BULLETIN

OF THE

AMERICAN ASSOCIATION

OF

JESUIT SCIENTISTS

Eastern States Division

VOLUME 28 March, 1961 NUMBER 1

Bulletin of the American Association of Jesuit Scientists

Eastern States Division

(FOUNDED IN 1922)

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Application to mail at second-class postage rates is pending at Woodstock, Maryland. Published quarterly at Woodstock College, Woodstock, Maryland, by the American Association of Jesuit Scientists (Eastern States Division).

Annual dues for members of the Association (including a subscription to the BULLETIN) are $6.00.

THE *BULLETIN*: AN EDITORIAL

You are observing an experiment. It is an experiment to test the vitality of the Association's BULLETIN. Should the BULLETIN be continued? The problem has been posed at Association meetings over the past few years, and the present number, along with those to come, will represent at once a solution and a test.

Let us first explain some aspects of the problem. Its general tenor is known to all those readers who attended last summer's Holy Cross meeting; for the others, a reading of the minutes should serve to make it clear. The Committee on the BULLETIN, in its report at the meeting, offered suggestions concerning the journal's content, the difficulty of obtaining suitable copy, and the unfavorable reactions of externs to the Society's scientific work as presented in the BULLETIN.

The solution to the last difficulty is extremely simple. After noting that each issue of the BULLETIN states the restricted nature of its circulation, the report continued, "It seems to the Committee that the BULLETIN was never intended to be on open shelves in libraries, and that this particular obstacle might be overcome by removing the BULLETIN from student libraries where it might by chance be." This is only an immediate corollary of the function of the BULLETIN, as clearly indicated in the Association's constitutions and history. The first number of volume five, published in 1927, sums up this function succinctly: "It is clear that the review finds its only reason for existence in the benefits which it may bring to the teacher in science and mathematics in our Colleges and High Schools."

This goal is itself sufficient to mark out in general the journal's proper scope. What follows is our effort to elaborate the Committee's specific recommendations on content, with the aim of stating what we hope is a clear editorial policy for future issues.

The fundamental requirement of all material accepted for the BULLETIN is that it be of specific interest to Jesuit scientists. Doubtless most of the writings of the Association's members, especially those stemming from research, are of interest to all scientists in a certain field, or perhaps to science teachers in general; these, we feel, should be published in appropriate professional journals directed to all readers of this sort. The discussions and reports of the BULLETIN, on the other hand, should be of peculiar interest and value to *Jesuit* readers. For this reason, one might question the relationship between the BULLETIN and the *Jesuit Educational Quarterly* or the news-letters of the provinces. Here the distinction will not always be as clear-cut; it will be present, however, because the

readers of the BULLETIN are *scientists*. This means that the BULLETIN will generally demand more technical explanation and detail in its contents, if they are to be of value to its readers.

What sort of material fulfills this basic requirement of possessing peculiar value for Jesuit scientists? Perhaps it would be useful to list some of the items that occur to us, or that have been suggested by the Committee on the BULLETIN:

1. Official notices and reports of the Association.

2. News of scientific life in our colleges, high schools, and scholasticates, and among Jesuit graduate students. It is of particular importance that the reports cover the news in such a way as to be of maximum interest and assistance to members of the Association. To offer helpful information and encouragement by way of news exchanges has always been considered one of the main purposes of the BULLETIN. Yet we are not fully satisfied that all the news submitted serves to attain this goal, whether its deficiency lies in basic content or in adequate coverage of details. Examples of some areas that might be helpful are the following: special lectures; new courses, programs, syllabi; co-operative programs to train students or to provide supplementary work for lay teachers; research projects; new equipment and its source; grants, fellowships, scholarships for faculty or students; new faculty members, and brief reports on their background.

3. Reports on our alumni, their graduate studies and employment.

4. Obituaries of Jesuits who have made significant contributions to scientific research or education.

5. Interviews with outstanding lay scientists and educators, usually Catholics, on the particular problems and needs of Jesuit schools in science education and research.

6. Articles treating these same subjects or other topics of special interest to Jesuit scientists. Here we may refer to our above suggestions for news items. Some of the other problems that face us directly, and are therefore worthy of our consideration, concern our place as Jesuits in the scientific world, the training of Jesuits in science, and the ends and means of our scientific endeavor as seen in the light of the Society's educational goals and liberal arts tradition.

The present copy of the BULLETIN aims to exemplify our editorial policy—exemplify, not typify, because we obviously cannot cover its full scope in any single number. We particularly regret that we have not discussed the special problems of our high schools. We regret, too, our delay in preparing this issue; our apologies are surely due to those whose prompt cooperation in submitting news reports has encountered a notable time lag before their appearance. Our problem has been one of reorganization, and we hope it is well on the way towards solution.

We have spoken of the BULLETIN and its content, and of the readers for whom it is intended. One difficulty remains: finding material. This vexation has tortured the journal's editors from its very inception. Should the BULLETIN be dropped on that account? It was in answer to this question that last summer's Committee proposed a continuance of the publication under new editorial arrangements. These are now in effect: the BULLETIN is edited by theologians at Woodstock, and regular correspondents for news reports will, we hope, be found in all of our high schools, colleges, and scholasticates. But this will not solve the problem. We cannot be satisfied with a journal in which all the unofficial content other than news items originates at Woodstock. Nor could such a situation be expected to continue.

You are, indeed, observing an experiment. But much more than that, you are called upon to engage in conducting this experiment. We urge all readers to send in copy suitable for the BULLETIN. Send in articles and surveys. Send in news reports on your work. Send in, at least for the staff, your views on the BULLETIN and its value. Our question is this: What have you to say that would be of value to your fellow Jesuit scientists? Write it down and send it off to us.

THE VOCATION OF THE PRIEST-SCIENTIST

FRANK R. HAIG. S.J.

Introduction. In the controversies that swirled with often bitter violence around the subject of evolution last century, the whale was a favorite topic of debate. Since the whale is a mammal and mammals originally developed on land, the big animal must be the descendent of a creature that lived on land. But, the critics of the theory of evolution were quick to point out, there must then have been some intermediate, transitional form which, as intermediate and transitional, must necessarily have lacked nimbleness when it walked on land and speed when it swam in the sea. How, then, could it have survived the fierce competition for life?

Every priest-scientist, hyphenated being that he is, must, I am sure, at least at times, feel great sympathy for that intermediate form and ask wonderingly how he is expected to survive. His fellow priests tend, in all seriousness, to question his priesthood and his fellow scientists to doubt the sincerity of his commitment to science. While the quest for identity is an agonizing problem for all in modern times, it is such *ex natura sua*

for him. Obviously, therefore, the question of the vocation and role of the priest-scientist is one that must be faced and argued out.

Undoubtedly each priest-scientist arrives in time at a personal evaluation of his own mission. I would like here to present two explanations of his role which I feel are radically incomplete and even misleading and two considerations that, I believe, are fundamental to a correct understanding of the position of the priest-scientist within the life of the Church.

Prenote. Even before coming to such a discussion, every priest-scientist would lay down one antecedent condition on any proffered explanation. However the role of the priest-scientist is to be understood, his life's work must be seen as intrinsic to the mission of the Church. No priest-scientist will accept an explanation that makes his function a mere accident of contemporary history. It is, therefore, not sufficient to say that there are not at present enough Catholic lay scientists and so priests must do the work. It is deeply offensive to say that lay scientists demand too high a salary and so we will train priests to take their places as teachers, as if a priest could be content with the role of academic scab or strikebreaker. The demands for the priest are too insistent to permit the removal of a priest from his true work to put him into a job not truly and basically priestly. It would be better to drop science from Catholic colleges and universities than to do that. Admittedly, science as a vocation is essentially the province of the layman, and of the priest only by exception. Still, the Church encourages some of her priests to become priest-scientists. She must, therefore, feel that they have a true priestly mission in science. Call it a prejudice if you wish, still no priest-scientist will accept any explanation of his life's work that does not make it intrinsic to the mission of the Church.

Necessary but not sufficient. The first radically incomplete explanation of the vocation of the priest-scientist that comes to mind is contained in the statement, "I am in science because I am interested in it." Now it is true that it is psychologically impossible for a man to possess the dedication and drive required in science unless he is fascinated by it. The task is simply too difficult unless a man experiences in the work itself a certain real satisfaction.

Yet a priest-biologist, for instance, whose life is adequately summed up by saying, "Oh yes, he is a good biologist," is something of a monstrosity. Everything a priest does must somehow contribute to his basic purpose of helping man to come to know, love, and serve God. For what other purpose was he ordained? Hence interest is necessary but not sufficient as an explanation of the vocation of the priest-scientist. It can undoubtedly ex-

plain why a man would choose to be a scientist but not why he would be allowed and encouraged by the Church to be a priest-scientist.

Apologetics. There is a second reason which does not explain the vocation of the priest-scientist, though it comes to mind readily. The vocation of the priest-scientist cannot be understood in merely or even basically apologetic terms. As if a priest were to say, "I am going to learn evolutionary biology to refute Julian Huxley." With such motivation he undoubtedly will not learn evolutionary biology well and he certainly will not convince or refute Julian Huxley. The sad fact is that he will not even know at what points he should be refuted and will end up in the pitfall of condemning the good with the bad. This has been the Church's sad experience in the past.

Of course, it is evidently not true that the priest-scientist, or the lay scientist for that matter, should close his eyes to apologetic interests. It is both of utility and of importance to remain constantly alert in a search for impressive and convincing ways of stating the truths of faith and exposing the falsity of the charges brought against religion. In so doing we frequently gain clearer insight ourselves. Take the following obviously apologetic quotation from Sir Arthur Stanley Eddington: "The materialist who is convinced that all phenomena arise from electrons and quanta and the like controlled by mathematical formulas, must presumably hold the belief that his wife is a rather elaborate differential equation; but he is probably tactful enough not to obtrude this opinion in domestic life" (*1*). Despite its comic tone, or perhaps because of it, this quotation is valuable in forcefully bringing out the problematic status of the human person as person in any materialist system. And to be conscious of such ways of "answering the enemy" is only one aspect of St. Paul's injunction to the Colossians: "Use wisdom in dealing with those not of the faith, making the most of your opportunities. Always put your message attractively, and yet pointedly, and be prepared to give every inquirer a fitting answer" (*Col. 4:5*). And St. Peter gives the same command: "Enthrone Christ as Lord in your hearts and be ready always with an answer to everyone who asks a reason for the hope that is in you" (*1 Pet. 3:15*).

But necessary as apologetics is, still it has its drawbacks. First, it is not itself creative. A person interested in science for apologetic reasons does not usually create new science. Secondly, it allows the enemy to choose his own ground. The apologete must defend where the enemy chooses to attack, with a certain resultant distortion of perspective. Finally, though apologetics is necessary and important, still the major argument for Christianity is not something in the realm of logic and dialetic but the evidence of the fruitfulness of the Christian life in peace and good works. It is to this that all Christians are called upon to give witness.

If Eddington may be allowed to speak once more, he commented: "I have sometimes been asked whether science cannot now furnish an argument which ought to convince any reasonable atheist. I could no more ram religious conviction into an atheist than I could ram a joke into a Scotchman. The only hope of 'converting' the latter is that through contact with merry-minded companions he may begin to realise that he is missing something in life which is worth attaining. Probably in the recesses of his solemn mind there exists inhibited the seed of humour, awaiting an awakening by such an impulse. The same advice would seem to apply to the propagation of religion" (*2*). Eddington here clearly states the value of the witness involved in the apostolate of presence. His position is, I believe, basically correct though his own practice shows that it must be tempered somewhat with a dash of Pauline boldness.

Since interest in science and the apologetic utility of a knowledge of science do not satisfactorily explain the vocation of the priest-scientist, the question remains as to what does. There are two lines of thought that I think are here of importance.

The priest-scientist as symbol. It would seem that we cannot overlook the role of the priest-scientist as symbol. The life of science is an all-absorbing thing. It requires an asceticism and peculiar dedication. Of its own nature it builds up a private language unintelligible to outsiders and a whole *esprit* and outlook and way of viewing life and life's problems. And this is surely correct, to be expected and desired. It is only an actualization of what St. Paul taught the Corinthians: ". . . There are different kinds of gifts, though it is the same Spirit who gives them, just as there are different kinds of service, though it is the same Lord we serve, and different manifestations of power, though it is the same God who manifests his power everywhere in all of us" (*1 Cor. 12:4–6*).

The life of science is one distinct way of carrying out the Christian vocation to know, love, and serve God in himself and in our fellow man. It is one realization of the Christian mission to seek sanctity, to be holy as our heavenly Father is holy. The priest-scientist is meant to symbolize this union of the life of science and the life of grace. He is meant to keep before men's eyes the fact that a call to the life of science is a call to a way of life through which God is to be reached.

Perhaps this talking of the priest-scientist as symbol does not seem at first sight impressive. Maybe the point can be made clearer by recalling a description of Albert the Great by Etienne Gilson. Gilson writes: "[Albert the Great] does not wait until the need of repairing an evil already committed obliges him to busy himself in his turn with science in order to remedy it. He does not believe in the policy of letting the adver-

saries do everything with the intention of later joining their school in order to learn laboriously the use of the weapons that will be turned against them. Albert studied the sciences against no one, but for God. When you find a man of that sort, he does not waste his time proving that the teaching of science does not contradict that of the Church: he suppresses the question by his example, showing the world that a man can be a man of science because he is a man of God" (*3*).

What Gilson says about "suppressing the question" by his example is to be done by the Catholic lay scientist, too, of course. It is only that it is to be done by the priest-scientist formally, externally, visibly. He is a symbol of this "natural" union of the life of science and the life of grace, of its necessity and of its possibility.

Integration. The importance and value of this role of symbol is one clue to why the priest-scientist exists in the Church. A second clue is a natural outgrowth of it.

Actually, in speaking of the role of the priest-scientist as symbol, what is meant? What is he a symbol of? He is a symbol of integration, the integration of the life of science and the life of grace. This role of integration he carries out in his very person, by simply being what he is. But there is a second role of integration that is necessary and that is in the world of thought and culture.

Father Walter J. Ong, S.J., treating of this integration in thought and culture writes: "The Church has a stake in the totality of human knowledge, for it is in terms of this totality that she must explain her message to the world, and indeed, that her members must hold her message in their own consciousness" (*4*).

The Church must always be rethinking its message, meditating on it, re-expressing it to every age. Every great truth must be retold to every generation. And, though truth may not change, men do, and so do their interests and the areas of conflict in which they are involved. The catastrophes and tragedies that come upon the Church when it neglects to do this rethinking are much worse than the sensational mistakes like the Galileo case. What happens is much sadder. People simply no longer understand what the Church is saying. There occurs a loss of contact. That is when we hear such sad statements as "The Church has lost the working class."

In his strange book, *The Letters of Pope Celestine VI,* Giovanni Papini has a terrible denunciation which, fortunately, is highly exaggerated but at least shows what this loss of contact, this loss of integration in the world of thought and culture is like. Papini pictures Pope Celestine as writing to theologians of his day as follows: "Every century has its

language, its appetites, its dreams, and its problems; you have stopped the clock of history . . . You have not been able to pour the eternal wine of truth into flaming gourds, into chalices of clearer crystal . . . and you continue to dish up the same everlasting soup . . . without paying any attention to the Christians who are outside your cloistered doors, and who by now are accustomed to more appetizing and more palatable food" (*5*). This is what happens when integration breaks down.

When, however, this integration is achieved, when the Church does rethink its message in the language of the everchanging present, then a true christianization of the intellect occurs. Then there is had a true presence of the Church to the fields of secular learning and a restoration of the world of the mind in Christ. Consequently, as Father Ong has also pointed out, the Church "needs to be present at the frontiers of knowledge, to make this knowledge her own at its sources—for the very good reason that it is precisely knowledge at its sources, new knowledge, which is most affecting the most alert human minds" (*6*).

It should not be thought, however, that the endeavor to achieve this integration is a use of science for apologetic purposes. The falsity of this view, at least if taken in an exclusive sense, is evident if for no other reason than that the mission of the priest-scientist is not primarily to outsiders but to the faithful. And it is the true science of his day, pursued according to its own proper autonomy, that he seeks to master and, if possible, to develop. In this phase of his work, the priest-scientist is motivated as is any scientist by the sheer desire to understand, by simple curiosity. But once he has come to know and master his science, and to the extent that he has mastered it, he must then attempt to make the world of faith and the world of science transparent to each other, to keep the bridges open and traffic flowing back and forth, to raise the intellectual sophistication with which the faith is expressed and understood to a level with the intellectual sophistication with which the life of science is carried on, to bring it about that the intellectual world proper to faith and the intellectual world proper to science be able to co-exist in the same mind as parts of the same mental life.

As the priest-scientist achieves this integration, he is not supposed to keep it to himself. It is to be the common possession of the Church, of all the faithful. When he teaches physics or mathematics or biology, when he lectures or counsels, even to an extent when he preaches, it is to be in terms of this integration of the eternal Word of God and the contemporary scientific wisdom of mankind. It is his special role and reason for being to symbolize this integration, to achieve it and to communicate it.

Sacramentality. When the vocation of the priest-scientist is so conceived, an interesting fact emerges. The role of the priest-scientist fits into the life of the Church not so much in its teaching function as in its mission to sanctify. In considering the role of the priest-scientist as symbol of integration and as effective agent of integration, we cannot help noting that our terminology has become distinctively sacramental. A sacrament, after all, is a *signum efficax gratiae*. The life of science is meant to be a channel of grace. The priest-scientist works to make it effectively so. No wonder that he feels instinctively that his work is intrinsic to the mission of the Church.

Such a view of the vocation of the priest-scientist makes it indeed a large order and few priest-scientists fulfil it as they ought. Yet I do not mean to write of our stumbling steps but of the mountain heights appointed for us to climb. It is a wonderful challenge and a great grace to be asked to try.

References

1. A. S. Eddington, *The Nature of the Physical World* (Cambridge, 1953), p. 341.
2. *Ibid.*, pp. 336–7.
3. E. Gilson, *Christianity and Philosophy* (Sheed and Ward, 1939), p. 116.
4. W. J. Ong, S.J., *American Catholic Crossroads* (Macmillan, 1959), p. 145.
5. G. Papini, *The Letters of Pope Celestine VI* (trans. L. Murane; Dutton, 1948), p. 57.
6. W. J. Ong, S.J., *op. cit.*, p. 146.

Woodstock College

SOMETHING HAS TO GIVE!

An Interview with WILLIAM J. THALER
on Graduate Science Departments in Catholic Schools

J. A. PANUSKA, S.J.

The problem. Jesuit colleges and universities are under pressure. Today, excellence is demanded not just by our consciences, but by students, professors, administrators, and even non-academic citizens who are legitimately concerned with our national security. Even in more serene times we would be healthily dissatisfied with the degree of excellence we have attained and are apparently likely to attain. It is no longer singular to re-evaluate seriously our whole status in education. Human society and forces in our civilization are changing rapidly; some say that we have aged centuries within the past few decades. What adjustments must Jesuit schools make in order to keep pace?

When the urgency of excellence is coupled with current financial pressures, optimism may yield to gloom. Can Catholic America, on whom we depend almost entirely, afford excellence on a large scale? Even if it can, real sacrifices will be necessary, and Catholics will want to know if our effort in education is worthwhile—if there is a reasonable hope of success.

While these problems face us on all levels of instruction, perhaps they are asked most frequently with regard to graduate science departments. In such departments, excellence is especially difficult to achieve, the cost of maintenance is far out of proportion to student fees, religious influence seems to be minimal, and graduate programs are sometimes said to be expendable for the sake of the college effort as a whole. This is not to deny that undergraduate departments are often much enhanced by the presence of a graduate program in the same area, especially in the matter of faculty recruitment and general tone.

Towards a solution. The status of Catholic graduate science education —excluding professional schools—was the subject of an interview on February 14, 1961, with nuclear physicist William J. Thaler (B.S., Loyola College; Ph.D., Catholic University of America). Currently in the department of physics at Georgetown University, Professor Thaler is best known for "Project Tepee," a radio-monitoring method developed by him at the Office of Naval Research (see *Time*, August 17, 1959, pp. 42–45). He has had considerable experience in dealing with scientists, and has long been interested in the goals of Catholic education. Speaking from this background, Professor Thaler has proposed his own re-evaluation of Catholic graduate science education in answer to the questions that follow.

Do you believe that Catholic schools should continue to run graduate science programs?

Catholic schools have an obligation to run graduate science programs. The importance of science is increasing so rapidly in our daily lives that Catholic leadership is mandatory to insure a proper perspective in interpreting scientific results as they affect the moral and spiritual life of the community. Furthermore, Catholic students who wish to prepare for careers in science at the advanced levels will benefit greatly from continued training in a Catholic environment.

Would you care to place any limitations on such graduate science programs?

I can think of no restrictions I would care to place on this, but a few points should be kept in mind. Considerable care must be taken in planning the curricula and the research facilities of the graduate science departments. Certain basic courses are, of course, required in any graduate program, and these must be provided. Because of the limitation of funds that is present in most Catholic institutions, graduate research activities, an essential part of the program, must be tailored to fit the means at hand. Research at the graduate level need not require highly specialized and extremely expensive research tools, such as nuclear reactors, synchrotons, and the like. Many areas of basic research are wide open to profitable explorations at a minimum of expense. These should form the basic effort, and extensions should grow logically from areas of industrial or governmental interest, where support would be forthcoming.

What about theoretical work?

At most only a small percentage of graduate students in the sciences, or in physics at least, have a real first-rate theoretical capability; for this reason, the great bulk of their work is going to be a mixture of experimental and theoretical—with emphasis on the experimental side. This is just the way people are. This means that to have an adequate graduate department you have to have an adequate experimental research program.

Some educators say that Catholic schools should withdraw from this area of scholarship. You disagree, and so it would seem that you believe that Catholic schools have a function which cannot or will not be satisfied by non-Catholic schools.

Yes, I would say that Catholic graduate science education has a double objective. First, it must provide the community with trained and able workers to advance the legitimate well-being of society in the areas where

science functions. Its second objective, more important than the first, is the development of the individual's talents to enable him to render a satisfactory account of his days on earth and gain eternal life. Non-Catholic schools give little or no thought to this latter more important aspect of graduate science education.

Do you think that the schools are performing this second function well?

Yes, I believe that Catholic schools provide the continuing reminder to the graduate student that there is more to education than just mastering our present knowledge of the physical laws. Of course, there is always room for improvement, and this area is no exception.

Don't you think that Newman Clubs or similar religious and philosophical associations for the graduate student could provide this need adequately without a Catholic graduate science program?

No. Science presents many dangers of thinking along materialistic lines. The danger of loss of perspective is too great. If a student goes to a secular school, groups like the Newman Clubs are very desirable, and possibly even necessary, but the trouble is that the schedule of the graduate science students is very heavy to begin with, and I don't think that a facility such as a Newman Club has the power to attract all the Catholic students. Graduate students in a Catholic university are simply surrounded by things Catholic. The whole atmosphere is such that they are reminded that, along with their scientific education, their faith is part and parcel of their lives.

What do you consider to be the cause of the weakness that many think is all too common in Catholic graduate science departments?

I think that the weakness, where it exists, stems from the general lack of support of science by those who largely determine the emphasis given to various areas in Catholic education. Much improvement has taken place in the last ten years, but science is still not recognized to the degree warranted by its present and future importance in the life of the community. This lack of support shows itself in various ways, such as salary levels, lack of equipment, and physical plant deficiencies.

Is there any remedy for this weakness?

Yes, it is a matter of pointing out to those who guide our Catholic institutions the importance of providing adequate salaries and facilities for the graduate science faculty. Science, because its knowledge is applicable to man's material well-being, is rapidly outdistancing the humanities in

importance in our materialistic society. We need Catholic leaders in science who are aware and will make others aware that science and its material applications have their roots in things spiritual, and that they must be recognized for what they are, not magnified beyond reason. We must maintain a balance between the sciences and the humanities, reflecting our understanding that our fellow-man's spiritual needs—his problems, his hopes, his fears—are just as important as his material well-being. For this, the humanities are essential; the danger, however, is that Catholic leaders will understress science.

You think, then, that the problem is one of educating the educators?

Yes, exactly. Many administrators do not understand scientific needs—you can't really expect them to, since they are not scientists. Scientists have requirements that do not exist in other areas. If a man is in English literature, you can give him an office, supply him with paper and an adequate library, and he can work. The physicists—with the exception of a small number of theoretical physicists—cannot do this. They have to have a physical plant of some size, at least. They have to have time to conduct their experimental research; they can't just do it at odd hours of the evening in the way in which one can write an English paper or do history studies. There is need for developing a research atmosphere in graduate science departments. This can be done by a full-time faculty whose specialties interleave with one another—a faculty that gets experimental research going, discusses results that aren't clear, calls in members of other departments. You just have to build this general feeling of research atmosphere. And it takes time.

What about the strength of our graduate science departments? Apart from the benefits of a Catholic atmosphere, do you think that Catholic schools have any advantage on the purely scientific educational level?

An advantage lies, in general, in the relatively small size of the schools. This allows more individual attention to the graduate student, and also affords the possibility of broadening the student's training, thus preventing overspecialization in a single field. Secular graduate schools tend to grind out physicists, chemists, or engineers who have little or no knowledge outside of their own special area within an already specialized field. I think our schools could make the most of this strong point of theirs by holding interdepartmental seminars to give the graduate students a chance to see the interrelation of scientific knowledge, and perhaps stimulate a cross-breeding of interests and application among the scientists.

Another advantage that some Catholic graduate schools have is their

association with medical schools and medical research centers. Such a relationship is wide open to work in biophysics, biochemistry, and the so-called biomedical aspects. At the present time I am very interested in interdisciplinary research involving a team approach. One can have medical men, specialists in various fields, biologists, chemists, and physicists all working in a united team on a specific problem in the biomedical field. And this is a real area of strength in many Catholic institutions. There seems to be adequate money available for medical research, and many medics are desperately anxious to have physicists and others cooperate with them in their research.

On this question of the strong points of Catholic science departments, I would like to add that *per se* science does not, of course, involve any moral or spiritual implication, and thus Catholic schools have neither advantages nor disadvantages in this regard. The area of the Catholic side of education is that of the spiritual and moral. Physics, chemistry, and biology study natural laws. It is true that through these natural laws one can appreciate the tremendous power of God in creation, but the study of the laws is not itself a treatment of creation. Our grasp of the power of God through this intricate and wonderful creation doesn't make any difference in our ability to grasp the science itself.

Now to a really knotty problem. Granted that first-rate faculty members are needed for good departments, we simply cannot afford to pay salaries comparable to what the scientist can earn in industry—at least, the universality of the problem seems to imply a real objective impossibility.

If you can't afford to pay them what they could get in industry or sometimes even in other universities, I would say first that you have to relax the restrictions on outside consulting that most universities impose on their faculty. Here you often have the same kind of limitations throughout all the departments. Yet a scientist's time is worth much more, hour for hour, than that of, say, an English professor—not to underestimate the latter's value to the university, of course. If you could relax considerably the restrictions on outside consulting, then the man who is interested in teaching, who wants to further the cause of Catholic education in science, and who has enough of a reputation to do consulting —and it doesn't take very much, really—can add to his income.

An obvious problem with this is the time that consulting might involve. It would have to be controlled.

The average consultant pay in this part of the country is $100 a day plus expenses. This means that if a faculty member were permitted to do

this work for one day a week, his income would amount to an additional $5200 a year—a reasonable sum of money, wouldn't you say? That's assuming that he could get a job—or enough of them—so that he would average out to one day a week. On that basis, a man could reach the amount he might make in industry, and his "salary" would be competitive.

If relaxation of regulations on outside consulting is your "first" solution, do you have a second?

Yes, and I prefer this solution. Sometimes a man can get a research grant on a more or less continuing basis. He is going to be reluctant to do this if besides his teaching duties he has this research responsibility and gets no additional remuneration from it. So why not permit him to pay himself some reasonable percentage of the research grant in addition to his university salary? Some non-science professor may protest. My answer is that they simply have to face the facts of life. If they were in a free competitive situation, they would be making less than the scientists. The fact that we are in an academic environment does not mean that the scientist should be kept down to the level of remuneration that the non-scientists demand in their speciality. That is the core of the problem.

I said that I prefer this solution to the first one because in addition to increasing the teacher's salary, it has several further advantages: the work would be done at the university, the university would benefit by gaining instruments and the like, possibly some graduate students—and even, perhaps, an extra professor—could also be supported by the grant, and all the credit from successful research would go to the university to increase its prestige.

Don't you see a danger in this? The man who brings in the most outside money will be most highly evaluated, and there is likely to be serious friction within the university.

All a reasonable man wants is a wage comparable to what he could get if he were working in industry or for the government. Therefore, the practice of rewarding a faculty member according to the amount of contract money he can bring in is, I think, a minor consideration. There is often a misconception about how much money actually accrues to the university from a research grant. It really gets very little: enough to cover overhead and other costs. A grant simply adds up to the possibility of doing research and of getting some special equipment with which to conduct the project. It doesn't put dollars in the university's pocket. Furthermore, at most Catholic universities, if a professor gets a contract it doesn't change his salary one dollar, even though he has the responsibility

of providing reports, doing original research, and so on. This means that the man who is content to do nothing but his academic duties—teaching and the like—gets the same remuneration as the man who is interested enough to go out and get a research contract and perform additional research work.

I want to emphasize, though, that there has to be a limitation on the time that a faculty member can spend on the research itself. There must be no interference with teaching duties. Remember that the primary purpose of maintaining a graduate science department is to educate the students. The major purpose for conducting research is to further the capability of the students, not the professors who happen to be in charge of the research. We must employ those means necessary for this education. But if you adhere to my philosophy on getting outside research grants, then you don't fall into the trap of perverting your graduate science department into a research factory that turns out papers primarily, with only incidental interest in producing good students. I know of some universities whose contract research became so heavy that special research institutes had to be formed in which faculty members held academic rank but did no teaching whatsoever. This is a mistake, and it has a bad effect on educational policy. Of course, I don't mean to imply that research institutes have no important function in the progress of science.

You don't think, then, that our schools should run institutes given over entirely to research?

Our first responsibility should be to educate our students. If a particular university gets to the point where it has built up an adequate facility for teaching the students, yet still has capability left over to do pure research beyond the function of the students' benefit, then I think such research should be an optional course for that institution.

I believe that another difficulty involved in obtaining good faculty members is the hesitancy on the part of the prospective professor to associate himself with a weak department. What do you think?

People with established reputations in the sciences will come for one of two reasons: either they want to head a department, thus enhancing both their own reputation and consequently that of the school, or they are offered a lot of money. And you can't really offer them a lot of money. The chances are, therefore, that they won't come at all unless they sincerely want to build up the department, or unless there is someone there of comparable stature with whom they can feel some kinship at a technical level. Another group—and these we can hope to get—consists of men who, though not of top-notch reputation, are nevertheless competent, reputable

scientists with lots of promise. A department staff built of these may look weak at the start, simply because its members have no reputation, but if they are given a little time to mature and to conduct their research program, the department should develop. If you hire promising young men and are patient with them—and perhaps find someone with more experience just to point out the right paths—you can build a good department from the ground floor. Most scientists realize this.

In summary, the burden of your message seems to be this: We must remain in graduate science education because it is our function to integrate religion and science, both for individuals and for society as a whole. To make this possible, administrators must become increasingly aware of the importance of science and willingly accept sound advice on requirements and planning. A specific and urgent need, if the job is to be done adequately, is the significant increase of science faculty salaries to a competitive level; this can be brought about without overburdening the university itself.

Correct. That sums it up. Something has to give—there's no way of avoiding this. We must keep graduate science in our Catholic universities; wider scope for outside consultation work and added pay from research contracts are two ways toward the faculty excellence we will always need to maintain.

WOODSTOCK COLLEGE

REPORTS OF SCIENTIFIC ACTIVITY

High Schools

Boston College High School. Chemistry classes have been experimenting with Baxter and Steiner's college text, *Modern Chemistry*. This two-volume work is the text for the highly successful TV "Continental Classroom." Some difficulties have been encountered in adapting this rather advanced text to the high school student. In the laboratory the students are not using a standard text book, but are writing up their own reports with a college outline format as the basis.

Georgetown Prep. Students were selected for a science honors course at the beginning of the second semester of freshman year, rather than at the beginning of sophomore year, as had been done in the past. The freshmen thus selected take the School Mathematics Study Group (SMSG) course in geometry. Three semesters of calculus and an advanced course in chemistry are also part of the honors program.

Fr. D. Bradley Murray, S.J. has begun work in the preparation of a freshman high school mathematics text. It will be built upon the basic idea of function, with an axiomatic treatment of the real number system and its operations.

Gonzaga High School. A science honors course has been set up as follows:

Mathematics: Algebra I and II (first year), plane geometry (first semester of second year), college algebra and trigonometry (second semester of second year and first semester of third year), calculus and analytic geometry (second semester of third year and both semesters of fourth year).

Chemistry: Both semesters of second year, and first semester of third year.

Physics: Second semester of third year, and both semesters of fourth year.

Scranton Prep. Mr. William Murray attended a joint Adelphi-Brookhaven Institute this past summer. The program was devoted to radiation biology. Mr. Murray has obtained equipment for radioactivity experiments in the biology and chemistry courses.

A junior at the Prep won first prize at the Marywood College Science Fair for his growth studies of irradiated seeds. He made comparative studies of germination and growth of seeds that had received different doses of radiation, and demonstrated their growth patterns by a series of delayed-action motion pictures.

Xavier High School. Mr. William Thompson has two freshman classes using the SMSG program in a pilot study. The success achieved with these two groups (one with an IQ of 140 or more, the other of average intelligence) justifies the extension of the course next year to replace the standard algebra program throughout the freshman class.

Colleges and Universities

Al-Hikma University, Baghdad. Emphasis in the science program has been shifted from physics to civil engineering. Fr. F. W. Kelly, S.J. (MIT, engineering) and Fr. William J. Larkin, S.J. (Catholic University of America, physics) have recently joined the staff. Fr. Larkin's doctoral dissertation in nuclear physics was a study of Cherenkov radiation.

Boston College. As part of the 100th Anniversary Development Program at Boston College, $2.5 million have been allocated for a new Science Center, $4.0 million for faculty salaries, and $1.0 million for a scholarship endowment fund. The Science Center, scheduled for completion in 1963, will supplement Devlin Hall with new facilities for faculty research, instruction laboratories, new equipment, and seminar rooms.

Biology. Fr. William Sullivan, S.J. presented a paper at the summer meeting of the AIBS at Oklahoma State University, and has had three recent publications in the *Transactions of the American Microscopical Society.* Chromatographic separation of proteins and amino acids and X-radiation studies have been among his research interests.

Fr. Sullivan has given many talks on Teilhard de Chardin's *The Phenomenon of Man,* including lectures at MIT, Boston University, and American International College. Two of his articles on the same work have appeared in the *Pilot,* Boston's archdiocesan weekly.

Dr. Robert Ortman is engaged in a joint project with Dr. W. Etkin (Albert Einstein College of Medicine) on developing amphibian pituitaries. He is also working on a U. S. Public Health Service grant for cytologic and cytochemical studies of pituitaries of lower vertebrates.

Canisius College. Dr. David G. Keiffer and his student assistants, after a year and a half of work, have recently obtained satisfactory results from their nuclear magnetic resonance apparatus. They designed and built practically all of the equipment, aided by a large stock of government surplus microwave equipment. The research program is in the field of electron spin resonance.

Program for teachers. As part of the effort to raise the level of high school science teaching in the Western New York area, the physics, chemistry, biology, and mathematics departments have given a number of special courses for the benefit of science teachers during the past

several years. Two of the courses have aroused special interest: a course in meteorology by the Buffalo weather man, Bernard Wiggin, and a course in electronics by a Bell Aerosystems electrical engineer, Stanley Walter.

Undergraduate research. A grant of $5900 has just been received from the NSF for the support of a program of summer undergraduate research participation by chemistry majors. This is the third such grant received by the department.

The research activities of the chemistry undergraduates seem to lead many of them to graduate study. Of the thirty-five graduates in chemistry over the past three years, twenty-six have gone to graduate school. During the same time about half of the physics graduates have gone on to further studies.

Grant for nuclear equipment. The physics and chemistry departments recently received an AEC grant of more than $17,000 for nuclear detection equipment and instrumentation. This apparatus, along with previous equipment, has been put into a newly established radiation laboratory, which is well equipped for nearly every type of radiation measurement.

Fordham University. The science departments recently received a multi-departmental grant of $12,800 to continue for the third year in the NSF Undergraduate Research Participation Program. At Fordham this program is under the direction of Fr. Clarence C. Schubert, S.J., and is administered in conjunction with the science honors program. Students are selected from among those in the honors program by the individual professors who are to direct the particular project. Working full-time in the summer, and part-time during the academic year, the undergraduates assist the professor and his graduate students, or work on a project of their own under the professor's direction.

Perhaps the most significant achievements of the program are shown in the intention of participants to attend graduate school, and the number of fellowships and assistantships offered to the senior participants. The senior participants of 1959–60 are all in graduate schools. Some students have done work suitable for publication and presentation at national meetings. Frequent, even weekly, brainstorming sessions are conducted with all the participants present, and this has been found an effective stimulus for the students' research and for cross-fertilization of ideas.

Chemistry. Dr. Emil J. Moriconi has succeeded Dr. William F. O'Connor as chairman of the department. Dr. I. M. Hunsberger, noted for his research in sydnone chemistry, has resigned his post at Fordham to become chairman of the department of chemistry at the University of Massachusetts.

Current research in the department embraces the fields of enzymology, synthesis of heterocyclics, ozonolysis of polycyclic hydrocarbons, chelates, phase rule studies, kinetics of insecticidal action, free radical stabilization, slow combustion of hydrocarbons, reactions involving pure ozone, ion and electron emission spectroscopy, and isotope separations.

Since the fall of 1958, Fr. Schubert has been engaged in a study of chemisorption of gases by means of electron and ion emission microscopy, with particular attention to pure iron. He is also continuing his studies of the reactions of ozone with hydrocarbons.

In chelate chemistry, Dr. Michael Cefola is conducting kinetic and thermodynamic studies of selected chelate compounds, and Dr. Philip S. Gentile has been preparing inorganic complexes and chelates by solid-solid interaction. This work with chelates is supported by the AEC. Dr. Norman O. Smith has been directing phase rule studies, using a dilatometric approach.

Recent publications by members of the chemistry department include the following contributions of three Jesuit authors: F. J. Dillemuth, D. R. Skidmore, and C. C. Schubert, "The Reactions of Ozone with Methane." *J. Phys. Chem.*, 64, 1496 (1960).

Mathematics. Fr. Arthur Clarke, S.J. and Mr. Peter Curran have received NSF Faculty Fellowships for the year 1961–62. They will study at Yeshiva and Columbia Universities, respectively.

Physics. The department has received three National Defense Education Act Fellowships in theoretical physics for the year beginning in September, 1961. These fellowships are open to college seniors interested in teaching careers who would like to specialize in theoretical physics. The fellowships are for three years, with stipends of $2000, $2200, and $2400 for successive years.

Fr. Joseph F. Mulligan, S.J., chairman of the department, has received a fellowship for post-doctoral work at the new campus of the University of California at La Jolla. For the past five years, he has been engaged in theoretical work on atomic and molecular structure. The work, supported by the NSF, has included molecular-orbital calculations of wave functions and energy levels of molecules, and calculations of the fine-structure of the *He* and *Be* atoms. Currently he has been making semi-empirical calculations of potential energy curves over a wide range of internuclear distances. Various techniques, such as the Rydberg-Rees-Klein method, are being used, and the calculations are carried out with the aid of the Bendix G-15 electronic computer.

Research currently in progress in the department includes work in nuclear physics, electron physics, optical spectroscopy, molecular spectroscopy, and theoretical physics.

Dr. Joseph Shapiro is directing two theoretical research projects under AEC sponsorship: the calculation of cross-sections for nuclear reactions at high energies, using the statistical theory of nuclear reactions; and the calculation of energy levels, fine structure, and hyperfine structure of light atoms, such as *He* and *Be*. Both projects make use of the department's Bendix G-15 electronic computer.

Dr. Alfons Weber is engaged in molecular structure studies, with emphasis on the technique of high-resolution Raman spectroscopy of gases and vapors. The research is supported by the NSF.

Fr. Frederick L. Canavan, S.J. is directing Fordham's research program in low energy nuclear physics. The university has completed a new laboratory for this work, and has invested approximately $8000 in equipment for the study of gamma ray energies, coincidences, and angular correlations. A study has been made of the attenuation of angular correlations by extra-nuclear fields in Hf^{181}. Fr. Canavan also plans studies of viscosity effects in liquid samples, and of temperature effects in crystalline samples. These investigations should lead to information on nuclear quadrupole moments, and, in the case of known quadrupole moments, should shed light on the nature of the extra-nuclear fields.

Georgetown University. The ground-breaking ceremony for the new science building was held on October 9, 1960. The building is expected to be ready by the summer of 1962. It is to be 222 feet in length, 110 feet in depth, and 90 feet in height; the inside area will be 132,000 square feet. At a total cost of $4.5 million, the building is being constructed on the hill between the present White-Gravenor Hall and the newly erected medical-dental dormitories.

The ground-breaking ceremony was preceded by an exhibition on "Science at Georgetown." Dr. Robert N. Page, Director of Research at the U. S. Naval Research Laboratory, officiated at the ground-breaking. It was followed by a formal dinner for the benefactors of the university. The principal address was given by Dr. Alan T. Waterman, Director of the NSF.

Conference on astro-geophysics. A conference on astro-geophysics, sponsored by the NSF, was held at Georgetown from August 1 to August 24, 1960, under the direction of Fr. Matthew P. Thekaekara, S.J. Thirty-two college professors took part in the conference, which was held under a grant of $21,000. Seven of the lectures were reported in detail in the *Washington Post*, which also published three news stories on the director and participants, and an editorial on the significance and achievement of the conference. A Georgetown TV Forum and an NBC radio interview also featured the conference. A monograph, "Recent Advances in Astro-

Geophysics," was edited and published by Fr. Thekaekara. It is a topical symposium based on lectures given at the summer conference.

Observatory. The following projects are under contract with the U. S. Air Force Laboratory at Bedford, Massachusetts:

1. The observation of flares fired from rockets at altitudes above the surface of the earth approximately 600 to 800 miles. In this project the Georgetown Observatory is serving as the coordinator for twenty-two observation sites in the continental United States.

2. The design of a visual system to monitor the sky for artificial satellites.

3. A study of the accuracy of fundamental star positions as given in basic catalogs. This problem has become important in recent years because of the work that is being done with satellites and flares. Star catalogs are in preparation on magnetic tapes, so that positions can be read off rapidly and processed to the epoch of an observation. Fr. Jules de Kort, S.J. has made a study of the consistency of thirty-nine old star catalogs to show that the majority of them, some nearly a century old, can be reduced to a common system, thus providing valuable data on proper motions for modern catalogs. This work required the use of larger computers (such as the IBM 704 and 705) than the one in the observatory.

A group of fifteen undergraduate students were employed in a project known as "Operation Minitrak." The purpose of the project was to measure the Army's minitrak records of the passages of several satellites. The observatory has also undertaken the task of measuring photographs of the moon taken at the Lick Observatory in California. When the work is completed the Army expects to have the most accurate mapping of the moon ever attained. These projects have been under U. S. Army Map Service contracts.

Dr. Kiess and others have been observing the spectra of the planets Mars, Venus, and Jupiter. This work is being carried out under a contract with the U. S. Army Engineers at Fort Belvoir. Results obtained so far indicate that practically all previous concepts of the nature of the atmospheres of these three planets will have to be revised. Spectrochemical studies in conjunction with the department of chemistry at Georgetown are under consideration to verify the existence of nitrogen tetroxide in the atmosphere of the planets.

Under a grant for spectroscopic research on faint lines in the spectrum of the sun and on the neutral spectrum of titanium and other astrophysical metals, several members of the staff and graduate students from both astronomy and physics have been continuing a project begun nearly twenty years ago by Fr. Paul A. McNally, S.J. and Dr. Kiess. Both the NSF

and the National Geographic Society have assisted with funds for this work.

Physics. At the beginning of the fall semester Fr. Thekaekara was appointed acting chairman of the department. His current research interests include interferometric measurements of titanium wave lengths, molecular bands in yttrium salts, faint lines of the solar spectrum, and analysis of the spectra of titanium, yttrium, and zirconium.

The appointment of Dr. William J. Thaler, of the Office of Naval Research, as Professor of Physics at Georgetown was announced in early September, 1960. He will continue as a consultant with the Navy Department. Professor Thaler's Project Tepee has been referred to earlier in this issue of the BULLETIN; by means of his method, nuclear bomb blasts and rocket firings can be detected almost instantly by high frequency "back scatter" radios at secret locations in the United States. He was also technical director of Project Argus, sometimes called "the greatest scientific experiment of all time." Under Project Argus, three atomic bombs were fired from shipboard and detonated 375 miles above the South Atlantic, creating a shell of electrons that enveloped the earth for several days. The project revealed much about the earth's magnetic field and the behavior of radiation in the upper atmosphere.

Dr. Ralph Henderson, of the physics department, is on leave during the 1960–61 academic year, while studying field theory at Columbia University on an NSF Faculty Fellowship.

Professors Charles Beckel and Edward Finn presented a paper entitled "Power Series Expansions about Equilibrium of the Heitler-London and Rittner Vibrational Potentials" at the annual Symposium on Molecular Structure and Spectroscopy held at Ohio State University.

Mr. Ralph Regalbuto presented a paper entitled "Piezoelectric Apparatus, the Adaptation to Several Lecture Demonstrations" at the fall meeting of the Chesapeake Section of the American Association of Physics Teachers. Mr. Regalbuto is Secretary-Treasurer of the section.

St. Joseph's College. In April, 1961, the science departments of the college will act as hosts to 100 high school seniors selected for excellence by the Philadelphia Science Council. They will come to St. Joseph's to see the biology, chemistry, and physics laboratories in operation.

Physics. The September, 1960 enrollment of physics majors totaled 195, with the students distributed as follows: seventy-six freshmen, forty-six sophomores, forty-two juniors, thirty-one seniors. Slightly more than half of the junior and senior physics majors are cooperative students working alternate terms in industry.

The physics department is operating two sections of an undergraduate nuclear physics laboratory recently equipped on a $20,000 grant from the

AEC. The equipment includes two rate meters, two scintillation spectrometers, a coincidence-anticoincidence amplifier unit, two flow counters, a five-curie neutron source of plutonium-beryllium, several special neutron counters, an alpha scintillation detector, two survey meters, a vacuum system, a bubble chamber, apparatus for experiments in nuclear magnetic induction, and six scalers with accompanying geiger tubes for detecting alpha, beta, and gamma rays.

Mathematics. In September, 1960, a major sequence in mathematics was initiated with an enrollment of seven freshmen. Previously, the mathematics offered at the college was in the form of service courses for other science departments.

University of Scranton. Fr. Paul J. Casey, S.J. is chairman of the University Research Committee, which was formed in 1957 with the following aims:

1. To encourage and stimulate interest in research in all departments of the university.
2. To review and evaluate proposed research projects and applications for research grants.
3. To provide expert advice on procedures, plans, and policies directed to obtain financial support for faculty research.
4. To serve as a clearing house for information on current research projects undertaken at the university, as well as those in the planning stage.
5. To serve as a liaison with the Jesuit Research Council.

Chemistry. An NSF Undergraduate Research Participation Program was initiated in the summer of 1960, and under a total grant of $24,150 the program will continue through the academic year 1962–63.

Departmental research at the present time includes work by M. D. Appleton on mongolism and blood proteins, glycine metabolism *vs.* mental retardation, and low temperature lubricants. Fr. Casey has been analyzing amino acids by gas chromatography. U. Burti and W. Haab are studying the interfacial tension of cholesterol and cholesterol esters; the former is also working on the chromatographic separation of mixtures of alcohols, and the latter on the kinetics of succinic dehydrogenase.

Biology. An NSF In-Service Institute for High School Teachers was held during the academic year 1959–60.

Present research in the department includes a study of the cytological effects of maleic hydrazine on tree plant species by J. Callaghan, and a study of the effects of various concentrations of different antibiotics on pigmented and non-pigmented *Staphylococcus aureus* by J. T. Evans.

Mathematics. The department is running an NSF In-Service Institute for the second consecutive year.

Physics. An NSF In-Service Institute is being held by the department during the current year. The AEC has made a grant of $9000 to the physics department for instrumentation.

Dr. J. Harper is collaborating with Dr. McGinnis on a text, *Electronics for Scientists.* Dr. McGinnis is also engaged in research in high resolution Raman spectroscopy, and in the selective absorption of the *Hg* 4358-angstrom line by the use of natural resonance methods.

Wheeling College. The science departments, under the direction of Fr. Joseph A. Duke, S.J., have been awarded a grant of $14,400 by the AEC to equip a laboratory for a course in nuclear technology as applied to the life sciences. This course will be introduced into the curriculum in September, 1961.

Chemistry. Under a grant from the NSF, the department is conducting a series of seven workshops for science teachers. The first five, held in the months from October to February, were: "Mathematics for Chemists," by C. H. Sorum (University of Wisconsin); "The Nucleus," by Truman Kohman (Carnegie Institute of Technology); "The Electron," by John A. Timm (Simmons College); "The Periodic Chart," by Luke E. Steiner (Oberlin College); "The Electrovalent Bond," by John F. Baxter (University of Florida).

Fr. Duke spent the summer at California Institute of Technology doing research in the department of immunology. With Shizuo Watanabe he was author of an article, "The Effect of Inorganic Pyrophosphate on the Light Scattering of Rabbit Myosin B Solution in the Presence of Magnesium Ions," *Arch. Biochem. and Biophys.* 90, 96 ff. (1960).

In cooperation with a group of chemical industries in the Ohio Valley, Wheeling's chemistry department held a symposium consisting of seven lectures on "The Chemistry of Water." The following topics were included: "The Chemistry of Water and Aqueous Systems," "Corrosion Control—Metal Deterioration," and "Chemical Deposits and Corrosion Control."

Scholasticates

Shrub Oak. A research contract for the study of atmospheric radioactivity was signed with the Naval Research Laboratory in September, 1960. Equipment acquired under the grant includes two scaler circuits, a counting rate meter, printing traffic counters, a lead jug, and several counters. This equipment will be used in measuring fall-out and some of the decay products found therein.

Fr. Thomas L. Cullen, S.J. was awarded a Pan-American Professorship to teach at the Catholic University in Rio de Janeiro from March 1, 1961 to December, 1961.

A new course, "Structure of Elementary Algebra," is offered to non-mathematics majors who wish to teach the SMSG algebra course during regency. The text is *Studies in Mathematics,* Volume III in the SMSG series.

Fr. Joseph F. Mulligan, S.J., chairman of the physics department at Fordham, delivered a lecture at Shrub Oak in February. His talk was entitled "Science and Humanism."

Weston College. The ninth year of regular meetings of the Weston Science Colloquium has begun with the following lectures: "Rocket Exploration of the Earth's Magnetic Field," by Mr. Jerome Killiher (Air Force Cambridge Research Center); "The American Catholic Academician: A Research Progress Report," by Professor John D. Donovan (Boston College); "Mathematics and the Principle of the Excluded Middle," by Professor Louis O. Kattsoff (Boston College).

Fr. Walter Feeney, S.J. and Mr. Edward MacKinnon, S.J. are members of the recently formed Boston Colloquium for Philosophy, organized by members of the faculty of Boston University. At the first meeting, held at the Boston University Faculty Club on February 9, 1961, Professor Carl Hempel of Princeton University read a paper on "Inductive Inconsistencies," which was followed by a long and lively discussion. Fr. Feeney teaches cosmology at Weston, as well as courses in mathematics at Weston and Boston College. Mr. MacKinnon received his doctorate in theoretical physics at St. Louis University, and has written several articles on the philosophy of science, most recently in *The Modern Schoolman.*

Woodstock College. Several theologians who were in graduate studies before coming to Woodstock were given the opportunity of carrying on scientific research last summer. A number of publications have resulted from their work.

Biology. Fr. J. A. Panuska, S.J., (*Md.*) received a grant of $1050 from the NSF to investigate the "Annual fall-winter aspermia and anestrus and the spring breeding period in *Tamias striatus* as affected by prolonged exposure to cold." He spent the summer at St. Louis University as a visiting investigator using their facilities for this project.

Fr. Alan J. McCarthy, S.J. (*N.Y.*) received his M.S. degree in biology from Fordham University in February, 1961. His dissertation was entitled "A histochemical study of polysaccharide and acid phosphatase in the embryo of *Xanthisma texanum* DC." The *Xanthisma texanum,* "Star of Texas," is a plant of the Composite (or Sunflower) family.

Mr. Michael A. Lorenzo, S.J. (*Md.*) has published a monograph, "The cephalic nervous system of the centipede, *Arenophilus bipuncticeps* (Chilopoda, Geophilomorpha, Geophilidae)," *Smithsonian Misc. Collections,*

vol. 140, no. 4, publ. 4425 (November 8, 1960). Based on his doctoral dissertation (St. Louis University) in vertebrate zoology, the work is a study of the gross anatomy and neurohistory of the "brain" of a representative geophilomorphous centipede.

Mr. George D. Ruggieri, S.J. (*Md.*) has published a paper (with Ross F. Nigrelli), "The effects of holothurin, a steroid saponin from the sea cucumber, on the development of the sea urchin." Zoologica *45*, Part I, 1–16. It is based on his doctoral dissertation (St. Louis University) in experimental morphogenesis. During the summer of 1960, he continued research on the effects produced by various biologically active substances extracted from marine animals on the development of the sea urchin. Extracts from various sponges obtained from Bimini, British Bahamas, were tested on a developing system. The work was done in collaboration with Dr. Ross F. Nigrelli, Chairman, Department of Marine Biochemistry and Ecology, New York Acquarium, and was supported by a grant from the Damon Runyon Fund. Concurrently, Mr. Ruggieri did research at Beth Israel Hospital, New York, in collaboration with Dr. William Antopol, on the effects of viruses and various tetrazolium salts on the developing sea urchin.

Chemistry. Fr. Robert D. Cloney, S.J. (*N.Y.*) spent the past summer doing theoretical research with the Molecular Structure Group at the Catholic University of America. He was studying configurational interactions in a molecular orbital calculation of the energy levels of the Be_2 molecule.

Mr. Charles L. Currie, S.J. (*Md.*) completed work for his doctorate in physical chemistry at the Catholic University of America in January, 1961. His dissertation in the field of kinetics was entitled "The vapor-phase photolysis of methyl azide." It was a photochemical study of the elementary reactions in a kinetic mechanism for the overall decomposition of methyl azide, CH_3N_3. The work was supported by a grant from the U. S. Army Engineer Research and Development Laboratories, where the Basic Research Group is interested in the behavior of metastable substances such as the azides. Mr. Currie presented a paper based on his research at the Conference on Azides sponsored in the fall by the Army Engineer Laboratories at Fort Belvoir, Virginia.

Mr. Richard W. Rozett, S.J. (*N.Y.*) received his M.S. degree last summer from St. Louis University. His thesis in inorganic chemistry was entitled "The solvolysis of decaborane." He studied the initial stages of the reactions of B_4H_{10} with water and with ammonia.

Mathematics. Mr. Joseph E. Billotti, S.J. (*N.Y.*) received his M.A. degree in mathematics from Fordham University in June, 1960. This past summer he spent six weeks at the Research Institute of Mathematics, a

division of the Research Institute for Advanced Studies (RIAS) in Towson, Maryland. There he engaged in private research under one of the resident mathematicians, and also helped to prepare some monographs for publication. RIAS is an institute established by the Glenn L. Martin Aircraft Company solely for the purpose of basic research. Operating with a permanent staff representing the various sciences, it welcomes visiting scientists to engage in research at the institute on grants from the Martin Company, the NSF, the Air Force, and other agencies.

Mr. Edward W. Brande, S.J. (*N.Y.*) completed work for his doctorate in mathematics from St. Louis University in January, 1961. His dissertation, a study in number theory, was entitled "The representation of binary quadratic forms by quinary quadratic forms."

A paper by Mr. James F. Smith, S.J. (*Buff.*) will appear in the *Pacific Journal of Mathematics.* Published under joint authorship with P. P. Saworotnow, it is entitled "On some classes of scalar-product algebras." The paper is based on Mr. Smith's 1959 doctoral dissertation in functional analysis at the Catholic University of America.

Physics. Mr. Thomas H. Green, S.J. (*Buff.-Philipp.*) received his M.S. degree in physics from Fordham University in June, 1960. The degree is preliminary to further studies leading to a doctorate in the philosophy of science.

Mr. Richard J. Pendergast, S.J. (*N.Y.*) received his Ph.D. in theoretical physics from St. Louis University in June, 1960. His dissertation, "The spin-lattice relaxation in paramagnetic salts," was a theoretical investigation of the effect produced on spin-lattice relaxation in paramagnetic salts by certain Hamiltonian terms obtained by reducing a relativistic two-body wave equation to approximate form by the method of Chraplyvy.

Graduate Studies and Research

A paper by Mr. James T. Dehn, S.J. (*N.Y.-Philipp.*), describing work done in Georgetown's ultrasonic laboratory, appeared in the December, 1960 issue of the *Journal of the Acoustical Society of America.* The article is entitled, "Interference Patterns in the Near Field of a Circular Piston."

Mr. William Hall, S.J. (*Buff.-Philipp.*) is doing research in developmental cytology under a grant from the National Institutes of Health. The project, which is being carried out at the Rockefeller Institute in connection with Mr. Hall's studies at Fordham, involves an electron microscopic study of several species of blue-green algae and chlorophyll-containing bacteria.

Mr. Ray Salomone, S.J. (*N.Y.*) is currently working under an NSF

Cooperative Graduate Fellowship in Fordham's chemistry department. His thesis is entitled, "The Synthesis of Molecularly Modified and Isotopically Labeled Biaryl Systems Related to DDT for Testing of Insecticidal Properties."

Mr. John St. George, S.J. *(N.Y.)* is also working under an NSF grant in chemistry at Fordham. His research is concerned with the conformational effects in the formation of enamines with cis- and trans-hexahydro-2-hydrindone.

Fr. M. Yanese, S.J., *(Japan)*, a Fulbright Fellow at Princeton University, was invited to Boston University in December, 1960 to discuss the work he is doing on the quantum theory of measurement. Together with Araki, another Japanese physicist, he has generalized a theorem of Professor Eugene Wigner of Princeton by showing that any operator that does not commute with a conserved quantity cannot be measured exactly. This result indicates that the amount of information available concerning an atomic system is more severely restricted than the Heisenberg indeterminacy principle indicated. Heisenberg's principle allows an exact measurement of one variable if one sacrifices accuracy in measuring its conjugate variable; the present results impose restrictions on the accuracy of measurement under any circumstances.

OFFICIAL REPORTS AND NOTICES

The 1960 Meeting at Holy Cross

First General Session

The thirty-fifth annual meeting of the American Association of Jesuit Scientists (Eastern States Division) was called to order by Reverend James K. Connolly, S.J., President, at the College of the Holy Cross on Tuesday evening, August 30, 1960, in the large lecture room, 103 Haberlin, at 8:00 P.M.

Unfortunately, the newly appointed president of Holy Cross, Very Reverend Raymond J. Swords, S.J., was unable to address the Association due to the sudden violent death of one of the students at Holy Cross. Reverend Andrew MacFadden, S.J., executive assistant to the president, addressed the Association on behalf of Reverend Father Rector and extended the members a cordial welcome.

A motion was made and passed that the Secretary's Report be accepted as submitted. Then the President appointed the committees on nominations and resolutions.

As proposed in the meeting of the Executive Council, the President set forth to the members at large the problems facing the Association in the continued publication of the Bulletin. It seems rash at this moment to depart radically from the traditional function of the Bulletin, even though the number and training of the members in our high schools, colleges, and universities has changed a great deal in the past few years. Father Fiekers, after years of faithful service, submitted his resignation.

The task of the Editor would be greatly facilitated by the more productive cooperation of the sectional chairmen in supplying the Editor with material proper for publication. Therefore, the President proposed that the members consider these problems during the convention so that some action might be taken in the final general session. It was not planned to have at this time a general discussion before the members have an opportunity to consider the problems; however, a discussion was initiated by Father Mulligan. In the ensuing discussion many members expressed their views on the type of article to be published in the Bulletin, the relationship of the Bulletin to other publications and the function it should perform towards the members of the Association. It was agreed, following a motion by Father Brennan, that a committee be formed whose function will be to collect information on the nature and purpose of the Bulletin as stated in the Constitutions and delineated in the past record of the Association. The committee will present this information in usable form to the members in the next general session. A motion to close the discussion on the Bulletin at this time was proposed by Father Dillemuth and passed by a majority.

The Presidential Address on Radio Astronomy which followed so captivated the members that many regretted the inevitable limitations of time. The meeting adjourned at 9:00 P.M.

Final Business Meeting

The meeting was called to order at 9:30 A.M., September 1, in 103 Haberlin. The President's first action was to call for a report from the Committee on the Bulletin composed of Fathers Robert Brennan, Edward Sherry, George Coyne, Gerald Hutchinson, Matthew Thekaekara. As chairman of the committee Father Brennan presented the report to the members. Upon the conclusion of the report comments and suggestions were offered by many members.

The president urged a greater activity among the members in contributing to the BULLETIN as this is the distinctive representative organ of the Association even though other publications carry items of specific scientific interest concerning our members. Commenting on the type of news item which is desirable Father Brennan and others called attention to the fact that they should partake more of the nature of a short research summary submitted by knowledgeable members of the various departments so engaged. Father Mulligan was of the opinion that the unity of the Association should be divorced from the BULLETIN. The BULLETIN with suitable aid from local reporters could also convey valuable information concerning undergraduate college programs to high school teachers, and to college teachers a guide to our various graduate programs that would materially assist the placement of students and the recruitment of staff members. A motion introduced by Father Drury to accept the report of the Committee on the BULLETIN was carried, as was the report of the Treasurer which followed.

The report of the Committee on Resolutions was submitted by Father Devane:

1. Be it resolved that the American Association of Jesuit Scientists (Eastern States Division) express its gratitude to Very Reverend Raymond J. Swords, S.J., President of Holy Cross, and to Reverend William F. Kelleher, S.J., Father Minister, and to the Holy Cross community for their cordial reception and generous hospitality on the occasion of this 35th annual meeting of the Jesuit Science Association.

2. Be it resolved that the Association extend its profound gratitude to Reverend Bernard A. Fiekers, S.J., retiring editor of the Jesuit Science BULLETIN, for his long and arduous labors in a very difficult job.

3. Be it resolved that the Association express its gratitude to Reverend Thomas J. Smith, S.J. and to Reverend Robert MacDonnell, S.J., whose labor on arrangements contributed so much towards making this meeting both enjoyable and profitable.

4. Be it resolved that the Association extend its congratulations to the Very Reverend Raymond J. Swords, S.J., on his appointment to the presidency of the College of the Holy Cross.

5. Be it resolved that the Association send its congratulations to Reverend Henry M. Brock, S.J., on the occasion of his sixtieth year in the Society.

6. Whereas this Association has on the death of Reverend Francis X. Wilkie, S.J., lost one of its most enthusiastic members, be it resolved that this Association express its profound regret at this loss and that the members commend to God the soul of this devoted Jesuit and scientist.

7. Be it resolved that the Secretary of the Association be instructed to send a copy of these resolutions to Very Reverend Father Rector and Reverend Father Minister of Holy Cross and to Father Fiekers and Father Brock, and a copy of the resolution on Father Wilkie to his nearest relative.

J. F. DEVANE, S.J.
R. O. BRENNAN, S.J.
J. KELLY, S.J.

Father James Harley then submitted the slate of the nominating committee; President, Father Clarence Schubert; Treasurer, Father John O'Conor; Secretary, Father John Kinnier; all were unanimously elected.

The mathematics division reported the election of Father James Fischer as sectional chairman and the physics section Father James Ruddick as chairman.

There being no further business, the meeting adjourned at 10:30 A.M.

JOHN H. KINNIER, S.J., *Secretary*

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