the origin of colour. Line's lack of success in these disputes with both Boyle and Newton was due mainly to his stubborn adherence to doubtful Aristotelian principles. However, the fact remains that, because he formulated serious objections from the traditional point of view, he forced the innovators to critically evaluate these traditional pillars of scholastic science and to express their own new ideas with clarity and in a manner acceptable to their contemporaries. Moreover, Line and his fellow schoolmen were arguing from the very point of view in which many of these new scientists had themselves been trained. Thus, the new scientists in their answers displayed the great intellectual leap which they had been obliged to make to reach their new position. They were forced to put into words and figures the solutions which they had perhaps grasped intuitively, but which others were unable to accept so swiftly.

As has been said, this influence of Jesuits on the general movement of the scientific revolution has so far received scant attention in histories of science and culture. The fact that the history of science is a relatively young discipline has much to do with the situation. We are still waiting for definitive biographies of most of the great men of science. In fact we have very few good modern editions of their collected works. Moreover, Jesuits themselves have done little to reveal the contribution of their predecessors to the foundations of modern science. In this matter of investigating the part played by Jesuits in the history of science, we should not be unwilling to take the first step since we are in a very favourable position for making that study. Our favourable position is twofold. First, it stems from our own appreciation of the spirit, the education and the type of life of these Jesuit scholars of former centuries; secondly, it comes from our access to the sources on which such a study must rely. The published works of these Jesuit scientists of the sixteenth and seventeenth centuries are generally available. In the United States the Library of Congress, the New York Public Library, the Columbia University Library and many other university libraries have fine collections of *Jesuitica*; in Europe the great national libraries are rich storehouses of such materials. There are smaller specialized libraries in many countries. In Ireland, for example, there are very fine collections of scientific books of the period in Trinity College and in Marsh's Library. Even more important from some points of view are the manuscripts and the unpublished correspondence which are to be found scattered through many Jesuit archives in Europe. Of particular interest are the archives from the old Roman College which are still available in the Gregorianum, Rome. Little has been done thus far to edit this material. Fr. Phillips, S.J. catalogued some of the Clavius material in Rome; Fr. Bernard Maitre, S.J. worked on the correspondence of Kircher, as did also Fr. Lamalle, S.J. A few other Jesuits are engaged at the present time in limited projects of a similar nature, but an immense amount of work remains to be done. The need is for Jesuits with a good background in science, a leaning towards history, and a fair grasp of Latin, and, if possible, of a few of the European languages who will be prepared to undertake the spadework in unearthing and publishing this material. Such a work would take many years to accomplish, but the contribution made to our understanding of the development of modern science and civilization would be well worth the effort and the time involved.

Two quotations taken from the writings of two eminent modern scholars may serve to underline the suggestion made above. J. D. Bernal, writing on the scientific revolution, asserts:

Even the movement of the Counter-Reformation, which successfully checked and turned back the advance of Protestantism in Europe, had not the same effect on science. The Jesuits who directed it, had the intelligence to realize that they were more likely to win souls by fostering science than by blindly opposing it. They ac-



cordingly entered fully into the scientific movement, particularly the new astronomy, and were even the agents for spreading it and setting up observatories in India, China and Japan. At the same time they acted as watchdogs inside science to guard against any damaging effect it might have on true religion, and thus unintentionally gave an advantage to scientists in Protestant countries out of their control (1).

L. Thorndike, dealing with the *Mundus Subterraneus* of Fr. Athanasius Kircher, S.J., concludes:

The question arises, after reading this and somewhat similar books by other Jesuits of the seventeenth century, whether this is merely a reflection and result of Kircher's own genius, curious and encyclopedic, naive and ostentatious and marveling, or whether such books by members of the same Order represent a concerted effort to offer the reading public in general and Catholics in particular, works which profess to cover the physical science and even the occult arts of the day in the hope that they will read these rather than, or at least together with, the more radical or more superstitious utterances in such fields. Or whether they aim, by voluminous tomes and disquisitions, enlivened occasionally by some hypothesis or old superstition, to create a sort of intellectual fog or smoke-screen which may impede and smother the radical departures and innovations and prevent a clear defining of the issues? This would accord with charges often brought against the Jesuits in the political sphere and with regard to their casuistry and doctrine of probability in the field of morals. But I know of no direct evidence for such concerted action in the intellectual field with respect to science (2).

Much could be said in reply to Bernal and Thorndike in defence of those scholars who, as Francis Bacon wrote, "partly in themselves, and partly by the emulation and provocation of their example, have much quickened and strengthened the state of learning" (3). Let us be satisfied for the present with a quotation from Boyle's *Excellency of Theology*:

Nothing hinders, but that a man, who values and enquires into the mysteries of religion, may attain to an eminent degree in the knowledge of those of nature. . . . You need not be told, that Copernicus, to whom our late philosophers owe so much, was a churchman; that his champion Lansbergius was a minister, and that Gassendus himself was a doctor of Divinity. Among the Jesuits you know that Clavius and divers others, have as prosperously addicted themselves to mathematics as Divinity. And as to Physicks, not only Scheiner, Aquilonius, Kircher, Schottus, Zucchius and others, have very laudably cultivated the optical and some other parts of philosophy; but Ricciolus himself, the learned compiler of that voluminous and judicious work of the *Almagestum Novum*, wherein he inserted divers accurate observations of his own, is not only a divine but a professor of divinity (4).

#### References

1. J. D. Barnal, *Science in History* (1954), p. 287.
2. L. Thorndike, *History of Magic and Experimental Science* (1958), vol. 7, p. 577.
3. *Works of Lord Bacon* (London, 1843) Book 1, p. 15.
4. Boyle, Robert, *Collected Works* (London, 1773) Book 4, p. 62.

## A NOTE ON THE MATHEMATICIAN ABBÉ CHARLES BOSSUT

THOMAS F. MULCRONE, S.J.

In a few widely consulted histories of mathematics it is stated that the French mathematician Charles Bossut was a Jesuit. This note presents some evidence for the opinion that Bossut did not at any time belong to the Society of Jesus. For much of this evidence I am greatly indebted to Abbé J. Despont, director, the archives of the Archdiocese of Paris, and to Père A. Demoment, S.J., archivist of the French Mediterranean (Lyons) Province of the Society of Jesus, and I wish to thank them for their generous correspondence concerning the ecclesiastical status of Charles Bossut. In as much, however, as Bossut was a student of the Jesuits, some details of his life and association with the Jesuits are included. These details derive principally from M. E. Doublet's excellent centennial memorial on the life and achievements of Bossut (1).

Charles Bossut was born on August 11, 1730 at Tartaras, a small village near the town of Saint Étienne near Lyons, France. At the age of fourteen he entered the Jesuit College at Lyons where it was his good fortune to have Père Laurent Béraud, S.J., (1702-1777) as a teacher (2). Few secondary school educators have enjoyed a distinction comparable to Father Béraud's: that of having had a hand in the formation of such scholars as Bossut; Jean Étienne Montucla, the distinguished historian of mathematics; Joseph J. Le F. de Lalande, the astronomer; and Charles P. Claret Comte de Fleurieu, admiral and Minister of the Navy.

Certain aspects of Father Béraud's extracurricular academic influence seem to have made a distinct impression on many of his students. He had constructed at the college a small observatory, which is still extant and now expanded, where his favored students were able to apply some of their knowledge of astronomy. It was here that Lalande received some formation. Father Béraud was also the custodian of a notable collection of medallions and other objects connected with the history of the city of Lyons. This collection was for the most part dispersed during the French Revolution of 1789. Finally, he seems to have had quite extensive acquaintance with men of prominence in various callings. It is thought that it was Father Béraud who encouraged Bossut to read the *Éloges Académique* of Bernard Le Bouvier de Fontelle, the secretary of the Academy of Sciences. Presently the young Bossut, whose preparation had gone no further than the elements of the calculus (3), dared to write to Fontelle. A sympathetic reply sufficed for Bossut to journey to Paris to visit Fontelle. Bossut was received kindly by Fontelle, who introduced him to the mathematicians Alexis C. Clairaut and

Jean Le Rond d'Alembert. This introduction to d'Alembert and the friendship and collaboration that eventually ensued proved to be singularly fortunate for Bossut. D'Alembert was never a classroom teacher, and Bossut may be considered his principal, and his only immediate disciple.

There are several important questions concerning Bossut's clerical status, including the places and dates of any ecclesiastical studies, for which I was unable to discover answers. Father Demoment noted in his correspondence the scarcity of church documents dealing with the period in question, many such documents having been destroyed in the course of the French Revolution. He remarked in particular that the archives of the Society of Jesus of the Province of Lyons were seized in 1763 when Louis XV suppressed the Society in France, that a large part of them were destroyed in the Revolution, and that a number of the extant documents are in the archives of the municipal library or civil departments of the city of Lyons. What is certain is that, while still a young man, Bossut did enter the clerical state and that he honorably wore the soutane and was known as Abbé, the customary title of the diocesan clergy, until 1792. It is quite certain that he did not go beyond minor orders, that he was never ordained a priest (4).

There does not seem to be any evidence that Bossut was ever a Jesuit. Father Demoment informed me that, as far as he knew, Charles Bossut's name does not appear in any lists of Jesuit novices before the Revolution (5). There is no mention of him in the list of names of members of the old Society that appears in the preface of *Vita Functi in Societate Jesu 1814-1894*. There is no reference to him in Sommervogel—de Backer, *Bibliothèque de la Compagnie de Jésus*, nor in the *Archivum Historicum Societatis Jesu*.

Although Charles Bossut is not among the most eminent of French mathematicians, his many accomplishments insure him a substantial place in the history of mathematics. From 1752 to 1768 he taught at the École du Génie at Mézières and wrote his *Cours complet de Mathématiques*, in seven volumes, which went through several editions. From 1775 to 1780 he taught hydrodynamics in Paris, and he was examiner at the École Polytechnique from 1796 to 1809. Bossut's employment for so many years as an educator, together with the circumstances that he studied under the Jesuits and carried on after the suppression of the Society, in the garb and under the title of a diocesan cleric, the type of scientific teaching for which the Jesuits had become famous (6) is very likely the reason for his being regarded as a Jesuit (7). During 1784-1789 he collaborated with d'Alembert, Lalande and Marie Jean A. N. Caritat, Marquis de Condorcet, in the writing of the *Dictionnaire de Mathématiques*. Bossut's *Essai sur l'Histoire générale des Mathématiques*, (2 vols., 1802) was well received and translated into several languages including English (8). His *Memoires de Mathématiques* (1812) is a collection of earlier work which included papers on navigation, astronomy, physics and geometry. The *Memoires de Mathématiques* closes

with his *Discours sur la vie et les ouvrages de Pascal* which had appeared as Preface of the *Oeuvres de Pascal* which Bossut published in 1779.

Bossut was awarded several prizes offered by the French Academy of Sciences. He was a member of the Legion of Honor and the Institute of France, of the Institute of Bologna, of the French Academy and the Academy of Turin, and of the Athenée of Lyons. He died in Paris on January 14, 1814.

M. E. Doublet is very explicit in his affirmations that Bossut was a sincere Catholic and an edifying ecclesiastic, one who had little in common with those clerics, numerous enough in his time, whose lives were a source of scandal (9). Bossut was not friendly with the radical, atheistic Lalande, nor with the revolutionary, irreligious Condorcet, who likewise had attended a Jesuit school, the Jesuit college in Rheims. It was in opposition to Condorcet that Bossut prepared his edition of the works of Pascal, an edition correcting the garbled edition that Condorcet had prepared in 1776 on the advice of Voltaire in order to link Pascal with the Philosophic Party.

Bossut was an ardent admirer of Blaise Pascal, not only as a mathematician and a physicist but also as a theologian. Doublet remarks that this led him to believe that Bossut was one of the last Jansenists (10). It is the opinion of many competent judges that in the *Discours* Bossut does not give indications of any notable Jansenistic leanings or of any personal convictions at variance with Catholic belief.

It would be edifying to be able to report that Bossut had for Father Béraud and the Jesuits of the last years of the old Society the esteem and devotion that Abbot Francesco Maurolico, Sicily's "second Archimedes", had for Father Christopher Clavius, S.J., and the first Jesuits (11). Unfortunately that was not the case. In my opinion the author of the *Discours* may be absolved of the charge of being bitter against the Society. He who never tired of relishing Pascal's *Pensées* gives in the *Discours* not much more than the expected approbation of the literary qualities of the *Lettres Provinciales*. Nevertheless Charles Bossut's treatment of the Society of Jesus is definitely unfriendly. Most of the charges of Choiseul, Pombal and Aranda against the Jesuits are noted in the *Discours sur la vie et les ouvrages de Pascal* with at least the indifference of an uncritical historian. Perhaps it was too early for critical judgment; perhaps it is too much to expect that he should have had the courage to dissent, writing as he was in 1779, when so few were willing to speak out in defense of the Society. For he wrote in the midst of the Society of Jesus' darkest hours, for which Society, as far as Bossut knew, a new day of truth would never dawn.

#### References

1. E. Doublet, "L'Abbé Bossut (A l'occasion du centenaire de sa mort)," *Bulletin des Sciences Mathématiques*, 2<sup>e</sup> serie, 38 (1914) 1<sup>a</sup> partie, pp. 93-96; 121-125, 158-160, 186-190, 220-224.
2. See C. Sommervogel, S.J., Augustin et Aloys de Backer, S.J., *Bibliothèque de la Compagnie de Jésus* (Brussels: Collège Phil. et Théol., Héverlé-Louvain, 1890-1909), 1,

1318; 11, 1601; 12, 952. See also A. Demoment, S.J., *Les Établissements des Jésuites en France depuis quatre siècles*, editor, Pierre Delattre, S.J. (Enghien: Inst. Supér. de Théol., 5 vols. 1957) vol. 2, col. 1502-1604.

3. E. Doublet, loc. cit. p. 95.
4. *ibid.*
5. A. Demoment, S.J., private communication, September 22, 1964.
6. An interesting account of one facet of the world of mathematics in which Bossut was involved, together with some references to the Jesuits as educators at that time, is contained in D. I. Duveen and R. Hann, "Laplace's Successor to Bézout's Post of Examineur des Elèves de l'Artillerie," *Isis* 48 (1957) 416-427.
7. The earliest author who terms Bossut a Jesuit is D. E. Smith, *History of Mathematics* (Boston: Ginn, 1923) I, 540.
8. Bossut's history was however inferior to Montucla's *Histoire des Mathématiques* (2 vols., 1758), the first modern history of mathematics and a classic that is still good reading. The second edition of the work (1799-1802) was expanded to four volumes by Lalande with some assistance from other scholars. These editions do not attain the standard set by Montucla's work. The expanded edition was reprinted in 1960.
9. At least one encyclopedia refers to Abbé Charles Bossut as "Abbé Bossuet" so care may be necessary to distinguish the mathematician from the able theologian, but suspect character, Abbé Bossuet, a nephew of the celebrated bishop and pulpit orator Jacques-Bénigne Bossuet. See H. Daniel-Rops, *The Church in the Seventeenth Century* (New York: Dutton, 1963) 390-391.
10. E. Doublet, loc. cit., p. 223.
11. See M. Scaduto, S.I., "Il Matematico Francesco Maurolico E I Gesuiti," *Archivum Historicum Societatis Iesu* 18 (1949) 126-141. Bossut did, however, mention several Jesuit scientists in his works. Dr. Dirk J. Struik kindly informs me that in Bossut's *Histoire générale des Mathématiques* (Paris, 1810), vol. 2, there is mention of Fathers Guldin, Kircher, Riccioli and Scheiner, and each is identified as a Jesuit. This *Histoire* was just about a second edition of the *Essai*. And in the English translation of the *Essai* under the title *A general history of mathematics from the earliest times to the middle of the eighteenth century* (London: J. Johnson, 1803) the names of Boscovich, Lallouère and Saint-Vincent appear, each of whom is referred to as a Jesuit. In the *Discours* Bossut also refers to Father Lallouère.

## CORRESPONDENTS FOR THE BULLETIN

Listed below are the correspondents who have been or will be gathering material for the "Reports of Scientific Activities" section of the BULLETIN. The news editor of the BULLETIN would like to take this opportunity to thank publicly all of the correspondents who have generously supplied us with material in the past.

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**Campion College:** Fr. George V. Farrell  
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## OFFICIAL REPORTS AND NOTICES

### *The 1965 Meeting at Fairfield*

#### FIRST GENERAL MEETING

At 7:30 p.m. in Gonzaga Auditorium Rev. James J. Ruddick S.J., President of the Association, called the meeting to order. He then introduced Very Rev. William G. McInnes, S.J., President of Fairfield University, who welcomed the members of the Association to Fairfield.

Fr. Ruddick announced the nominating committee: Fr. Gerald Hutchinson, Fr. Joseph Billotti, Mr. James Lambert; and the resolutions committee: Fr. Joseph M. Kelly, Fr. James K. Connolly, Mr. James F. O'Brien. A discussion on the apostolate of the Jesuit as a priest and scientist is being planned for next year's annual meeting. The following committee was appointed to begin planning for this discussion: Fr. Edward MacKinnon, Fr. Francis Haig, Fr. Donald MacLean, Fr. Joseph Mulligan, Fr. James Smith and Fr. Andrew Whitman.

The final event of the evening was the address of the invited speaker, Dr. William Webster, chairman and chief executive of the New England Electric System. His lecture was entitled "Comments on the American Nuclear Power Reactor Program."

The meeting was adjourned at 8:50 p.m.

#### FINAL GENERAL MEETING

Fr. Ruddick called the meeting to order at 9:30 a.m., August 29 in Gonzaga Auditorium. He then delivered a lecture on the history and present activity of the Manila Observatory.

The following report of the Committee on Resolutions was then read:

The members of the American Association of Jesuit Scientists (Eastern States Division) assembled at Fairfield University for their fortieth meeting hereby resolve:

1. That they are sincerely grateful to the Very Rev. William C. McInnes, S.J., President of Fairfield University, for his generosity in receiving us, to the members of his community for their kind hospitality and particularly to Father Robert E. Varnerin for his generous and effective direction of affairs.
2. That they gratefully appreciate the excellent work done in editing and publishing the BULLETIN.
3. That the President of the Association write a letter of condolence to the families of members deceased in the past year.
4. That the President of the Association write letters of congratulations to our jubilarians.
5. That the Jesuits of all Provinces be notified of the annual meeting in whatever manner the Executive Council chooses.

Joseph M. Kelly, S.J.  
James K. Connolly, S.J.  
James F. O'Brien, S.J.

The report was accepted as read by a voice vote.

The report of the Committee on Nominations placed Very Rev. James Fischer, S.J., Rector of St. Andrew-on-the-Hudson, in nomination for president of the Association. There were no other nominations. Father Fischer's election was unanimous and his term of office began upon election.

The news editor of the BULLETIN, Mr. Lawrence Jones, S.J., requested that local correspondents inform him of changes of address.

The treasurer's report as read by Fr. William Sullivan was accepted by voice vote. Fr. Sullivan suggested that there should be a representative of the Association in each house, whom the treasurer could contact with respect to billing for annual dues.

Fr. Fischer adjourned the meeting at 10:30 a.m.

REV. JOHN MACDONNELL, S.J., *Acting Secretary*

PROGRAM OF THE SECTIONS

**Biology.** Saturday, August 27, 1965.

1. *Cellular development in the mid-gut of mosquito larvae.* Mr. James F. O'Brien, Willowdale.
2. *The function of Cytochromoid C in electron transport and photophosphorylation in photosynthetic bacteria.* Mr. Gary Schwartzkopf, Boston College.
3. *Biological control of insect pests.* Fr. Daniel Sullivan, University of California, Berkeley.
4. *Reports from Jesuits in graduate studies and reports on research in Jesuit colleges and universities.*
5. *Discussion:*
  - a. *RPI project on science courses for baccalaureate education.*
  - b. *Commission on Undergraduate Education in the Biological Sciences.*
  - c. *Biological Science and Curriculum Study.*
  - d. *NSF programs for biology teachers.*
  - e. *Research grants to Jesuit biologists.*

**Chemistry.** Sunday, August 28, 1965.

1. *Priest-scientist: the challenge of living integration.* Fr. Donald I. MacLean, Pomfret.
2. *A chemistry curriculum for the quarter system.* Fr. George J. Hilsdorf, St. Peter's College.
3. *Report of the NEACT conference on equilibrium.* Fr. Gerald F. Hutchinson, Fairfield University.
4. *Reports from graduate students.* Mr. Noel Brawn, Chairman.

**Mathematics.** Sunday, August 28, 1965.

1. *Some reflections on teaching the history of mathematics.* Mr. John Lutts, Loyola College (Baltimore).
2. *Report on Minivac 601.* Mr. A. J. O'Brien, Loyola High School (Baltimore).
3. *Geometry:*
  - a. *A review of Moise and Downs.* Fr. Timothy Reardon, Fordham Preparatory School.
  - b. *A review of MSG "Geometry with Coordinates."* Fr. Richard Harper, Loyola High School, (Baltimore).
  - c. *Helping the teacher.* Fr. John Woodward, Gonzaga High School.

**Physics.** Sunday, August 28, 1965.

1. *The Olympic-Wallowa lineament: a major deep-seated tectonic feature of the Pacific Northwest.* Fr. James W. Skehan, Boston College.
2. *Jesuits trained in physics since 1945.* Mr. Joseph S. Rooney, Woodstock.
3. *The national magnet laboratory at the Massachusetts Institute of Technology.* Mr. Robert F. O'Brien, Weston.
4. *Goddard Space Flight Center.* Fr. William R. Callahan, Weston.

**Philosophy of Science.** Saturday, August 27, 1965.

1. *Teilhard, Lonergan and heuristic bias.* Mr. Gary W. Schwartzkopf, Boston College.
2. *C. S. Pierce's theory of 'Evolutionary Love.'* Fr. Vincent Potter, Yale University.

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