



Science/Technology Education in Church-Related Colleges and Universities

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Session 6: General Discussion

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Session 6: General Discussion

BRUNGS: Normally I don't do what I'm going to do now, namely, start off the session. But some people will have to be leaving before the end of the meeting. While everybody is still here, I would like to thank Al Panuska for an superb keynote address and for his excellent interjections into the discussion. For me to say that of a former superior is great testimony. I also want to thank our essayists while they're all here. The meeting simply would not have occurred and would not have been as profitable as it is without them. I want to make a special note of Dr. Chase of Wheaton and Rustum Roy. Though they were not able to attend, they contributed a great deal to our undertaking with the excellent papers they've submitted.

I want to thank all of you. I'm always amazed at these meetings how charitable and how patient people are. I've been to meetings where this simply is not true. The one thing I like most about ITEST meetings, as distinguished, for instance, from American Physical Society meetings, is that we don't run a "prima donna of the meeting" contest. There is no one-upmanship in our meetings. It's refreshing to see people looking, if not for the right answers, at least for the right questions. One of my physics professors years ago used to come into quantum physics class every day and start by saying: "you will not get the right answer if you don't ask the right question. And even if you do get the right answer without asking the right question, you won't know you have it." That's the purpose of these meetings.

I think it's the purpose of the kind of interdisciplinary work we all seem to think we need in our schools -- to help each other come up with the right questions so that we can work toward right answers. One of the major contributions, for instance, that the science faculty can make to the theological and philosophical faculty is to talk to them and help them to pose the right question. Without the right question, we can forget about the right answer. This weekend we've been groping for the right questions. In this context I would like to launch into a little speech. The weekend has been much of what I would call algebra and I think it's time to do what I would call geometry. We've been looking at the "quark" of sci/tech education in church-related schools, and it's time to look at the environment in which the "quark" lives. What is the environment? It is both promising and threatening.

First of all, many of us are religious. Our numbers are decreasing and we're getting older. We aren't going to be around too long, certainly not in terms of the history of the world. We are not going to be replaced by other religious at least in the foreseeable future. Now, this is good. It's far beyond the time for the laity to be moving into these areas. But there is a down side to this. Almost all of us who are religious have degrees in fields other than science, and it makes interdisciplinary work more natural for us. I have four degrees, only one in science. Losing this is going to affect the campuses, to affect this broader education that we have. The science faculties in church-related schools in the future are not going to have this by and large. There will be a price to pay for that. It's all the more essential that we look at what we are doing and try to get these kinds of initiatives started now.

In the broader context this is the world in which our schools exist. We see the "eastern empire" crumbling back into the nationalities, ethnic and religious groups from which it was forged. We see the ancient hatreds rising. The Azerbaijanis and the Armenians are fighting again. At least it seems that that empire is crumbling. We have to consider seriously whether the "western empire" is not also crumbling for much the same reasons but under a different set of circumstances. When I had John Murray in theology 30 years ago, he was even then worrying that American society and American education was excessively pluralistic. Will our society degenerate into an aggregate? I think we can see that it well might do so. That's what a "philosophy of privacy" (I am my own arbiter in all ways of what I think and what I do) leads to. That's a significant danger to our society. It's a real danger to education. We are not our own arbiters. We are not the creators and designers of reality. We must realize that we have to live in a reality that is a given.

I'm not worried about what's going on in the cosmologies. They're presenting whole new sets of data, whole new issues. But by and large, they are not going to touch our daily lives. Scientific writers are promising us a new human on the biological level. Our religious tradition promises us a new human on the eschatological level. This is going to affect our lives. It's going to affect our bodies, and that's pretty immanent to who we are. We have to

approach sci/tech education in the context of these issues. They present challenge, they present menace, and they present enormous opportunity. How does the new human promised us by science relate to the eschatological new human of Christian revelation? Is there any relation beyond the two “new humans”? How can we help each new human feed upon the other and help it grow? That’s a serious question facing church-related education. How can we bring these two concepts of what it means to be human, one immanent, one eschatological to point accurately to the new human promised us in Christ?

We would serve our society, science, and Christianity by looking at that question. I’m not giving an answer; I don’t know an answer. Nonetheless, I think that’s a valid question.

That’s what I mean by context. We must do more than just teach science. We have to teach science well, as science. I don’t want the physicists teaching ethics, and I don’t want the ethicists teaching physics. But if we can work together on our campuses, we can work on an overarching question -- who is this new human? -- in our institutions, as a genuinely interdisciplinary focus. We can cooperate in seeking the proper questions.

Finally, I want to take this opportunity to thank Bob Bertram who routinely does a superb job as moderator of these meetings. I also want to thank Sr. Marianne for sitting out there taping the meeting and doing all the work she’s doing. I want to thank Bernice Morris for 17 years of devoted labor and loyal service to ITEST. I thank them all very much.

BERTRAM: Well, folks, we’ve got our agenda. Thanks to the superb way in which you all as a group took that challenge last evening, we’re presented with a somewhat sharper focus to our discussion than we might have had. I suggest that we keep the questions that you considered in your small group discussions last evening in our consciousness this morning. If there are very compelling reasons for your dealing with issues that are not embraced in those three, then, of course, feel free to do so. There’s no need to confine ourselves to one topic at a time.

KEILHOLZ: There are two people here who had important roles in the development of my faith and my scientific training. I want to acknowledge that. Sr. Leona Truchan was my professor of biology and advisor at Alverno College in Milwaukee when I was in school there. And Sr. Rosemary Connell was my professor of biology and advisor at Fontbonne. I’m moved by that. It always seems to me that at these meetings we come back to talking about the human person, the qualities which make us human. For me, one of the most important is the ability to have relationships with other human beings.

It may be true, as Bob (Brungs) has pointed out, that the numbers of religious are dwindling, but I hope you will never forget that you have touched the lives of many, many people. None of us have any idea of our impact on others. For me, this is a rare opportunity to be present with two people who are not aware of what an important part they played in my life. I hope that my life is worthy of the gift that they have given me.

BERTRAM: I’m sure it adds nothing to what Peggy just said for me to come in, as the egghead, and explain that the genre in which she just now spoke is what in the history of theology is called a *confessio*. Remember Moliere’s comedy in which the man who suddenly became rich and, therefore, was accelerated into a higher class of French society felt he had to equip himself for his new social expectations. He took dancing lessons and instruction in rhetoric. He comes home from his rhetoric lesson and says, “Guess what I learned today? All my life I have been speaking prose.” Many Christians, without knowing the name for it, give testimony. The rest of you might use what Peggy has said as a trigger to ask the Brungian question perhaps -- remember, it wasn’t an answer, it was the question -- whether the sort of thing that Peggy Keilholz has benefited from under the tutelage of Sr. Leona and Sr. Rosemary might begin to qualify for what Brungs asks concerning the new human. Well, that’s just a sub-question to that question.

BYERS: Bob, I’m more optimistic than you are on the religious. I don’t know if they will be replaced in the same form, but I don’t think the religious have died yet. When I asked for the floor yesterday, I wanted to comment on the Galileo case. As it happened, I had the latest copy of *Origins* with me. The Pope has made another speech on

science and faith. The side bar contains a little bit of history on the Galileo affair I thought I'd read that into the record:

“Pope John Paul II’s rehabilitation of Galileo began in 1979 in a speech to the Pontifical Academy of Sciences in which he used the Galileo case to illustrate his belief that there should be no irreconcilable tensions between science and faith. The following year he created a commission to restudy the Galileo trial while he continued to speak sympathetically about Galileo in speeches to scientists. The commission finally proposed in 1984 that the Holy Office judges were wrong in condemning Galileo. The findings were published in 1984 with an introduction by then Archbishop Paul Poupard who, now a Cardinal, is currently head of the Pontifical Council of Culture. Galileo’s judges ‘committed an objective error,’ the Archbishop said in part, and related the error to the prevailing mood at the time in which science and religion were integrally linked. Galileo’s views ‘seemed to shake the whole theological structure’ and the judges believed ‘he had violated a point of Catholic doctrine.’ The error is a healthy warning against confusing faith with points that can be changed by time.” That’s where we are with the Galileo affair. At least at the level of the Vatican that confession has been made and reconciliation hopefully can proceed.

I would like to comment on one other thing. When we were in our small group yesterday, I was reflecting on our small but not insignificant experience in the Human Values Committee with dialogue with the scientists. Although it’s too pat, it helps to look at the overall situation this way. Perhaps in Galileo’s time, the church was overly confident that it had the “Truth” and was not willing to listen to what Galileo was saying. It’s more complex than that, but I think that is the premise. It is also true now that the matter has largely reversed itself. The scientific community believes it has the “Truth,” with a capital T. Individuals will back off from that if pressed. In the atmosphere of this dialogue, the hardest thing is to get the bishops to say anything because they’re almost unconsciously intimidated by the scientists and by the drumbeat of propaganda, for lack of a better word, over the last 100 years that science is the only way to truth.

There is an interesting reversal when religious people in effect ask whether they can say something in this forum? We are defensive; no, not defensive, we are shy, very, diffident. Scientists are saying, “Well, we’ll listen to what you have to say.” It’s an interesting phenomenon and it took me by surprise and flip-flopped the images that one has of the religious establishment. The religious establishment, when it engages science, is remarkably self-conscious and unsure of itself. As we continue the planning for a conference, it’s useful to bear that in mind.

KEEFE: I’d like to speak to the matter of the interface that Dave Byers has been discussing and relate it to a few things that have been perennial problems at once in theology and in ecumenism. Generally one may suppose that the discussion of the interrelation of science and religion has certain dimensions of an ecumenical project. One of the problems that we continually run into is a very general understanding of the terms which is sufficiently ambiguous to permit statements to be made whose intelligibility suffers from that vagueness. For instance, theology and religion tend to be lumped together. And as Dave has remarked, science has a tendency to be identified simply with the truth of the material world. Let me explain what I mean. An historian writing a history of some particular period or event is governed by the data before him. His work is a synthetic effect which at his most optimistic he would not identify with the actual conditions for history which actually happened. That which actually happened is always a bit beyond the attainment of the historian.

Thus, the faith presents a challenge to a theological inquiry which is never complete. I might presume, without having any scientific training, that by analogy it may also be said that the scientist is continually questioning a reality which continues to respond to him and will not cease so to do. Thus, one does not identify history with what the historian does or physical reality with what the scientist does or the faith with what the theologian does. Yet when we see statements such as science brings us to God, it sounds to me very much like saying theology brings one to God.

There is a theological tradition which indeed hopes that to be the case. It's the tradition that moves out of Augustine, Anselm and Bonaventure, the Augustinian tradition, which intends to be a faith seeking an understanding. It operates, when it operates at all, only in prayer. There's no doubt whatever that any human inquiry so can operate. Faith is not limited simply to religious questions. It's an overall grasp and appropriation of the free truth of the concrete order in which we live. But it's very difficult to keep that in mind.

Last evening I came in during the discussion and so I missed some of it. Dr. Procaccini came out with a very insightful and provocative statement about the unity of scientific insight with artist insight, and this is precisely what the Augustinian tradition has insisted upon since Augustine first remarked about the ancient beauty he had found too late. This ancient beauty which is forever new is something we all find too late. But we continue to seek it and in the end, please God, we shall find it. We find it, however, only in terms of prayer.

For Augustine to seek the truth was to seek an ordered free unity which could only be called beauty. In contemporary theology, people such as von Balthasar, who has written a theology of aesthetics or an aesthetical theology if you prefer, realize this. This attempt sees the unity of truth as free, as something that escapes conceptualization in a sense of being always transcendent to the best that we can articulate. Our articulation is not false, but it's always an additive. What draws us on is the lure of beauty, the desire to possess an order of freedom which transcends us but which is at the same time very much our own.

There is no question that when we understand, we understand in a moment of appropriation of this beauty in a fleeting sort of fashion. It's what an artist does; it's what a scientist does; it's what anyone does when they seek to understand and after much struggle make some slight advance by which they see. The only word that can describe the unity of that insight is clarity. It is not a conceptual necessity; It can't be reduced to necessity. It has the clarity of a work of art, the clarity of beauty. When we try to articulate it, then we begin to stumble.

I would expect that Bach, whenever he wrote a fugue, ended up dissatisfied with what he had done. The few artists that I have known never seem to be entirely satisfied with their work. Writers re-write and re-re-write to make their work better. Many of them finally drive their publishers to despair. We all are dissatisfied with our work to the extent that it's not perfect. That will always confront us.

That relates to what integrity, this search for beauty, might be. If it is free, it's obviously debated. One cannot reduce it to necessity, one cannot show that it must be this way. That it is this way is gift. If one is doing theology, this is easier to understand. Theologians have a tendency to confuse this gift with a kind of voluntarism; but in the end, if one is going to do theology, one must accept the given, the gift character of the historical order. For a theologian, this is generally a doctrinal, a Biblical, a confessional tradition. For the physicist, this is the free data that comes to him through a dial, a telescope, a detector in the lab, or whatever. It comes to him as truth, as something upon which he may rely utterly. He may not understand it but the data don't lie. While his or her interpretation of them, however, is always doubtful, the data are sound.

Take this problem of the interrelation of science and religion -- religion not theology. Take science in the broad sense of the appreciation of the splendor of the material order of the world -- of majestic science of which we have been hearing. That's a good term. If we look at science and religion in this context, the great question is always going to be how to preserve the freedom of those percepts which make it all worthwhile. There is in theology always a tendency to rationalize, to reduce this free truth to an accessory. At the moment when the Augustinian tradition peaked in Bonaventure, it was recognized that one understands the material, singular, historical reality before us by an intellectual (not a sense) intuition. That is to say, the "isness" of the thing is given us not conceptually but through an existential apperception.

Hardly had that been grasped than its condition of possibility, an ongoing illumination by which the mind is freed of its own necessities, was said by Scotus and by those after him to be unnecessary. Their Aristotelian logic had by then begun to declare -- and there was a tendency to suppose -- that what is true is true because it cannot not be true. Its truth has the structure then not of freedom, not of beauty, not of rectitude, not of that integrity which is

personal, but of an integrity which is impersonal, necessitarian, and determinist. This has happened in theology over and over again and not least within the Jesuit tradition. One might think here of Suarez whose work underlies that of Descartes.

If we're going to maintain that the historicity of the theological enterprise, it's only going to be done in reliance upon an historical God. For the theologian this is a doctrinal, a confessional tradition. I say this to explain why I objected to the non-doctrinal emphasis which I thought I heard in Fr. Panuska's willingness to accept a certain failure of traditional orthodoxy on a campus. I'm speaking specifically about the presence of atheism and so on. It is very clear that you cannot in any university prescribe belief. Belief is free. There is no way in which it could possibly be forced. To try to force doctrine, to try to force dogma, is clearly a waste of time. Nonetheless, a certain self-identity in an educational operation seems to me to be utterly necessary. If there is no sense of historical identity, we begin to look upon truth we're seeking in nonhistorical terms. If we look for truth in nonhistorical terms the community of the university then is threatened by doctrine and at the same time another kind of orthodoxy begins to replace it. There have been enough incidents of this in the past to require no particular illustration.

We must remember when we are seeking the union of truth which is scientific and truth which is religious that we are dealing with historical inquiries. Ultimately what is at issue is the very meaning of history. Is this a theological category? Can it be said that the world with which the scientist is concerned is the world that God made good? Does not the goodness of this world, its freedom, underlie the free scientific inquiry upon which the experimental method rests? I've raised that point in a number of these conferences. It is by no means a novel idea. In physics today in the persons of people like Capra, in Ernest Mach a few generations ago, there is a tendency to discover a non-historical truth, a tendency to look upon the world in terms that can only be called Buddhist or Hindu. This seeks a soteriology from history, a salvation from history, a tendency to find the truth in ideas only and not in the world about us. It is difficult under those circumstances to understand how an experimental inquiry, the very life blood of science itself, can take place. If we do not take the world about us as the source of our information, we're going to find it in our own pointy little heads. Then our quest becomes impersonal. We are simply seeking a pure, non-concrete, non-historical truth and the search is going to dehistoricize us. We cannot do otherwise. This has been spelled out too often in the history of ideas even to be a matter of very great interest.

The notion that one fulfills one's humanity with a free spontaneity is something that came in with the Old Testament, with the old Covenant. It is verified continually in the New. It is by this kind of free commitment to a Good Creation that we image God. It is, therefore, true that a scientist who seeks the truth in this fashion cannot but seek God, because God is present in his world. It is by His presence that the world is good. Now, he may not be clearly conscious of this. I don't mean here to speak in terms of Rahner's notion of an anonymous Christianity. It's not necessary to impose Christianity on people merely because they're doing physics. Nonetheless, there is in this a certain dogmatic background, and that can be lost. This is a free inquiry. When it begins to be pursued under terms of necessity, when you begin to identify theology and religion, science and reality, then there's no longer any need to check your science by theology, if you check your theology by doctrine. This is a danger to both sides. It makes a very bad theology. I'll leave it to the scientists as to whether it makes bad science. I suspect it does.

FORD (ST. LOUIS): I give talks at high schools, and my latest topic begins with the question of Galileo. I ask them what they can tell me about Galileo. The students invariably tell me that he was suppressed for his teachings. Then I ask how many of them are aware that within the last 50 years a first rate physicist was destroyed, was killed because he advocated the Einsteinian view of relativistic physics. It's almost unknown, but the Soviet physicist, Boris Hessen, died in a Gulag 50 years ago for advocating the Einsteinian view. I wish I could give you a good reference to the story. And he was not the only one. Mark Bronshtein disappeared into the Gulag for the same reason. Nikolai Vavilov, the famous geneticist who died in the Gulag in 1943! The 20th century is the era of the destruction of science for advancing valid scientific truth.

There is a Soviet scientist whom I am studying, who also disappeared into the Gulag 50 years ago. He started as a mathematician. The title of the paper I'm writing is "The Religious Roots of Modern Soviet Mathematics." This

person plays the key role. He left Moscow State University in 1904, having been perhaps one of the most brilliant math students they ever had. He then went to the Moscow Theological Academy. He was a professor there, with brilliant promise, when it was closed in 1918 after the revolution. He returned to his science and made significant and notable contributions to science in the Soviet Union. He was a naturalist, a biologist, an artist. He taught perspective drawing and wrote about iconography. He was a mathematician and a physicist. He wrote a defense of Dante on the basis of the modern relativity theory. The whole point of his life and work was to say not only is science in no way incompatible with theology but, in fact, it's just the reverse of that. And he himself was, as it were, living proof of that.

His name was Pavel Florensky. There's no name that is being urged forward more urgently today under glasnost than the name Pavel Florensky. "Science and Religion," the publication of the leading atheist society of the Soviet Union last January carried a biography of Florensky, and published the letters that he wrote showing the scientific investigations that he carried on after he had been sentenced to the Gulag. Right up to the end, he was studying permafrost while he was freezing to death in Siberia. He never gave up his scientific inquiries nor his urge to contribute to society, to advance scientific knowledge. He never wavered in this until he was finally done in. The letters are tragic, the most dramatic letters in the history of science perhaps.

In the Soviet Union the theologians -- remember the Galileo case here -- have plenty to say to science. This man went into the Gulag because, in the 1920s, the notion was that once science appears, theology will evaporate like the mist. But he was one of the leading figures in the electrification of Russia, one of the greatest achievements of the revolution. Because he went to those meetings wearing his pectoral cross and black cassock, he was eventually arrested and not allowed to continue. I offer that as an additional comment on the situation that Dave Byers described. The religious community feels itself on the defensive, but, at least in some areas, the situation is really quite the opposite.

VOICE: When was he killed?

FORD (ST. LOUIS): In 1938, probably.

VOICE: He was a Russian Orthodox priest?

FORD (ST. LOUIS): A Russian Orthodox priest. I've written a still unpublished paper on him.

BERTRAM: Take what Don Keefe said about history and the freedom in which the historical reality is given to us, and then to use Charles Ford's telling history as a case in point, ask what kind of connections you could draw between those two. That would in itself be a project in relating a historical science at least -- you didn't speak as a mathematician, you spoke as an historian -- to an effort by a theologian. I guess it would take us an hour just to find the entry point to pursue that, but I couldn't help but notice how engaged you all were as Charles Ford spoke. What Lonergan speaks to is attentiveness to the particularities, the concretenesses of the history. I can't help but think it has been something more than an accident.

PERRINE: I have a lot of sympathy with those who condemned Galileo at the time. It's hard to see how anyone but Galileo could have realized how wrong they were, because it would be difficult to extricate what was bad science in the Old Testament and what was good theology.

I was thinking of something that came up in conversation last night about the unique contribution of church-related schools to science education. I'm fairly sure that something which science never will provide us, and something which religion and world views always provide us, is the conviction that there's some meaning to life beyond death. That I think any church-related school will provide and it really enhances the argument and changes the outcome of a lot of decisions. When we have a conviction from some transcendent source that death is not an ultimate tragedy that has to be fled at any cost, we make different decisions with regard to things like people

dying of cancer, or things like organ transplants. There's a million areas where there's a different behavioral and concrete outcome because of a conviction that death has some meaning, that there's a possibility of meaning and existence beyond the termination of this physical existence. That can be a very important and indispensable contribution of the church-related school which can't come up in a secular context.

EAGAN: In terms of this discussion of the importance of history and the sensitivity to it, I'm thinking how practically we might think again about how a religiously integrated or religiously oriented school could contribute to science and technology education. I think it's important if there's going to be contribution of church-related schools to science and technology education, it's important to think about the impact or effect scientific and technical development can have in a society. And that's a very dimly understood subject. In my field, there are people who try to get at the social and economic impacts of science and technology. This is a difficult subject. But there has been some progress.

Some kinds of impacts can be referred to as resource freeing. When the steam engine was first brought on line in England, it was used to pump water out of the mines. It simply replaced donkeys or horses that had driven the pumps. The English weren't doing anything new. They used the steam engine to do what they had always been doing, but it was a resource freeing effect. On the other hand, there are scientific and technical developments that enhance human capability. Someone got the idea of putting that steam engine on wheels which ran on tracks. That simply by a quantum leap increased the capability of travel on the part of the English.

Also, there are times when scientific and technical development simply redefine or define a new reality. When Galileo put those lenses in that brass tube and looked at the cosmos, human understanding of cosmology, our place in the universe, was altered significantly. In today's world, we have to think about those three possibilities. The resource freeing possibility presents little problem. I don't see anybody in a religiously oriented school having any difficulty with that. The religiously oriented have little difficulty with the enhancing effects of scientific and technical development. What seem to be driving our concerns are the impacts that really are altering the human conception of our place in the universe. Such developments as the pill, for example, simply altered the choice many Americans or many people had. Such things as amniocentesis, for better or for worse, altered people's choices in significant ways and redefined for them their possibilities and their desires.

If we're going to plan a conference to get at this question, it ought to be understood that scientific and technical development have a variety of possibilities. We ought to take that into account in determining the agenda of such a conference.

ACKER: I would like to talk about the church and Galileo. Galileo was right but for the wrong reason. The church has not been given enough credit for understanding that. Galileo used the proof from the tides. The sloshing up of the tides was proof to Galileo that the earth was indeed not the center of the universe. Ernan McMullen and Gingrich had an article in the *Scientific American* at least ten years ago about the Galileo affair. Galileo interchanged the major and minor premises in deduction when he saw that Venus underwent all phases. And he said that, if Venus undergoes all phases, not just crescent phases, the system was heliocentric. Galileo was called to task even at that time for interchanging the major and minor premises in deduction.

Tycho Brahe produced another system which would also have made Venus show all phases. Just because the streets are wet doesn't mean it was raining. They could be wet for a number of other reasons. The church is getting a bad rap on Galileo. When we talk to these high school students we ought to show them that the church wasn't so bad. After all, the proof for the heliocentric universe was never even discovered until about 1834 when Bessel had an instrument that was sensitive enough to know parallax. The ancients had been looking for parallax for a long time and could never find it.

Galileo was right, but he was right for the wrong reason. The church had every reason to question Galileo more thoroughly. We jumped on the bandwagon too fast about the truth of theology and scripture and everything. Galileo told the church that the Bible is to tell us how to go to heaven, not how the heavens go. He was quoting

the Vatican librarian, Baronius. That is not an original statement of Galileo's.

I've looked into this a lot because of teaching at the seminary. I'm trying to teach these priests that there's more than one side to the Galileo affair. We have to be very careful as members of the church not to step on today's bandwagon about Galileo.

SEIBERT: I'd like to note one other church/science relationship in the relatively recent past. In the mid 1930s Archbishop McNicholas of Cincinnati established the Academy *Divi Thomae* which was a series of educational institutions. Within it he set up the school that he called the *Institutum Divi Thomae*. It was a graduate school offering only four graduate degrees, both masters and doctorates in science and theology. At that time only priests and religious men and women, could attend it. Later on it was opened to lay people. The Archbishop's entire idea was to invite priests in his own diocese and religious men and women to come to this to study science and theology. You had to have a background in one to get in to study the other.

I had the honor of going there for two years. We were expected to go back to our colleges and do research. As far as I know we were among the first undergraduate schools who were getting their undergraduates to do scientific research.

PANUSKA: I'm about to depart, but I thought that I should respond to Don Keefe. Don, I really do appreciate your historical perception and learning. I'm jealous of it. It's my weakness that I don't have that perception and I could learn a great deal from you. But I think that you did not understand fully my side bar observation about the possible spring element or even value in tolerating some seriously distorted voices on the church-related campus. I'm not encouraging this, but tolerating it and seeing that it can help in the total educational environment if the environment is positive enough and supportive enough. I just wanted to say that, but I think we could talk a great deal about what's involved in that.

MURPHY: I want to pick up on Sr. Angelice's (Seibert) comment. At least with some of the small women's colleges in New England, research was a requirement for graduation for a chemistry major. I graduated in 1950 from St. Joseph's College in Connecticut where that was a requirement. So all of us were doing this before NSF was doing any funding for undergraduate research. The research itself was done on a major requirement basis and you had to do it. Some of that work was published. Since that time, St. Joseph's College has managed to have undergraduate research grants almost as often as the rules would permit. You get it for two years and then you have to step aside for a while. I also know that Mount Holyoke had that as an undergraduate requirement as well. So I don't think it was that rare back then. I think it was rather more common but people weren't talking about it. There's a report from the National Advisory Board regarding funding from the National Science Foundation. One of the points that they made in that report is that they would like to encourage undergraduate work and have as one of its components undergraduate research and their researching faculty to do it. Undergraduate research has been around a long time. It's not universal, particularly at large universities. But the smaller colleges I think were doing this way back and probably are continuing to do it well today.

BERTRAM: Let me ask a question. Suppose you took the trends of citations that we just now got from Sr. Mary Ellen and from Sr. Angelice which I suspect are best case scenarios of church-related colleges, and then let's remember Sr. Angelice's caution last evening, not necessarily to press for what's unique about church-related colleges but the somewhat more modest question of what is characteristic of them. Would anyone venture a guess as to why in these best case church-related experiences there is that kind of encouragement for undergraduate research or the kind of research that you described in this Institute of St. Thomas. Does that have anything to do in your imagination with the fact that they were related to the church? Not unique to the church, but characteristic of the church.

CONNELL: In a way Sr. Mary Ellen answered that because she mentioned that Mount Holyoke was doing the same kind of thing. But it's my own personal opinion -- partly out of experience and also from hearing other people -- there was a movement in many colleges in the '50s and even in the '60s toward teaching and away from

research, even research for science majors. I came back from Notre Dame hoping to begin research, and I did for a short while. But the big thing was, no, you have to teach so many courses; that's why you were educated. I know that there were people who finished at other institutions and went back to other colleges and it was the same kind of thing. That's when the colleges were attracting larger numbers of students and not necessarily larger numbers of faculty. So the emphasis was on teaching. It was hard to persuade an administrator who was not a scientist that research should be part of teaching.

One, a psychologist, saw no reason for that kind of thing. She was not into experimental psychology herself and the whole thing was teaching. Therefore, if you do research, do it on your own time and do dorm duty, and all the other things that were done in those days. The background and the personality of the administrator and the emphasis on teaching, particularly where we had a lot of people going out to teach -- large education departments -- all were part of this.

BERTRAM: I gather that you are saying, Rosemary, between your lines that it would have been more like a church-related college if there had been occasion for research as well as for teaching. My question is what's churchy about that?

CONNELL: I don't think it was churchy. I think we would have sent out better prepared scientists. If Mount Holyoke did it and St. Joseph's in Connecticut did it, it was because they were good colleges that had an understanding of what their students needed, not because they were church-related.

BERTRAM: But I gather church-related colleges do what good colleges do. And one of the good things to do is to do research.

CONNELL: And one of the good things to do in the '50s and '60s was to send out people prepared to teach.

MCCLOUGHLIN: I think that in chemistry it's almost universal that, while it's not required to do undergraduate research in a state institution or a private institution, it is most strongly encouraged. Every institution that I have been in strongly encouraged that the undergraduates do undergraduate research, whether it's a state or a private institution. In fact, the American Chemical Society gives credit to the institutions that strongly encourage this. So I don't think that it's unique, at least in chemistry, to do undergraduate research.

CROSS: There's an up side to undergraduate research. I'm talking about that thrill of discovery that we've been giving testimony to, namely, how wonderful it is to be a scientist. The down side is that being a scientist can be terribly tedious. And I think in a church-related institution the notion of scientists as servants is an important concept, especially in the contemporary atmosphere in our country which is very egoistically oriented. I would think that, if there's anything unique about our church-related institutions, it's providing a larger perspective on the nature of a life of service than secular institutions do.

SKEHAN: I'd like to follow up on the idea of undergraduate research. I'm most familiar with Boston College. I had the privilege of founding the undergraduate geology department. The undergraduate research flowed from the need that I had to do research. Also, we were understaffed in the early days and we needed to offer some other course credits. We could do that with the undergraduate research. Another necessity that became a virtue was to expand, offer and require of our majors courses in mathematics and physics and chemistry which has been highly praised in theological circles because it was not the trend. It came partly out of necessity and partly because there were no other faculty. Some of these things that come out of necessity can also be virtues. I'd offer that as a partial explanation in addition to the need that I had to have some associates in undergraduate research.

BERTRAM: I wonder if I could try my hand once more at what I tried rather fumblingly to do earlier. The church-related colleges, even in best case scenarios, simply do what any good college would do. It strikes me as a wonderfully Christian understanding of church-related colleges. Might it not be though that one of the strange chemistries about what's Christian is that Christians do what any good human would be doing. In that sense, Christians are not distinctive, but they do what any good human being would do for very distinctive reasons. They

have reasons for doing what everybody does and the reasons they have are not those which everybody has. There is nothing more distinctive than the kind of historical givenness of God's gift to us in Christ Jesus.

That may seem to put us back at ground zero where we started this conference. In other words, the gap may seem to be unbridgeable between the faith and the reality which sciences probe. I guess what I'm fishing for is whether we can take something which good church-related colleges do and, nevertheless, attempt to make a link, provide reasons for their doing what any good college would do out of the very distinctive thing called Christian faith. Can we do this without falling into making up, manufacturing, good reasons for bad deeds? So, it's not ideology. I would think that we need not be put off by the fact that Christians are not distinctive necessarily in their institutional behavior, but they are distinctive in their reason giving. Ultimately they are. But that means drawing connections.

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