

SCIENCE, HIGH TECHNOLOGY AND FAITH

The Role of the Catholic Scientist in Asia

Hong Kong, December 5-10, 1988

- I. Inaugural Address, by Cardinal Paul Poupard
- II. An Introduction — A Part of an Account, by Professor Lucien Morren
- III. Some National Reports: India, Korea, Philippines
- IV. Basic Human Values in the New World of Science and Technology, by Bishop Mark Hurley
- V. Science, Technology and Social Justice, by Bishop Francisco F. Claver
- VI. The Mission of the Catholic Scientist in Asia, by Professor Lucien Morren
- VII. The Recommendations of the Seminar
- VIII. The List of the Participants

MESSAGE OF THE HOLY FATHER

To Cardinal Paul Poupard

On the occasion of the conference being sponsored jointly by the Secretariat for Non-Believers and the Federation of Asian Bishops' Conferences, from December 5th to 10th, on the theme of "Science, High Technology and Faith," the Holy Father asks you kindly to convey to all assembled in Hong Kong his cordial greetings and the assurance of his prayers for the success of the meeting. He expresses the hope that the conference will provide guidance and encouragement to all who work for a progress and development that will genuinely serve the well-being of the people of Asia in full respect for their human dignity and spiritual vocation. His Holiness invokes God's grace upon the participants and imparts his apostolic blessing.

Cardinal Casaroli

I. INAUGURAL ADDRESS

by Cardinal Paul Poupard

To begin, I would like to extend to all of you a sincere welcome to this conference on "Science, High Technology and Faith," jointly sponsored and organized by the Vatican Secretariat for Non-Believers and the Federation of Asian Bishops' Conference. I was very pleased by the ready way in which the Secretary General of the Federation of Asian Bishops' Conferences accepted the proposal of the Secretariat for Non-Believers that this conference be held, and the welcome it has received from the various bishops' conferences of Asia and by the participants suggested by them; it is clear that the conference is responding to a need!

The Goals of the Conference

But why did the Secretariat take the initiative in proposing the conference? The response to that question is to be found in an address of our Holy Father John Paul II. In speaking to those present at a plenary assembly of the Secretariat in 1981 on the theme "Science and Non-Belief," he noted that:

The subject you are studying, "Science and Non-Belief," is one that has vital importance; the Holy See has, for a long time, wished to promote careful research on this topic. It is one of the purposes of your Secretariat, whose responsibility includes both the study of atheism and the dialogue with non-believers. It is quite clear to all of you, I feel sure, that what is needed is not an academic study of the theme, but rather a pastoral reflection — though this reflection must not exclude strict academic methods and careful research.

And in the same address, the Holy Father adds that: "Your work includes ... relations with the episcopal conferences in their various socio-cultural situations."

It was in accordance with these responsibilities of the Secretariat for Non-Believers that in the prospectus which I sent you with my letter of invitation I defined the two primary objectives of this conference as the study of the challenges (dangers and opportunities) arising for faith from the impact of science and technology and of the mentalities generated by them, and the discernment of the possibilities of a dialogue between the Catholic Church in Asia and science and technology.

The Need for Study

In recent decades we have had important scientific discoveries, following each other in rapid succession; in most cases, they have been followed almost immediately by technological applications. Asia is not isolated from this scientific and technological revolution. The exploitation of nuclear energy, the launching of space satellites, genetic engineering, transplants of human organs, the new era brought about by the computer, and the many other manifestations of this revolution are all a feature of the Asian scene. Asian countries, especially Japan, Singapore, Hong Kong, Taiwan, South Korea and India, have all made great economic progress thanks in great part to the possibilities offered by science and technology.

The Catholic Church welcomes scientific and technological progress, in Asia as elsewhere, and wishes to support it and collaborate with it. This progress is, as Pope John Paul II said, "the accomplishment of the will of the Creator of the universe, who entrusted the earth to all men and women" (Address to an international group of scientists, March 26, 1984). At the same time, the Church is concerned that increased scientific knowledge and technological power be always used for the good of men and women, and that it never be used against them.

The Church, therefore, recognizes the need for a careful and ongoing study of both the positive and negative impact that science and technology can have on the way people view the world, on their cultures and their values, on public opinion and social structures. This impact on modern life results not simply from the discoveries of science themselves, but also from the methodologies used in science and technology, the mentalities that they can give rise to, the ideologies that, consciously or unconsciously, are adhered to by scientists and technologists, the domination and manipulation of science and technology by groups for their own selfish ends. The impact of science and technology raises questions in the areas of ontology and epistemology, religion and ethics.

Dialogue and Mutual Collaboration

When the Holy Father spoke to the plenary assembly of the Secretariat for Non-Believers last March, he alluded to the neoscientific mentality:

Which would restrict the role of human reason to that of scientific reasoning alone. In this reductionist perspective, all other human activity is nothing more than feeling. Even the act of faith is a

gratuitous option without foundation in reason. The rational structure of the act of faith is valued only as a sort of symbolic knowledge, irrelevant from the point of view of a rationality which claims to be the only strictly "scientific" intellectual attitude. This vision is largely prevalent in scientific circles and imbues to a large extent the popular mentality influenced by the media.

But the misuse of science and technology, for military and other ends, and industrial and ecological catastrophes have shaken the confidence of this mentality. "Confronted with the anguished questioning occasioned by these catastrophes ..., new areas of dialogue," the Pope pointed out, "are beginning to open up between the Church and what some are already calling the 'post-modern' age."

In past centuries there have been misunderstandings between faith and science; errors were committed by those on both sides. The Second Vatican Council clarified the distinction and complementarity of faith and reason and "the legitimate autonomy of culture, particularly of the sciences" (*Gaudium et Spes*, nos. 36 and 59). Dialogue, especially during the re-examination of the Galileo controversy, (cf. *Galileo Galilei. Towards a Resolution of 350 Years of Debate, 1633-1983*, Duquesne University Press, Pittsburgh, 1987), has led to a better understanding of the distinction and the diversity of both methods and finality between science and faith, and "of the relationship between the revealed truth and the truths that are discovered empirically" (cf. Address of John Paul II to the Pontifical Academy of Sciences on the fiftieth anniversary of its foundation, October 28, 1986). In recent years this dialogue between the Church and science has moved to new and deeper levels: from a search for mutual understanding to a search for sharing and a collaboration which can benefit both the partners in dialogue.

In a letter, dated June 1, 1988, to the Director of the Vatican Observatory (reprinted in its latest publication, *Physics, Philosophy and Theology — a Common Quest for Understanding*) the Holy Father appeals for such interchange and collaboration between the Church and science: "there is so much that each can offer the other." The Church can offer science "the vision of the unity of all things and all peoples in Christ who is active and present with us in our daily lives." This vision carries with it "a deep reverence for all that is, a hope and assurance that the fragile goodness, beauty and life we see in the universe is moving towards a completion and fulfillment which will not be overwhelmed by the forces of dissolution and death"; and provides "a strong support for the values which are emerging both from our knowledge

and appreciation of creation and of ourselves as the products, knowers and stewards of creation." The Church can help science and technology in finding the support and guidance of spiritual and moral values which they need to remain authentically themselves. It can aid them in their effort to remain open to the meaning of man and to the search for integral truth.

On the other hand, the Church gratefully acknowledges its debt and that of mankind to science: a better knowledge of the wonders of the universe, a more profound understanding of the greatness of man who is the image of his Creator, the new means of communication and encounter, the capacity to wage war against hunger and poverty, to produce economic and cultural goods, to provide education for the masses, to cure the sick, etc. (cf. John Paul II's speech to a group of scientists gathered in Rome to commemorate the birth of Alfred Nobel, May 9, 1983). The Church also appreciates the virtues of scientists: "not only their intellectual exploits but also their professional and moral merits, their intellectual honesty, their objectivity, their search for the truth, their self-discipline, their teamwork, their commitment to the service of man, their respect before the mysteries of the universe" (John Paul II to the Pontifical Academy of Sciences, October 28, 1986). All this could be matter for emulation by Catholics and other believers.

Though science and religion are distinct dimensions of a common human culture, and though neither forms a necessary premise for the other, they should, as the Holy Father says, "continue to enrich, nourish and challenge the other to be more fully what it can be and to contribute to our vision of who we are and who we are becoming" (Letter to the Director of the Vatican Observatory, referred to above). Both science and religion are called to collaborate in building a culture that is more in keeping with human dignity.

Expectations from the Conference

My hope is that this conference will not be a mere passing event but rather that it will lead the Church in Asia — beginning with its bishops and theologians — to reflect pastorally on the impact of science and technology and to enter into dialogue with them. It would seem that theologians in Asia have generally so far devoted little attention to theological reflection on the contribution of science and technology, making it and its impact on Asian peoples a part of the context of this reflection (cf. *Exchange*, no. 49, April 1988: "Asian Theologians on Science and Technology"). And yet, as the Pope has said, though

theology "deals primarily with the study of God's word expressed in the covenant of creation and the economy of salvation," it also "entails the continuous comparison of the truth which God has revealed to us with the knowledge supplied by scientific investigation" (cf. John Paul II to the scientific congress commemorating the third anniversary of the publication of Newton's *Philosophiae Naturalis Principia Mathematicae*, September 26, 1987).

This dialogue with science and technology (and the study of their impact) is pastorally important to the Church for the presentation of its message of salvation, for the purification and enriching of Christian life and for the updating of its apostolate in a world increasingly marked by science and technology. As the Holy Father said in his allocution to the 1981 Plenary Assembly of the Secretariat for Non-Believers: "If catechesis is insufficiently informed on the problems of the exact sciences as well as of the human sciences in their diversity, it may create obstacles for the mind instead of leading it to the affirmation of God." Traditional expressions of the Faith, mindlessly repeated, could clash with today's image of the universe as shaped by modern science (cf. "Atheism and Dialogue," *Quarterly Review*, Secretariat for Non-Believers, Vatican City, 1981, No. 3-4).

This dialogue with science and technology could also make it possible for the Church, working with the other great Asian religions, to ensure that science and technology in Asia remain open to the transcendence of faith and directed to the service of man — of the whole man and of all men. Asian science and technology should have a vivid sense of values and a strong ethical commitment.

In its search for mutual understanding, interchange and collaboration with science and technology, the Church has in those of its members who are scientists and technologists (and sometimes, in addition, theologians) a "key resource," as the Pope calls them (cf. Letter to the Director of the Vatican Observatory). Their work in science and technology is itself a service to man. But they can also serve as bridges between science and technology, on the one hand, and the Church and its theologians, on the other. They can speak up with authority in forums where decisions are taken on the kind of scientific and technological research to be undertaken and the way in which it is applied. They can help mold public opinion towards these ends. But for this the Catholic scientist should be formed; his sense of the transcendence of man over the world and of God above all things should be deepened; his faith intellectually nourished; his personal unity as

believer and scientist strengthened. I would hope that the present conference be for Asian Catholic scientists and technologists a sign of recognition and encouragement on the part of the Church and an invitation to exercise their specific apostolate.

I end with thanks to the Federation of Asian Bishops' Conferences for cooperating with the Secretariat for Non-Believers in organizing this conference — a task which in the best of circumstances would not have been an easy one because of the various countries involved but which was rendered difficult by the vagaries of postal systems. I thank also all the bishops, priests, scientists and technologists present for having accepted my invitation, thus making it possible for us to be here today to reflect together on the apostolic challenges posed by science and technology to the Church in Asia.

II. AN INTRODUCTION — A PART OF AN ACCOUNT by Professor Lucien Morren

The conference took place in the modern, comfortable and beautifully located Honeyville Canossian Retreat House, just below the Western point of the island of Hong Kong. It was jointly sponsored by the Roman Secretariat for Non-Believers (which becomes in March 1989 the Pontifical Council for Dialogue with Non-Believers) and the Federation of Asian Bishops' Conferences (FABC).

It was a remarkable meeting with an attendance of 28, comprising 16 clerics and 12 laypeople, among them one woman only! Eight Asian countries were represented, listed as follows (with the number of delegates in parentheses): Bangladesh (3), Republic of China (2), India (3), Japan (2), Korea (3), Pakistan (1), Philippines (6), Sri Lanka (1). There were to be two delegates from Indonesia and one from Thailand but, for reasons of health or otherwise, they did not arrive. The Secretariat for Non-Believers was represented by its president, Cardinal Paul Poupard, accompanied by Father Franc Rodé and Father Aelred Pereira. Among the delegations, there were three bishops, Archbishop C. Gnanadickam of Madras (India), Bishop T. Gomes of Dinajpur (Bangladesh) and Bishop F. Claver (Philippines). To complete the list of participants, we have still to mention three special guests: the Most Rev. Mark Hurley, former Bishop of Santa Rosa, California, and former chairman of the U.S. Bishops' Permanent Committee for Science, Technology and Human Values, Rev. Dr. Stanley Jaki, of Princeton, New Jersey, and the present author, Professor Lucien Morren of Belgium.

The conference began with a message from the Holy Father. Then Cardinal Poupard delivered an inaugural address reviewing the background of the conference, the reasons for convening it and its purposes, which are mainly pastoral. In past centuries, there have been misunderstandings between faith and science. The Second Vatican Council clarified the required distinctions and proclaimed "the legitimate autonomy of culture, particularly of the sciences" (*Gaudium et Spes* 59.3). Ways for a fruitful dialogue are now open. However, still too frequently, the popular mentality restricts the role of reason to science and considers faith as a gratuitous option deprived of foundation. The primary objective of the conference was the study of present challenges arising from impacts of science and technology: there are dangers but also opportunities; there are mentalities generated by them to be taken into account. Catholic scientists have a key role to play; they should serve as bridges between the secular realm dominated by science and the religious one. Science and religion are called to collaborate in building a culture that is more in keeping with human dignity.

The Lectures

Each day's sessions began with a lecture delivered by an invited speaker. Two or three national reports were presented, and these were followed by discussion.

The speakers and their subjects were the following:

- Professor Lucien Morren, "The Mission of the Catholic Scientist."
- Bishop Mark Hurley, "Basic Human Values in the New World of Science and Technology."
- Bishop Francisco Claver, "Science, Technology and Social Justice."
- Rev. Dr. Stanley Jaki, "Cosmology and Religion," (which was preceded by a historical survey of the scientific development in the Western world).

Let us briefly cast a look at each of these lectures and reports.

The National Reports

We may now review the second part of the sessions, the presentation and discussion of national reports.

A European is accustomed to cultural diversities. Nevertheless, one of the most striking features, quite apparent in the seminar, is that Asia is still much more culturally diversified.

Rather than give separate accounts of each national report, I prefer another scheme, perhaps less systematic but which enables more direct comparisons among the various situations. I shall proceed by considering different aspects of the problems which were raised, especially by the questionnaire which had been sent previously by the organizers of the seminar.

Four questions were put by the questionnaire, as follows:

1. What is the impact of science and technology on Christianity and other religions (purification, the strengthening and deepening of religion, or its erosion)?

2. What is the attitude of the local Church (bishops and theologians, clergy and laity) to science and technology (appreciation, encouragement, support and openness to receive, or rather ignorance, isolation, distrust and condemnation)?

3. Are there procedures and goals in science and technology, especially in biomedicine, which are contrary to the dignity of the human person, the sanctity of life, or respect for the environment?

4. Have there been any local initiatives to promote a fruitful dialogue between religion and science? What are the possibilities in the country for such a dialogue (interior to a Catholic scientist himself, and between him and other scientists, non-believers included)?

A few reports were direct answers to these questions. Some others, namely those of the Philippines, Korea and Taiwan, gave the results of local inquiries specifically organized to prepare for the conference, with many more detailed questions. In Korea, a survey was sent to 348 professors and scientists (with 147 answers), and another one to 115 parish priests in Seoul (36 answers). In the Philippines, 400 questionnaires were sent and 305 answers were received (from 220 scientists, Christians – mostly Catholics – and 85 members of the clergy). For Taiwan, the report gives the results of two surveys conducted each among 1200 students of Fu Jen University in Taipei (among them, the Christians amounted to 12-13% only). All such enlarged surveys are of course of primary importance although, sometimes, the answers were influenced by the way questions were put.

We should add that in India Dr. Hubert Monteiro and Father Aelred Pereira had already organized in Bombay several years ago three seminars with 64 scientists of various disciplines and spiritual

attitudes. For the present conference a meeting of 27 Catholic scientists was convened by Dr. Monteiro on September 18, 1988, and a report of this meeting was distributed in Hong Kong.

Problems Facing the Catholic Scientist in Asia

Let us now look at the problems raised by the four questions mentioned above.

The First Question: Replies

When one speaks of the impact of science on religion, a Westerner immediately thinks of the materialistic influence exerted by the scientific reductionism. It appears that such an influence is altogether weak in Asia. There are, however, differences from country to country. In the Philippines, the predominant context is still governed by a sociologically-rooted Catholicism which pays no great attention to science-faith relations but much more to the social problems. While in India, Korea, Taiwan, for instance, one gets a different picture. It is surely comforting to hear that the majority of scientists see no incompatibility between science and faith, and even that they consider both as mutually supportive. Nevertheless, the minorities who think in the opposite way are sufficient to hold our attention: 10% in Korea and in Bombay 31% of the 64 scientists who answered the inquiry declared themselves atheists or agnostics. Another way of tackling the issue is to put the questions: Is science the only valid way to knowledge? Or still more provocatively; Will science be able to solve all problems or explain everything? One then gets 16% who agree in Taiwan, 14 to 25% in Korea, 15% in India. Thus, as in Europe, scientism is not fully dead! One may also add that most media, newspapers and TV diffuse a similar atmosphere.

In the same order of ideas, a significant feature appears also in the large inquiries undertaken in the Republic of China and Korea. Among the 2400 students of Fu Jen University who took part in the two inquiries mentioned above, about 52% declared they have no religion. And in Korea, according to general statistics referring to religious denominations, 58% of the population indicate "no religion." In Taiwan, many students, says the Chinese report, feel that religion is of no help; and, moreover, one finds in both countries a mixture of Buddhist tradition and popular rituals leading many to equate religion with superstition. Educated people reject then any confessional adhesion.

Another element which requires serious attention is the fact that

among Catholic scientists there are several who (quoting the Indian document referred to above) “find it difficult to accept certain religious doctrines,” namely the Resurrection. When one sees Christians who on account of their scientific training are led to reject the very foundation of our faith, one can only explain their attitude by a dramatic lack of balance between their scientific and their religious cultures. This danger was pointed out in the conference. For instance, we were happy to read the following request in the report from Taiwan: “Christian scientists have an obligation to work towards a level of religious and theological knowledge commensurate with their secular knowledge.” And we would like to quote also the following passage from the report of Sri Lanka: “youth at the A-level and undergraduates in universities do not get an understanding of faith adequate enough to meet the challenges of modern science.”

The Second Question: Replies

Which brings us directly to the second question. The various problems raised when dealing with question one would be sufficient to demonstrate the pastoral necessity for the Church to pay great attention to science and technology. These matters do not concern scientists only but a much larger public, since “science and technology have basically altered our cultures and the patterns in which we think” (Taiwan’s report). As the same document puts it: “It is imperative that the Church in Asia more clearly recognize the centrality of science and technology ... and work to implement this vision.”

However, there are recurrent complaints about deficiencies regarding dialogues and the lack of scientific formation by the clergy and Religious, men or women. This situation leads, on their side too, to an unbalance in the cultural levels but in a way opposite that deplored for the scientists. It explains as well, at least partly, the absence of real dialogue between clerics and scientists. May the conference in Hong Kong mean a breakthrough in this respect, opening up new perspectives!

The Third Question: Replies

The third question, regarding scientific or technological procedures contrary to human dignity or causing damage to the environment, received answers emphasizing, as one would guess, the major fields covered by bioethics and population control (“in vitro” fertilization was, namely in India, a subject occasioning controversial debates), then armaments, robotics and ecological pollution. The complex technical social issues arising from economic development were also mentioned.

However, though several national reports tackled these questions, they were not frequently raised during the discussions and they are not emphasized in the final recommendations.

The Fourth Question: Replies

As regards question four, on initiatives to promote a fruitful dialogue between religion and science, if we except the meetings in Bombay mentioned above, the seminar itself seems to constitute a positive but isolated case. Nevertheless, in the preparation for the seminar there emerged a desire for such dialogues and a stronger feeling about their relevance. On the one side, Catholic scientists are generally not sufficiently aware of their vocation; on the other side, Church authorities at all levels should listen to the scientists in order to be more acquainted with their problems and with those problems' sociological, and ethical impact.

III. THREE NATIONAL REPORTS TO THE CONFERENCE

(We present here only a sampling of the reports — and here abridged — because of limitation of space. Additional papers and reports will be published in the review of the Vatican Secretariat, *Atheism and Dialogue.*)

1. Science, Technology and Religion: The Indian Situation

A. The Impact of Science and Technology on Religion

— Among Non-Scientists

Religion in India is to a great extent communitarian and social. Hence, despite the material changes that have been brought about by technology, there is no significant organized rebellion against tradition. Some rationalist groups do exist but do not have much vigor.

According to a view expressed at a recent seminar in Bombay on science and religion: "There is no conflict between science and religion because while science has failed to inculcate the scientific temper in our people, religion too has failed to inculcate true spirituality. Hence, they follow neither the teachings of science nor religion to their logical conclusion."

Perhaps the more educated are beginning to experience a conflict in their lives between their religious beliefs and their secular knowledge

which is conditioned by the impact of science and technology.

— Among Scientists

What is true of non-scientists is not true of Indian scientists. A survey conducted by Father Aelred Pereira and Dr. Hubert Monteiro with 64 scientists has revealed a wide spectrum of attitudes to science and religion. Although the sample size was small, the survey was based on indepth unstructured personal interviews and not on a questionnaire sent by post.

Of the 64 scientists interviewed, 20 professed to be atheists or agnostics who rejected religion either because of indifference or because of its perceived incompatibility with science. A few among them, while opposing religion as a creed or a doctrine, were willing to accept it as a code of ethical conduct.

Among the “believers,” there were wide differences in their religious attitudes which could be classified into six groups:

1. Weak commitment to religion.
2. Acceptance of religion but opposition to certain aspects: particular dogmas, rituals or norms of ethical conduct.
3. Acceptance of religion even while acknowledging certain incompatibilities with science.
4. Acceptance of religion and science as mutually exclusive, having no relationship with each other.
5. Acceptance of religion as compatible with science.
6. Acceptance of religion and science as mutually enriching.

Group 1

A few scientists classified as believers confessed that although they had not rejected religion, their faith in it was not very strong. Some were not very sure of what exactly they believed.

Group 2

A significant number of believers reacted strongly against what they termed meaningless ritual and superstitious practices. Image worship, certain cults, especially those involving animal sacrifice, and the display of excessive pomp and splendor were some aspects of religion

that scientists found repulsive. Some found certain moral teachings, like that of the Church on contraception, ridiculous, especially in the context of the large growth of population in the country.

Group 3

There were quite a few scientists in this group who recognized certain incompatibilities of religion with science and who did not know how to reconcile them. Nevertheless, they did not seem to be unduly perturbed by them and continued to practice their religion and pursue their research activities.

Group 4

Typical of this group is the testimony of a Hindu research scientist: "I never question why I believe in religion. I just accept it. It is a non-scientific approach but I keep religion and science apart. I have no religious explanation for scientific beliefs and no scientific explanation for religious beliefs, even though they cannot be proved by science. I do not seek any metaphysical proof of the existence of God ... There could be different realms of reality, and science has its place in one of them. I do not think, therefore, that there will be real contradictions between science and religion, but if they do arise, I will not try to find an explanation for them."

Group 5

Very few scientists found their religious beliefs and scientific knowledge compatible.

Group 6

Barely one or two scientists found their scientific activity and the practice of their religion mutually enriching. This was the testimony of one of them: "Study and research in science has only deepened my faith in God. The marvels of creation have led me to the Supreme Intelligence and filled me with a sense of mystery, a sense of science pushing back the screen of our ignorance."

B. Causes of Apparent Conflict

If science and religion are genuine quests for truth, there should be no contradiction between them. They should rather complement one another. Why is it then that so many scientists in India are atheists or agnostics and so many others are unable to harmonize their religious

and scientific lives?

One basic cause relates to the system of education in India. Too many young people want to have a university education and most want to specialize in the sciences in the hope of getting a job more easily. The result is that science — or for that matter, most subjects — are taught with the sole purpose of enabling a student to pass an examination. Moreover, memorization of textbook data and notes is often encouraged to the detriment of original thinking. Each subject is therefore often studied in isolation and there is no interaction between them. It is not uncommon to find science graduates having a great deal of knowledge in their own limited spheres but unable to correlate this knowledge with other branches of science. In fact, many are not even interested in other fields. With such an educational background it is not surprising to find the type of compartmentalization of science and religion observed in a number of scientists interviewed.

A second important cause of the problem is that religion in India is still very traditional and has not been able to keep pace with the rapid advance of science and technology. This is particularly true of Hinduism. In fact, some of the atheists or agnostics interviewed came from traditional, orthodox Hindu families. Christianity appears to be a bit more progressive. In spite of this, however, some of the older Christians still have pre-Vatican II ideas and some of the younger ones are given a type of religious formation that does not equip them to relate it to their scientific activity.

Thirdly, the scientist preoccupied with matter finds it difficult to accept certain concepts of God or a spiritual concept of man. An anthropomorphic conception of God is not acceptable to him, nor is a conception of God as a being holding the universe together and directly responsible for the creation of life. In the former case, he would fall within the scope of his scientific analysis, and in the latter, he is totally unnecessary, for the scientist can synthesize elementary forms of life today and might one day even succeed in synthesizing the higher forms. The Hindu scientist finds it difficult to adjust to a religious concept of the unreality of this world when his scientific work deals with material reality. The Christian scientist, too, experiences problems in understanding free will and a spiritual destiny which lies outside the universe.

Fourthly, the discoveries of science give rise to a technological environment in which material values predominate. Such an environment has a drastic impact on society in a developing country like India,

where the suddenness of its emergence has given people very little time to adapt to it. The result is that very often spiritual values which governed their lives before are completely abandoned and are even branded as old-fashioned by those who stand for progress.

Finally, religion does not always live up to its high ideals in keeping with a real spirit of love and a genuine quest for truth. Aberrations have often crept in; social injustices are still being perpetrated in the name of religion. Superstitious practices, too, still exist in many religions.

C. The Ethics of the Indian Scientist

While some scientists – even those who profess to be atheists or agnostics – have high ethical standards based essentially on their concept of human dignity, it must be admitted that many of them are unconcerned about the moral implications of their work. A number of scientists work just for self-esteem, to get more publications to their credit. Some working in industry are concerned only with the financial returns their work will bring their companies. A few, particularly those engaged in atomic or space research, are very patriotic and are mainly interested in increasing their country's prestige.

Very few scientists are bothered about the ultimate use to which their work will be put. Many working in biotechnology see nothing wrong in their experiments with human embryos and are unconcerned about the consequences of genetic engineering. It must be recognized, however, that some, although few in number, especially those working in the health area, are genuinely interested in ameliorating the lot of man. Likewise, some technologists, especially those working in the area of ecology, are very much concerned about improving the quality of life.

D. Attitude of the Local Church

The local Church is not conscious of the potential of science and technology to liberate people from superstition; nor is it conscious of the dangers that science and technology pose to religion. Hence, there is very little interaction – either positive or negative — between the local Church and scientists.

Priests have little or no knowledge of science and technology, as these subjects do not find a place in seminaries. Consequently, their homilies and their interactions with others lack relevance in a con-

temporary society which is strongly influenced by science and technology.

In a developing country like ours it is natural that more and more Church people are getting taken up with the "option for the poor." Hence, less importance is being given to science and technology. Traditionally, religious orders, like the Society of Jesus, did attach a lot of importance to science and intellectual pursuits in general. Today, even they have come to regard scientific research, intellectual excellence and higher education as "elitist" in view of their understanding of the "option for the poor." More and more importance is being given to "conscientization," "social justice" and the "social sciences" to the detriment of an involvement in scientific education.

E. Promotion of a Religion-Science Dialogue

There is need for an ongoing dialogue between Church leaders and people engaged in scientific work, if our faith is to be presented in a way that is meaningful to educated people who are more and more influenced by science. On the one hand, there is a need to improve the "scientific literacy" of priests, and on the other, a need to improve the "moral literacy" of scientists, who are largely ignorant of the ethical implications of their work.

Very few attempts have been made so far to promote a dialogue between science and religion. The survey on the attitudes of Indian scientists towards science and religion is one such attempt. Four seminars have also been organized in Bombay by Father Aelred Pereira with the collaboration of the author on different aspects of science and religion. In the area of biomedical ethics, a biomedical center has been set up in Bombay to study problems in this field and provide counsel to those in need of it. Mention should also be made of theology courses for the laity which, it is felt, enable them to live more mature religious lives and face the challenges posed by science and technology.

It is recognized, however, that much more remains to be done. The following recommendations have been made:

1. Priests should be exposed through seminary training and elsewhere to a basic knowledge of science and technology and recent developments in these fields. A few priests should be encouraged to take up more specialized studies in science in order to interact more effectively with lay scientists and to help evolve a relevant Christian theology.

2. Catechetical instruction at all levels for lay people must be more attuned to the needs of the day. This will enable them to better harmonize their "religious" and "secular" lives and confront the problems posed by science in a mature way.

3. The teaching of science itself must be broadened so that its value is appreciated in a wider perspective. Students will thus study it not just to pass examinations but will understand its interaction with other fields of knowledge and activity.

4. Religion itself must be made more relevant to modern man in its practice. The Church, before making pronouncements on moral issues involving science, should take great care in consulting scientists. It must not present itself as a "dogmatic organization" which has the answers to all questions, but rather as a body in quest of truth together with all men of good faith. It must strip itself of excessive pomp and continue to show real concern for the poor.

5. Groups of Catholic scientists should be formed to study questions relating to their scientific work and religion. The SIQS (International Secretariat for Scientific Questions, affiliated to Pax Romana) could be a model for such groups.

6. More dialogue meetings between Christian and non-Christian scientists could be very enriching to both and will certainly help promote the "moral literacy" that has been found lacking.

2. Two Surveys: Faith and Science in Korea

In order to have an objective point of view of what people, scientists and religious, think about the relationship between faith and science in Korea, we elaborated a simple questionnaire including all the main aspects of the relationship. The survey questions were sent to all the professors at Sogang University, a Jesuit-sponsored university in Seoul; to the members of two scientific associations, chemistry and biology, and to all the parish priests in Seoul. Both surveys were elaborated following the draft questions sent to us by Rome as guidelines for the preparation of the country report.

We received 147 answers out of 348 questionnaires sent to professors and scientists and 36 out of 115 from the parish priests. We present both surveys' results and a short conclusion drawn from the outcome of each one.

A) Survey 1, Sent to Scientists and Engineers

1. What, from your point of view, is the impact of science and technology on Christianity and the other religions?

Purification of religion	-	20	(13.6%)
Strengthening and deepening	-	58	(39.5%)
Erosion of religion	-	14	(9.5%)
Does not have any impact	-	43	(29.3%)
Do not know	-	11	(7.5%)
No answer	-	1	(0.7%)

2. What do you think is the opinion of those among the general population who are being influenced by popular science journals and the mass media?

Religion is incompatible with the scientific temper	-	60	(40.8%)
Religion is an obstacle to social development	-	4	(2.7%)
Religion is not essential, science and technology can solve all our problems	-	11	(7.5%)
Do not know	-	57	(38.8%)
No answer	-	15	(10.2%)

3. What is the attitude of scientists to the relationship between faith and science?

a) Natural science and engineering scientists

Integration and fruitful tension	Yes	-	78	(53.1%)
	No	-	27	(18.4%)
Distrust and opposition	Yes	-	11	(7.5%)
	No	-	89	(60.5%)
Science only can explain everything	Yes	-	36	(24.5%)
	No	-	67	(45.6%)
There is only one world, no supernatural realities exist	Yes	-	31	(21.1%)
	No	-	69	(46.9%)
Science is science and theology is theology, there is no need for an interaction	Yes	-	63	(42.9%)
	No	-	37	(25.2%)
Faith does not need anything else	Yes	-	2	(1.4%)
	No	-	98	(66.7%)
Do not know	-	-	5	(3.4%)

b) Biological science scientists

Integration and fruitful tension	Yes	-	63	(42.9%)
	No	-	22	(15.0%)
Distrust and opposition	Yes	-	18	(12.2%)
	No	-	64	(43.5%)
Science only can explain everything	Yes	-	20	(13.6%)
	No	-	60	(40.8%)
There is only one world, no supernatural realities exist	Yes	-	24	(16.4%)
	No	-	56	(38.1%)
Science is science and theology is theology, there is no need for an interaction	Yes	-	48	(32.7%)
	No	-	37	(25.2%)
Faith does not need anything else	Yes	-	1	(0.7%)
	No	-	81	(55.1%)
Do not know	-	-	6	(4.1%)

c) Social and human science scientists

Integration and fruitful tension	Yes	-	71	(48.3%)
	No	-	15	(10.2%)
Distrust and opposition	Yes	-	15	(10.2%)
	No	-	68	(46.3%)
Science only can explain everything	Yes	-	9	(6.1%)
	No	-	68	(46.3%)
There is only one world, no supernatural realities exist	Yes	-	12	(8.1%)
	No	-	62	(42.1%)
Science is science and theology is theology, there is no need for an interaction	Yes	-	43	(29.3%)
	No	-	41	(27.9%)
Faith does not need anything else	Yes	-	3	(2.0%)
	No	-	79	(53.7%)
Do not know	-	-	8	(5.4%)

4. What are the objections of scientists to religion in general and to Christianity in particular?

Religious teachings are outdated	-	47	(32.0%)
Rules and precepts are too stern	-	22	(15.0%)
Scientifically there is no heaven	-	62	(42.1%)

- | | | | |
|-----------------------------------------|---|----|---------|
| Religions are too conservative | - | 22 | (15.0%) |
| The Bible is full of misconstrued facts | - | 84 | (57.1%) |
| Do not know | - | 12 | (8.2%) |
5. Does science and technology lead some people to deny the validity of other kinds of knowledge, especially philosophical and religious?
- | | | | |
|-------------|---|-----|---------|
| Not at all | - | 111 | (75.5%) |
| Could be | - | 17 | (11.6%) |
| Definitely | - | 17 | (11.6%) |
| Do not know | - | 2 | (1.4%) |
6. Does progress in science and technology lead people to believe that science only holds the truth?
- | | | | |
|-------------|---|-----|---------|
| Not at all | - | 101 | (68.7%) |
| Could be | - | 22 | (15.0%) |
| Definitely | - | 21 | (14.3%) |
| Do not know | - | 2 | (1.4%) |
| No answer | - | 1 | (0.7%) |
7. Are there, in Korea, ideologies and mentalities which, rather than science itself, are responsible for giving the impression of an opposition between science and religion?
- | | | | |
|-------------|---|-----|---------|
| Not at all | - | 103 | (70.1%) |
| Could be | - | 7 | (4.8%) |
| Definitely | - | 23 | (15.6%) |
| Do not know | - | 13 | (8.8%) |
| No answer | - | 4 | (2.7%) |
8. The idea of incompatibility of science and religion is being promoted by:
- | | | | |
|----------------------------|---|----|---------|
| Certain authors | - | 44 | (29.9%) |
| School textbooks | - | 7 | (4.8%) |
| Atheistic organizations | - | 24 | (16.3%) |
| Secularistic organizations | - | 21 | (14.3%) |
| No answer | - | 4 | (2.7%) |
9. Or, rather than the above, does the erosion of faith come from the secularistic atmosphere and the rationalistic attitude occasioned by science?

- | | | | |
|-------------|---|----|---------|
| Not at all | - | 53 | (36.1%) |
| Could be | - | 20 | (13.6%) |
| Definitely | - | 65 | (44.2%) |
| Do not know | - | 8 | (5.4%) |
| No answer | - | 1 | (0.7%) |
10. Are there goals in science and technology, especially in biomedicine, which are contrary to the dignity of the human person, the sanctity of life or respect for the environment?
- | | | | |
|-------------|---|----|---------|
| Not at all | - | 66 | (44.9%) |
| Could be | - | 6 | (4.1%) |
| Definitely | - | 60 | (40.8%) |
| Do not know | - | 15 | (10.2%) |
11. Is science being promoted even in those areas that are contrary to the demands of religion, ethics and social justice?
- | | | | |
|-------------|---|-----|---------|
| Not at all | - | 22 | (15.0%) |
| Could be | - | 11 | (7.5%) |
| Definitely | - | 103 | (70.1%) |
| Do not know | - | 9 | (6.1%) |
| No answer | - | 2 | (1.4%) |
12. Do you think there are scientists who profess to be unconcerned about the morality of the application of their discoveries?
- | | | | |
|------------------------------|---|----|---------|
| There are many | - | 50 | (34.0%) |
| Not too many, not few either | - | 55 | (37.4%) |
| There are a few | - | 24 | (16.3%) |
| There is none | - | 5 | (3.4%) |
| Do not know | - | 12 | (8.2%) |
| No answer | - | 1 | (0.7%) |
13. Where is research being geared to?
- | | | | |
|---------------------------------------|---|-----|---------|
| Human development | - | 130 | (88.4%) |
| Service of an ideology | - | 15 | (10.2%) |
| Needs of the arm race | - | 64 | (43.5%) |
| To give satisfaction to scientists | - | 118 | (80.3%) |
| Amassing of riches for the scientists | - | 17 | (11.6%) |
| Do not know | - | 2 | (1.4%) |
14. Is public opinion in the country aware of these abuses?

Not at all	-	56	(38.1%)
Could be	-	38	(25.9%)
Definitely	-	37	(25.2%)
Do not know	-	13	(8.8%)
No answer	-	3	(2.0%)

15. What is your religion?

Buddhist	-	13	(8.8%)
Protestant	-	49	(33.1%)
Catholic	-	23	(15.6%)
Other religion	-	3	(2.0%)
Sans religion	-	57	(38.8%)
No answer	-	2	(1.4%)

B) Conclusions on Survey 1

The respondents, the majority being 48.7% Christian (Protestant and Catholics), and 38.8% without official religion, show clearly enough that in Korea there is no significant opposition between science and religion; an overwhelming 75% see science and technology not only not denying the validity of religious knowledge, but even asserting it (53%) by saying that science and technology have helped in the process of purification, strengthening and deepening of both Christianity and other religions. 69% affirm that progress does not lead people to believe that science is the only holder of wisdom; 70% do not see any ideologies or mentalities in Korea spreading the fact or rumor that religion and science are incompatible. A very weak 3% see religion as an obstacle for development and only 7.5% think that religion is not essential.

The relationship between faith and science is fruitful (53.1%, 42.9% and 48.3%); it is not one of distrust and opposition (60.5%, 43.5% and 46.3%); there is a supernatural world (46.9%, 38.1% and 42.1%) and faith cannot survive alone (66.7%, 55.1% and 53.7%); and likewise, science only cannot explain everything (45.6%, 40.8% and 46.3%).

On the other hand, scientific research is being seen as though helping human development (88.4%); is geared to give satisfaction to those scientists involved (80.3%); besides, science is being promoted even in those areas that go against social justice (70.1%); and the opinion is divided between those who think that there are goals that go against human dignity (40.8%) and those who claim that there are no such goals (44.9%). A combined 71.4% say that there are many, or at least

not few, scientists unconcerned about the morality of the application of their discoveries.

An interesting point can also be seen in the answers of both natural and biological science scientists stating that science and theology do not need to interact (42.9% and 32.7%), while on the other hand a clear majority (57.1%) show that the Bible is full of disputable facts.

C) Survey 2, Sent to Parish Priests in Seoul

1. How long have you been a priest?

0 - 5 years	-	0	(0.0%)
5 - 10 years	-	9	(25.0%)
10 - 15 years	-	6	(16.7%)
15 - 20 years	-	7	(19.4%)
20 years or more	-	14	(38.9%)

2. Is the Catholic Church aware of the potential of science for human development?

Not at all	-	8	(22.2%)
Could be	-	12	(33.3%)
Definitely	-	16	(44.4%)
Do not know	-	0	(0.0%)

3. And in the fight against poverty and illiteracy?

Not at all	-	1	(2.8%)
Could be	-	2	(5.6%)
Definitely	-	32	(88.9%)
Do not know	-	1	(2.8%)

4. Are the advances in science and technology, in terms of extension of life span and cure of sicknesses, helping humans to become better and more human persons?

Not at all	-	6	(16.7%)
Could be	-	5	(13.9%)
Definitely	-	24	(66.7%)
Do not know	-	1	(2.8%)

5. What do you think is the best way to promote purification from superstition, fatalism, etc., in the Church?

Receiving the sacraments frequently	-	1	(2.8%)
Only praying helps	-	1	(2.8%)
Strengthening the faith	-	6	(16.7%)
Learning theology and understanding God's will	-	26	(72.2%)
No answer	-	2	(5.6%)

13. Do you know how many Catholic scientists belong to your parish?

0 - 5%	-	22	(61.1%)
5 - 10%	-	2	(5.6%)
10 - 20%	-	0	(0.0%)
20 - 30%	-	0	(0.0%)
30% over	-	0	(0.0%)
Do not know	-	11	(30.6%)
No answer	-	1	(2.8%)

D) Conclusions on Survey 2

The Catholic Church in Korea is not too worried about what, if any, kind of special attention should be directed towards the scientific Catholic community. 30.6% of the priests do not know if there are scientists in their parishes; the local Church has not done anything to form them (58.3%); and they do not have any special problem that distinguishes them from any other members of the congregation (52.7%).

However, the priests seem very much aware of the potential of science for human development (44.4%), and in the fight against poverty (88.9%), and in human physical health (66.7%). They are also aware that pure materialistic development leads people to think that God is not needed anymore in Asia (69.4%) as well as in Korea (58.3%). Good news comes from hearing that 72.2% think that the best way to promote purification is by learning theology and understanding God's will.

3. Perceptions on Science, Technology and Religion: The Philippine Situation

Introduction

This report presents some findings of an empirical research which aimed at bringing into focus the perceptions and insights of the members of the local scientific community and the clergy on the relation of science, technology and religion.

More specifically, the study sought to answer the following questions:

1. *What is the attitude of the scientists in the physical and biological sciences to faith and religion?* Do they perceive religion as incompatible to the scientific temper or is religion an obstacle to progress and is superfluous in contemporary society? What religious doctrines and practices are called into question by modern science? Do scientists experience conflicts between their faith and science in the practice of their profession? Do they profess to be unconcerned about the morality of the application of their discoveries?

2. *What is the attitude of the members of the clergy to science and technology?* Do they recognize the great potential of science and technology for human development and for religion itself; of the dangers to faith and personal freedom and dignity posed by them?

3. *Is there a need to promote a dialogue between science and religion?* If so, what possible procedures and local initiatives can be done to promote a fruitful dialogue between religion and science?

To meet these objectives, data were gathered with the use of self-administered questionnaires. The findings have been drawn mainly from two groups of respondents, namely, the members of the scientific community and the members of the clergy.

A total of 305 (76.3% retrieval) responded to the survey; 220 scientists and 85 members of the clergy. Sampling for the scientist respondents covered:

- (a) several universities, concentrating mainly on the top four leading academic institutions in science;
- (b) government research institutions directly involved in science and technological development, e.g., Department of Science and Technology, Nuclear Research Institute, Philippine Council for Health Research and Development, National Food Authority, International Rice Research Institute, Radiation Health Service, and
- (c) semi-government corporations and top industrial firms, e.g., San Miguel Corporation, United Laboratories, Meralco, National Telecommunications Commission, National Power Corporation.

Highlights of the survey instrument focused on three main areas:

- (a) Sociological variables that aptly describe the respondents per-

- sonal profile;
- (b) Religious beliefs and practices; and
- (c) Perceptions on the relationship between science, technology, and faith.

Personal Profile of the Respondent Scientists

Findings reveal the predominance of females from among the respondents as they comprise the majority in the sample population, 60% against 40% males. 62% of the total respondents are married.

On religious affiliation, an overwhelming 91.8% profess the Catholic faith and a slim minority are Anglicans (4.5%), Protestants (1.8%) and members of the Church of Christ (1.8%). These findings reflect the religion of the peoples of the Philippines, which is predominantly Catholic.

The employment profile of the scientists indicates that 30% of the respondents are government employed, while 70% are affiliated with private universities, hospitals and industrial firms. Many of them occupy positions as directors, deans, department heads and chairmen, chief of sections, senior researchers and senior members of the faculty.

In the spread of the respondents with respect to their specific disciplines, their level of educational attainment and their function in the practice of their profession, the biomedical and health sciences have a big distribution, close to 54.1%. The biological sciences include the botanists, zoologists, microbiologists, geneticists and biochemists. In addition to the medical doctors, the health sciences group includes the pharmacists and medical technologists. The physical and material scientists comprise 19.1%, and they include the chemists and the physicists. 21.8% of the respondents are engineers and technical men.

The data also indicate a high level of educational attainment by the respondents. A high percentage of 86.36% obtained degrees beyond their first course (baccalaureate degree). A majority of 53.6% attended sectarian schools for their basic science degree, while 11.4% went to foreign universities for their graduate and postgraduate degrees. These findings show compatibility between their educational background and their relative positions in either the academic or corporate ladder, as well as their involvement in professional organizations.

With regard to function in their professional practice, 36.4% are

involved in research, 72.7% in teaching, 30.5% in administration. A minority are involved in industrial production, community health and other activities like marketing and entrepreneurship.

Many of the respondents perform multifaceted functions in the practice of their profession. Others teach and do research at the same time, and still others hold administrative positions and teach and/or do research simultaneously.

The respondent research scientists and university teachers registered a combined total publication of 2,614 papers published in local or international scientific journals. A great majority of 73% profess to undergo continuing education through seminars and conferences and advanced training in their field of specialization at least twice a year.

Religious Beliefs and Practices of the Respondent Scientists

A big majority (87.3%) considers going to mass every Sunday and receiving the sacrament of Holy Communion very important to them. 80% reads the Bible and believes that the Bible is the word of God. 94.5% strongly agrees that God exists and that there is life after death. But only 70% agrees that the Pope is infallible when he speaks on matters of faith and morals.

Perceptions on the Impact of Science and Technology on Faith

The Scientists' Viewpoint

Statements were framed in the survey instrument to elicit the views of the respondents on the impact of science and technology on religion; the strengthening or deepening of faith or its erosion. The respondents were asked to agree or disagree on the statements.

Culled from the findings, 84.5% of the scientists disagree that religion is incompatible with the development of science and technology. This assertion is reinforced with an overwhelming 93.2% of them who do not view Christianity as an obstacle to the progress of science and technology. Neither do the scientists consider biblical, spiritual and ethical traditions as the cause of our disregard of the natural world, nor have these traditions caused indifference in attitudes to present nuclear and ecological threats.

A thin minority of 14.6% subscribes to the belief that scientific theories have provided all the explanations of our origin and develop-

ment; 82.8% does not share the view that science as a method of knowing denies the claim that absolute truth is given by God. Although the respondents are not firm in their conviction of whether science has anything to do with spiritual or supernatural phenomena ($M = 2.40$), 71.4% of them believe that man's control over non-human nature has progressively been increased by technology. 16.4% of the scientists are undecided over these matters.

The respondent scientists are clearly undecided on the issue of whether our industrial and technological developments have provided the highest standard of living ($M = 3.05$). It is possible that the scientists view such developments in the Philippine context where industrial and technological developments have not, in reality, alleviated the nation from its economic backlash.

Generally, the respondents do not perceive developments like population control programs as attempts to replace Divine Providence and natural doctrine. The scientists are divided in their views on the impact of technological advancement on the freedom and dignity of the human person. Although 60.5% of them do not agree, those who do have cited research breakthroughs like cloning and artificial insemination as examples.

Close to one-quarter of the respondents asserts that since science is value free, scientists should remain neutral concerning the morality of the application of their findings. 61.3% disagrees with this statement.

Does science as a discipline, or technological advancement, strengthen one's faith? The answer to this question requires cautious interpretation. Although 64.5% does not agree that the scientific method of acquiring knowledge and the rationalistic attitude occasioned by science have contributed to the erosion of faith, and 67.7% perceives advancement in science and technology to have a strengthening effect in their belief in God, close to more than one third of the respondents either disagree or remain undecided on the issue. What can be clearly gleaned, however, is that 84.6% of them find there is a necessity for religion in modern life, and this need is more strongly felt by the material scientists. One other certainty is that the respondent scientists unanimously and strongly agree ($M = 4.74$) that one can be a good scientist and still believe in God.

Finer analysis of data does not reveal any significant difference in the general response of the biomedical scientists and the material

scientists in the statements.

With regard to issues which negatively interface with their professional practice, 13.6% of the respondents cited such issues which are incompatible with religious teachings and/or their own personal values. Among these are: origin and evolution of life, cosmoscience, population control programs and family planning, molecular genetics, extra-corporal fertilization and ovum implantation, abortion and transexual operations. 58% of the scientists find no issues in their particular field which affect their faith in God. The rest were noncommittal.

A portion of the questionnaire asked the respondents to rank five areas of scientific and technological developments where philosophy and religion should show more concern. The results and the following are the scientists priority areas:

- Population Control
- Genetic Engineering
- Psychology and Mind Control
- Sexuality
- Biotechnology

The areas of nuclear power and ecology trail slightly behind, with space science and robotics occupying low priority. Based on these responses it is clear that the members of the scientific community recognize the validity of other kinds of knowledge in the quest for truth.

The Clergy's Viewpoint

A comparison of the answers by the two groups of respondents showed some refined differences in their perceptions. Generally, however, the same pattern is observed.

Notable among the differences in responses is the fact that the members of the clergy are more strongly convinced that there is no incompatibility between faith and science, including technological development. Neither do they perceive that religion has remained indifferent to the material dimension of both the human person and the world. However, the findings indicate that the clerics show less confidence on the strengthening effect of scientific and technological developments on faith. One finding which is quite inconsistent with the first statement is the fact that one-third of the bishops do not agree that one can be a good scientist and still believe in God. The clergy in general also manifests a certain degree of indecisiveness ($M = 2.73$) on the issue

of population control programs, on whether these are attempts to replace Divine Providence and natural doctrine.

Another finding also reveals a higher degree of indecision ($M = 2.69$) among the members of the clergy compared with the scientists' thinking on the stance scientists should take concerning the morality of the application of their scientific findings. The bishops, however, are unanimous in their response that scientists should consider the moral aspect of their scientific findings.

In the areas of scientific and technological development where philosophy and religion should show more concern, the members of the clergy ranked the following priorities:

- Psychology and Mind Control
- Genetic Engineering
- Population Control
- Nuclear Power
- Ecology

Biotechnology and sexuality are the other areas they consider important. Consistent with the scientist's viewpoint, space science and robotics occupy low priority.

The clerics were also asked to rank five issues which should be addressed as fundamental in the teaching of religion and ethics. They have ranked the following according to priority:

- The Moral Subject
- Authority and Obedience
- Natural Law Tradition
- Sexuality
- Option for the Poor

Other issues like Population Control, Nuclear Power, the Consumer Society, Biotechnology, and Third World Oppression occupy lesser priority.

On The Need for a Fruitful Dialogue between Religion and Science

Some members of the scientific community maintain the stance that religion and science in general do not contradict each other. They, therefore, do not find any need for a dialogue in the two areas. For them, a person who is truly religious has a personal relationship with

God in the framework of which he makes sense out of his life and, hence, should not find incongruity between religion and science. They claim further that since the issues are more internally driven, it is more of personal efforts on the part of the individual in seeking the truth.

Others, however, expressed the need for a dialogue and suggested some strategies in doing it:

1. Identify real and concrete issues of concern where science and religion interface and promote awareness through information campaign and publications. Establish a central information network where an individual could seek answers to questions arising from conflicts in moral and ethical values and work practices. The Church should promote more active involvement and manifest visible leadership in these issues.

2. A dialogue between scientists and religious who have the competence to reconcile scientific findings with religious teachings. These competent persons should identify and farm out common problems and arrive at constructive and reasonable proposals in order to sustain a common stand on issues that directly affect scientific advancement, moral values and faith. They can form the core of an organization established for such purposes, where science and religion could share a common goal.

3. Conferences and seminars where men of authority in science and religion could periodically meet to discuss common topics directly affecting man which are deemed relevant to present conditions and their future impact as well.

The scientists expressed some concerns in directing efforts towards a fruitful dialogue between science and religion. They view mutual trust and respect as basic for the success of such dialogue. They further assert that issues should be presented objectively with open minds, avoiding direct confrontation or claims of righteousness of point of views. Some also feel that the Church should relax its ultraconservative stance.

Some Concluding Notes

It is obvious that science and technology are both human concoctions. They are products of man's ingenuity and art. They are an outflow of the givens in him and for him.

What about that which is given-to-him? Integrated in his being as *animal rationale* is his being *animal religiosum*. The history of mankind through the ages has more than provided evident and concrete proofs of this nature, whether they be in the primitive or sophisticated state of existence, whether they be literate or unlettered.

Face to face with his religious nature, the scientist and the technologist find themselves at the crossroads. Is it a *versus* or a *with* situation? What is the heartbeat of the rendezvous between science, technology and the faith? What should it be?

Science and technology are end-results of man's search for truth. The nature of the truth distilled from the scientific method is of such, that it was partial from the beginning, now, and ever. The inevitable partial nature of scientific truth is nonetheless sublimized by the scientist's objectivity and sincerity. The true scientist is characterized by his respect for what is true.

This is a country report of the Philippines. In the context of science and technology, the samples are drawn from the major disciplines and their related areas.

Given the predominantly Christian population of the country, the respondents view the practice of religion as a way of life. Their *being* practitioners of science does not create an obstacle to their life of worship. There is in fact a high degree of perception that their science has strengthened their faith. The physicality of their laboratory specimens creates a kind of a "suspended animation," a thirst to be quenched. Religion is strongly felt as a need and a necessity. The almost unanimous conviction can be paraphrased: a good scientist is a good believer in God.

The responses of the clergy may convey some emergent needs in their formation programs, vis-à-vis component programs to go with the study of morals, canon law, etc. The growing intensification of science literacy and the seeming complexities of its technological applications open an equally complex set of pastoral concerns. Science and technology are a special field of endeavor but whose impact is universal and profound. Quite often, the problems generated in and by man cannot be solved with a categorical yes or no. An effective and continuing contact by the clergy with science and its practitioners is a need which is more than urgent. Both parties in isolation are bound to suffer, and more so, their clientele. The very nature of the end-users of science and

technology dictates that the multidisciplinary of concrete cultural context is taken into consideration. In such context, the enormity of the moral influence of science can never be overemphasized. Though the level of scientific literacy and technology of the country leaves much to be desired, yet the potentials of making use of the appeal of science as a tool in developing the intellectual, artistic and emotional maturity hold much promise. It goes without saying therefore that while science education for the non-scientist should be dissected more closely, values education for the future scientist should be considered an integrated program.

The priority areas for a dialogue between science and religion show that concerns may vary, but that such a dialogue must take place is clear. The mass appeal which science easily projects also promises a tremendous spiritual dimension; and the scientist must choose the proper options to enhance and regulate his life.

IV. BASIC HUMAN VALUES IN THE NEW WORLD OF SCIENCE AND TECHNOLOGY

by Bishop Mark J. Hurley

A new world have been born before our very eyes, a radically different age, different in every dimension. Three revolutions, among others, have changed our lives, our culture and our civilization forever. With the cracking of the *atomic* code man became capable of destroying life on earth on a scale undreamed of in his philosophies; with the cracking of the *genetic* code man became capable of manipulating and controlling human nature itself; and with the cracking of the *electronic* code man became capable of moving into private lives in an all-pervasive way never contemplated before.

These three revolutions: the atomic, the biological and the electronic, empower the human race to threaten its own *existence*, to compromise its own *dignity*, and to lose its precious *freedom*. By the same token, supported by science and armed with technology, the human race has within its power to protect and preserve human life, to promote and enhance human dignity, and to preserve and expand human freedom.

Perhaps the true portrait of the 20th-century human might well be homo sapiens, cradling in his right hand the miracle drug penicillin to the glory of the human race, and brandishing in his left hand a fusion hydrogen bomb in holocaust and immolation of the human race on the

altar of war. In the great game of life as it is lived on this planet, man is not only the player of the game, but also the cards that are being played, and the stakes as well for which they are being played (Teilhard de Chardin).

No one discipline, no one group, no one science or combination of sciences can provide the answers that mankind seeks. Solutions, like truth itself, will be complex, sophisticated and interdisciplinary, for there is no scientific utopia on earth, nor a religious utopia either. We are pilgrims seeking answers, insight and wisdom in relation to nature's deepest mystery and elusive secret: God's gift of life itself.

Has there not been a serious erosion, a fundamental depreciation in the understanding and appreciation of God's gift of life over the entire globe? From country to country? From people to people?

The evidence seems quite compelling.

1. The "ABC's" of Warfare

There hangs over the earth the sword of Damocles, more properly called war and warfare, changed radically by the new science and the new technologies. The ABC's of warfare.

A. Atomic

"A" stands for atomic, which has produced hydrogen bombs which promise to annihilate major portions of the human family in a twinkling.

The first atomic bombs dropped on the United States will kill 18 million people and leave 60 million more casualties. It will drive the human race back into the underground caves of pristine centuries, not to mention the degradation of the environment.

B. Biological

"B" stands for biological, which promise exotic weaponry capable of setting loose killer strains of diseases and plagues.

C. Chemical

"C" stands for chemical, which presages noxious gases that kill on contact.

Nations — particularly the superpowers, the Soviet Union and the United States — are striving to put controls on these scientific breakthroughs. The signing of the agreement to cutdown the number of short-range nuclear missiles in Europe this past year by Mr. Gorbachev and Mr. Reagan was a very small and very limited first step. But the problem was not scientific; it was moral. It did not depend on scientific values but on human ones, on good will and mutual trust.

Similarly, attempts are being made by nations to eliminate entirely biological weapons. Yet nations continue to manufacture and store them, as the United States likes to say, in order to counter enemy biological weapons. But the biological knows no national borders; witness the spread of the acquired immune deficiency plague known as AIDS. The alarms have been sounded but the root causes scarcely addressed.

Chemical warfare was thought to have been for ever proscribed during World War I, in 1918. Just this past September Western experts held a conference on biological and chemical weapons. They were prompted by the use of poison gas by Arab nationalists in Iraq against their own Kurdish minority in 1983. 4000 Kurds died instantly as chemical bombs were dropped from airplanes, and 50,000 were injured — a move to suggest to the Kurds that they leave Iraq forever. It was genocide on a minor scale when compared with Pol Pot's in Kampuchea, but genocide all the same.

How have the nations responded? Although some 30 nations are believed to possess biological and chemical weapons — most of them in the Third World, but including also the two superpowers, yet there is a stubborn refusal to sign a total ban on the possession of both biological and chemical weapons. No one trusts the others.

The refusal is not based on science as such but comes from the conclusion that nations cannot trust each other — the other one will cheat, the other one has wicked ambitions. Again, the question becomes basically moral, growing out of the powers generated by science and technology.

Nations, even smaller ones, even poverty-stricken ones, are building up their armaments in such a way that in the foreseeable future they will be able to hold the entire world hostage to their destructive power. Cynically it can be said that a nation is not criminal unless it loses its war.

The famous British anthropologist of African fame L.S.B. Leaky tried to warn the human race, whose origins he traced back 3000 centuries. He called out to say that mankind was building tombstones to civilization, not milestones. He predicted slavery in a few years by reason of drugs and bioengineering. He said he had faith in the perfectibility of the human species but he added: "where faith is maimed, science is blind."

There are value judgments to be made; they will not be found in science or technology as such. But they will not be made without the intensive dialogue and complete cooperation between scientists and theologians, between the men and women of science and the men and women of good will and expertise, not the least, those in the Church.

2. The "ABCs" of Peacetime

A. Atomic

The nuclear accident at Chernobyl in Soviet Ukraine and the much smaller one at Love Island in the United States evoked scientific questions involving such things as meltdown, automatic safety controls, human supervision and administration. But the basic problem was and is moral: How much risk may a government take to secure atomic energy for peaceful purposes? How much risk to the life and health of the people working in the plant? Those living in the area? Living downwind, even in other countries? What risk to the natural environment is acceptable? To the air we breathe? The water we drink? The sunshine we bask in? The ozone which protects us?

B. Biological

The most radical and far-reaching discovery of our time in biology is undoubtedly the discovery by Watson and Crick of recombinant DNA. With the advance of the practice of medicine, a whole new series of moral questions has arisen.

The abortion question challenged the morals of medical doctors to such a degree that most of the United States' medical schools derogated the traditional Hippocratic Oath which clearly proscribed the taking of unborn human life. In a short space of time there has been a revolution against the judgment of the ages past, namely, that human life has a special dignity and worth. The proud tradition symbolized by Hippocrates was clearly compromised.

Well over 90% of the abortions in the USA, which number almost two million legal ones per year, are performed on perfectly healthy and normal babies. Special targets are made of the defective, Tay-Sachs and sickle cell anemia risks. But the matter goes even further! Abortion is recommended on sociological grounds of poverty, nervousness, mistaken pregnancy and the like. And by the ratio of 29 to 1 boys are preferred to girls, the latter being aborted, thanks to amniocentesis which reveals the sex of the fetus in advance of birth. In India just last week a feminist organization formally protested against this practice as genocide against women.

And we hear of the one-child family mandated, we are told, in China and Korea; two children in Vietnam; in Japan, abortion as the form of birth control; and in Singapore, special eugenics for the intelligent and rich young people.

Surely these practices go far beyond the ken of science but rather question the value of life itself.

In its trail we in the USA face infanticide, the harvesting of fetal tissue for experimentation, the mercy killing of the mentally ill, the terminally ill, the defectives, and the aged. The argument does not come from science but from economics, i.e., the cost benefit theory: when it becomes too expensive to maintain a person in society, he or she may and in some cases must be removed. It is one example of sociobiology: judging social patterns in terms of a genetic cost-benefit calculus (à la Francis Crick).

But again, who decides? Big Brother? Who give proxy consent? Who can give informed consent? Who determines the value of a specific life? A worthless life? Or a life that lacks meaning? Who? The State! And who can say as many do: All biology can be reduced to physics and chemistry? Or psychology to neurophysiology? Or the natural world to subatomic physics?

In the wake of biotechnology have come the test-tube babies, the surrogate mothers, the proxy fathers, the sperm banks, cryogenetics, and a host of problems and dilemmas. Should food and water be denied senile people as an extraordinary measure to keep them alive? What is the legal status of the frozen embryo where parents die intestate? To whom does a child belong: the "egg mother" or the "womb mother"? Should life be patented? What of the effects of genetic engineering in the non-human world? These are essentially moral and ethical pro-

blems. A new science has arisen; it is called bioethics.

Two disclaimers are in order here. First of all, men and women of science and technology have undertaken heroic measures, at times, to preserve, protect and enhance life and human dignity. Secondly, for all its history, tradition and undoubted wisdom, the Church does not possess instant answers. The Church's role is to enlighten conscience, not to replace it; the Church directs the mind to solutions that are truly human but it must do so cooperatively with the scientists who are bringing into being a whole new world, which, however, does not escape the moral order.

Life is a basic good but not an absolute good; it is "the necessary source and condition of every human activity and of all society" (Cong. Doctrine of the Faith). There are even higher goods for which life can be sacrificed: "no greater love it there than to lay down one's life for one's friends" (John 15). But there must be a caveat.

Just as freedom and liberty are whole and entire, when one nation's freedom is threatened, all are; so human dignity is similarly indivisible. When one human life is unjustly threatened, all lives are; when taken unjustly, all stand in danger.

The eminent biologist Dr. Leon Kass of Chicago University pointed out how the human race is now paying for its unrestrained conquest and profligate treatment of the natural environment. Similarly, he saw the threat through biology:

With the powers for biological engineering now gathering, there will be splendid new opportunities for a similar degradation of our view of man. Indeed we are already witnessing the erosion of our idea of a man as something splendid or divine, as a creature with freedom and dignity. Clearly if we come to see ourselves as meat, meat we shall be.

C. Chemical

Drug dependency has become a world-wide scourge, spawning a new pervasive culture, an international exchange and trade between many nations, not the least from Asia and South America to the United States, giving birth to a new violence and gangsterism, both inside and outside national territories. But worst of all, the personal tragedies of drug addiction have filtered down into young children and even to the unborn baby.

Concomitantly, the use of needles for drug injections is the second most numerous source for the transfer of the deadly virus known as AIDS, the acquired immune deficiency. Leakey many years ago was indeed a prophet when he predicted that drugs would lead to slavery of body, of mind, with the loss of health, liberty and mental faculties themselves, in a word, degradation and loss of all dignity. But society itself suffers the same fate when so many of its members become too chemically dependent and are rendered in varying degrees irrational and helpless.

Chemical weapons have not been confined to the battlefields of declared wars. As a native San Franciscan, I can faithfully report the hippie and flower-children's challenge to our generation, a sad heritage that perdures to the present. The "love generation," "the me-too generation" sent a message to the entire world:

Who wants to play this silly game of life? Who wants to go to war and risk death for a civilization that is not worth saving?

Karl Marx was wrong when he wrote that religion is the opium of the people; we say, opium is the religion of the people, opium which turns us off from our fraudulent society and turns us on to reality.

We demand acceptance because "we are human and we are here."

Nations all over the world have declared war on the commerce in drugs; so far with very little success.

D. The "B" and the "C" in the Electronic Revolution

The cooperation of science and technology is probably never better illustrated than in the electronic revolution. As Marshall McLuhan wrote: "There are electronic eyes with photos from space, photos through walls, sonar and radar, and electronic ears." The U.S. surveillance teams could boast and prove: "We can see a basketball at 12,000 miles." But in our opinion, the most awesome, and indeed most threatening, has its provenance in the data banks and computers.

Concomitantly, there has grown an insatiable appetite for information by private sectors as well as governments, at once desultory, capricious and hence dangerous. Computers have come of age; data banks are permanent fixtures.

In the United States, for example, there are at least 27 separate government agencies gathering information, much of it quite personal and private. 800 life insurance companies have a single data bank in Massachusetts with all the medical information it can store. Credit cards also contribute information to central data banks. The potential for dossier building is staggering.

Many nations have introduced SIN, the single identification number: Sweden in 1947, Israel in 1948, Norway in 1964, with others following. In the USA the social security number which is now required (in practice) at birth has become the SIN.

Again like the ecology crisis, there is a computer crisis. Time magazine, September, 1988, featured what it called the computer virus. Computer pirates were able to steal secrets from other computers, other than their own: more, they put "viruses" into the software programming that caused other computers to lose their data. Sabotage by computer virus!

In Great Britain the law which has tried to catch up its data processing act came into force in November 1987. It follows the 1981 Council of Europe Convention for the protection of individuals with regard to automatic processing of personal data. There is a registry for data users, a time limit, and legal rights to enquire about information stored in data banks.

There are at least two major moral questions. People have a right to their personal privacy, be secure in their own family, in consulting professional people, in the use of postal services, etc. The human mind is not fair game for an unjust invasion. Secondly, by placing a single identifying number on each person in a society there is laid out the perfect means for the foundation of a police state, an all-powerful government, a totalitarian society.

Scientists are being asked to build in controls; the law is striving to put limits; the Church is being urged to update its theology of privacy. A new moral climate respecting the dignity of the human person stands as a challenge and categorical imperative.

Privacy is an aspect of the spiritual nature of man. Privacy respects his non-material nature, his feelings, his emotions, his memory, his intellect. Men and women naturally desire and often demand the right to be left alone, especially by government or regime or state, a right most

valued by civilized man.

By what authority, on what basis, will the threat to privacy of the electronic revolution be controlled? The general public looks for answers and realizes that they are not found entirely in the science and technologies which brought into being these wondrous inventions.

4. The Scientific Method

While this paper has presented something of a laundry list, and an incomplete one at that, of scientific factors in moral and spiritual problems, yet there lies underneath all another factor both human and scientific; it is method.

It seems no exaggeration to say that the general population all over the world looks to science as savior and miracle worker, at least to a point. Science is perceived as synonymous with certitudes yielding knowledge on which all can agree, value free, verifiable in both method and content and of universal validity. Contrariwise, religion is deprecated as subjective, emotive, non-cognitive, of some use and value but with no claim to reality. Some philosophers and psychologists have even reduced it to psychology, or worse, neurosis and illusion.

The Harvard sociobiologist E.O. Wilson sums up the matter at the present time in this act of faith, a classic example of reductionism:

The basic laws of physical science are considered with the laws of biological and social sciences, for this world lies evolved from other worlds obedient to these laws. Science is the only avenue to the whole understanding of reality (*The New Religion*, 1978).

While sciences vary among themselves as to specific methods, yet they follow a similar path from invention involving imagination, observation, experimentation and model building to verification, to check how a thing "works," its consequences seen only in some language, at times, such as mathematics. With the power to predict and control, the scientist contributes to progress, differently from science to science and always with certain limitations.

The power so to accomplish is a gift of God to the scientist and merits both the admiration and gratitude of the human race and the explicit support of the Catholic Church, which recognized at the II Vatican Council "the rightful independence of science."

St. Gregory Nazianzen in the 5th century wrote something about the reception of the scientific method: "To form conclusions too quickly is unscientific; to avoid conclusions is atheistic."

Conclusion

The brave new world which has been born in the 20th century and which is charting the course of the 21st century has brought into sharp focus the matter of the erosion of the perception of the value of human life. Life is becoming cheaper, more expendable, more disposable. This concern is not denominational, sectarian or of a special religious interest, but is a deep, fundamental problem for all mankind.

Pope John Paul II warned that "the man of today seems ever to be under threat from what he produces. This seems to make up the main chapter of the drama of present-day existence."

Let it be clearly affirmed: Science and technology must never be stopped or unreasonably curtailed, precisely because they promise so much good and so much benefit for the human race. Man will never cease to expand his knowledge. The autonomy of the scientist must be respected by the Church; and Vatican II, reflecting surprisingly on Vatican I, stated: "We cannot but deplore certain habits of mind sometimes found too often among Christians which do not attend sufficiently to the rightful independence of science" (*Gaudium et Spes*, 36). Fundamental sciences such as physics, chemistry, astronomy, mathematics must be free, liberated from politics, economics or intellectual colonialism. Applied sciences and technology and the so-called human sciences touch man directly and intimately and thus bring in yet another dimension, the human, and hence, the moral and spiritual.

But the underlying human values will not come from science, much less technology. Because something can be done, does not mean it should be done; similarly, values as defined by philosophers and theologians are not born in a vacuum but must be based upon the realities of the scientific world. The moral arbiters must be genuinely knowledgeable about the world of science and technology. They cannot spin off moral principles with application to the real world from their ivory towers. Before they say anything, they must know what is happening and what prospects there are for the future. The Church needs the scientist and his contribution before any moral judgments can be rendered.

A new synthesis is possible, a new consensus based upon moral

principles: for example, the proposition that: "Human life ought not to be taken or endangered except when there is a clear and persuasive argument that other claims are ethically prior" (Gustafson); or, "Human beings have a dignity and worth which always must be respected, never suppressed or functionally subordinated to any non-personal reality" (J.C. Murray).

The Russian emigré Solzhenitsyn put a more poetical finish on the basic philosophical principle: "There is something intangible in me which I conjure you to respect because its principle is independent of you."

Every nation needs a public philosophy which believes that the moral history of that nation is more important than its scientific or military history. Pope John Paul prayed that "man must emerge victorious from this (scientific) drama which threatens to degenerate into a tragedy and he must find again his true kingship over the world and his full dominion over the things he produces."

In the new age, as I quoted de Chardin above, in the game of life as it is lived on this planet, men and women are not only the players in the game of life; they are the cards that are being played, and they are the stakes as well for which the cards are being played. What are at stake are life, liberty, and the pursuit of happiness for generations to come.

Thomas Jefferson put the matter in this way:

Can the liberties of a nation be thought secure when we have removed their only firm basis, a conviction in the minds of the people that their liberties are the gift of God? That they are not to be violated but with his wrath? I tremble for my country when I reflect that God is just; that his justice cannot sleep forever.

V. SCIENCE, TECHNOLOGY AND SOCIAL JUSTICE

by Bishop Francisco F. Claver, S.J.

A. Perspective

Bishop Hurley, in his talk yesterday, laid down much of the basis of our subject today — and that from the side of the First World. Today we look specifically at the social justice aspects of science and technology — and this from the side of the Third World.

Let me state from the very beginning how I intend to approach the topic assigned me. It is a broadly pastoral rather than a strictly scientific perspective I would like to take. And for me this means a preoccupation with social change, with the ideas and factors that make for it; all, I trust, from the standpoint of faith.

This is not by any means to excuse myself for the lack of research that should have been done for this paper, for the absence of scholarly footnoting that should grace my text. But the fact is, for most of the past twenty years, I have been "in the field," not in academe, and it has not been difficult shedding off the niceties of "scientific" writing! Still, I would like to think that our pastoral practice has not been devoid of any theoretical content whatsoever. Let me say a little more on this last statement for I believe it has some bearing on this colloquium in general.

When I started graduate studies in cultural anthropology, it was after a brief stint in the mission parishes of Mindanao. It was there the idea germinated of wedding cultural anthropology and pastoral work. Hence my interest in — not to say fascination with — applied anthropology at the outset. It was thus with not a little puzzlement that I quickly found out there was not too much organized material devoted in the current literature to this specific aspect of the general discipline of anthropology. It did not take long to see why.

Applied anthropology is not like applied chemistry or physics. In these latter, one takes the findings of "theoretical" scientists, uses their formulas and come up with the desired and expected results practically automatically. Applied anthropology, on the other hand, is not a technician's field. It is on the contrary — and paradoxically, I might add — the most theoretical of social sciences. Or at least it requires that its practitioners be men and women of deep scientific theory — and of sure theory — for the simple and frightening reason that an applied anthropologist has to be a social engineer, a person thus who cannot escape the fact that in applying his science he deals — "meddles" is the more correct term? — with people's lives. And in doing so, the temptation (and danger) of "playing God" with those lives is a constant and very real one.

The fact scares most anthropologists from admitting they are engaged in the applied area of their field, and understandably there are few, if any, who dare claim the name of applied anthropologist.

It strikes me that priests, missionaries, bishops, professional men of religion, not to say social reformers of all kinds, have no such qualms! They — *we* — are all social engineers in one way or another. And if we do not have the fear I speak of here, it is because either we are very sure of our theoretical presuppositions or because we are not at all bothered by their lack — possibly more the latter!

Precisely for the reasons just given, I expressed the hope above that our pastoral praxis has not been divorced from any theoretical presuppositions, theological and, yes, scientific, in its pursuit. To me, personally, the appeal of the work (on an intellectual basis, that is) has been in the validating of those presuppositions, in the deeper insights into them even as we were heavily involved with pastoral tasks. In a sense the doing of those tasks has been a constant testing of hypotheses drawn from ordinary sociological insights about the working of human societies.

I trust then that the experience will not be too meager a credential for what I have to say here. Perhaps in what I have said so far, I seem to be trying too hard to rationalize the stance one has to take when he engages in works for justice. But the fact is that one can get myopically righteous where social justice is concerned, and a more faithfully scientific outlook can go far to counteract and correct such a myopia.

With that said, let me go into the heart of what I have to say on science, technology and social justice.

From a social justice point of view, the problem with science and technology seems to come down to this basic question: *Who benefits most from scientific advance and from the technology created by that advance?* Or put negatively: *Who suffers most from them?* I would like to underline the fact that although we ask who benefits or, on the contrary, suffers most from science and technology, the question is really about the *uses* to which science and technology are put, not about their mere growth or innovating capability. For it is in their uses that they affect people justly or unjustly in their relationships with one another. This idea has been repeated here a number of times these past few days.

B. The Problem

I would like to talk about what I see is *the* problem in a series of cases.

1. Intellectual Colonialism

The situation I describe here is probably not too prevalent any longer, but there was a time when, at least in cultural anthropology, researchers would descend on a Third World people, do their studies for a year or two on them, then go back to their home countries, publish their findings in scientific journals — or gain a degree for their work (which more often than not ends up on some dust-gathering shelf in a university library) — and the results of their research rarely get back to the people on whom the study was done to be of use to them. The head of a research team I was once part of aptly called it “intellectual colonialism”: The Third World supplies scientific data for First World consumption but gets nothing or little in return.

I am not too sure the man was simply indulging in an exercise of acerbic wit. He had been long engaged in Third World studies and he was genuinely bothered that his painstaking research was not going to be of benefit to the native peoples he worked with — at least not directly or immediately.

It is in response to this problem that in some parts of the Philippines, in many rural Church communities, groups are being formed for what is called “participative research.” Ordinary village folk are being trained for investigation into their social realities, appropriating the knowledge gained for their own uses and action. The means at their command for such research may seem primitive in comparison with the more sophisticated (and expensive?) tools available to Western academics, but the knowledge gained is nonetheless as valid and as vital.

The point to be made from all the above is quite rudimentary: The means for the gaining, storage and retrieval of knowledge are enormously developed in nations where science and technology are most advanced. And if, as the adage goes, “knowledge is power,” the sheer bulk of knowledge they possess, though not unjust in itself, can and does lead to serious imbalances of power and, hence, injustices both between and within nations.

2. Control of Media Communication

The point just made above is best illustrated when we consider how information is controlled and managed world-wide — how it often is manipulated to protect vested interests.

Four years ago, a gathering of Jesuits of East Asia working in communications and the social apostolate was held in Manila on the subject of NITs — new information technologies. The communications men were understandably quite technical in their approach, more interested in the capabilities and qualities of new inventions, and were all for making as much use of NITs as possible in the work of the Church. The social apostolate men were not as enthusiastic. And it was not because they were anti-science, anti-progress, anti-intellectual but because they felt, in today's world, more particularly in the Third World, NITs represent rightly or wrongly too much power, "naked power" even, and the Church should not, even for the best of purposes, be saddled with the image of that kind of power.

The two contrasting positions are much more nuanced than presented here, needless to say, but their summation above is, I think, fair enough.

I don't know if you agree with the social apostolate men's seemingly exaggerated and fearful reading of the situation. I for one believe they had a point. There is such a thing as news management, as control of communication processes, and people and nations with more modern means of information technologies can — and do — manage and control the quality and mode of information diffusion. And those men, heavily immersed as they were in justice questions, were quite right about the image (and reality) of power that a body like the Church would project (and have) should it make unqualified use of NITs — at least in their present expensive forms. Subsequently, at the end of the meeting, they modified their opposition somewhat: "Let's avail ourselves of NITs in our work," they said, "but if we do, it must be clearly in the service of those too poor and disadvantaged to own or use them for themselves."

3. Economic Profit from New Technologies

If there is power in scientific knowledge and developed technologies, there is economic profit to be reaped from them too. The Philippine legislature recently passed a law on generic drugs, requiring pharmaceutical firms to label medicines by their generic names, drug-stores to carry and sell generic medicines, doctors to prescribe them. There was strong opposition to the law from interested drug companies and doctors and their opposition — although they would not admit it — basically sprung from the prospect they didn't want to face the severe loss of revenue. As the proponents of the law made very of clear, brand

name drugs are more expensive (sometimes twice or more) than the generic kind, though their healing qualities are for all intents and purposes the same.

In the process of the law's enactment, some interesting data came out about the transfer of technologies — or rather its absence — from the First to the Third World. Big drug companies have been operating in the Philippines for generations, but to date the drug industry, vastly profitable though it has been, has been limited to merely repackaging medicines — produced elsewhere — for sale locally.

The practice brings to the fore a quite universal deficiency when we look at science and technology from the perspective of social justice. Scientific know-how and technologies are not readily shared between the “haves” and the “have-nots” among nations — and all, most evidently, for reasons of economic advantage for the former. Economic profit, I would think, is not begrudged, but it is when it means further bleeding already anemic economies such as are the norm for poor, struggling nations of the Third World.

One hopeful development on the scene, at least as far as medicines are concerned, is the increasingly widespread utilization of herbal medicines. Because of the high price of modern drugs — high because of the poverty of our rural folk — Church-sponsored health work in the Philippines and elsewhere and other socially-conscious groups are promoting wider knowledge and use of such remedies. The work succeeds best when the results of good scientific research done by universities and medical schools are disseminated among, and brought down to the level of, countryfolk. The same, incidentally, holds true for the efforts to develop “appropriate technologies” using materials and resources readily available at the grassroots.

4. Sharing Knowledge and Power

Speaking of the grassroots, the forming of BCCs (Basic Christian Communities) is becoming a major thrust in many Churches of the Third World — and certainly in the Philippines. In the participative ethic that characterizes them, such a seemingly innocuous idea as sharing goods and benefits, burdens and responsibilities socially assumes transforming qualities hardly plumbed before under a more individualistic form of religion.

A decade or so ago, a huge multinational company set up a sinter-

ing plant on the island of Mindanao. Back in the home country the company was being sued for the health-destroying pollution it had wreaked on the people of the town in which its main ironworks complex was located. To get out of the hole it was in and to placate irate townspeople, the company with appropriate breastbeating sent them this message: "Honorable citizens of C_____ : You need no longer fear. We are moving the sintering portion of our plant to Mindanao." Installing pollution control devices in its home country would have cost a fortune. So the company relocated to the Philippines where restrictions on pollutants were thought to be less consuming of profits.

(A footnote to the incident: To the credit of the townspeople in question, they kept up their protest and condemned the company just as strongly for "importing death" to the Philippines.)

Transfer of technologies is, when all is said and done, nothing more, nothing less, than an equitable sharing of the benefits of scientific progress. In the case at hand, some transfer, some sharing takes place, but of a partial and doubtful nature: Sintering is only a part of steel-making; local raw resources are not used; the technology itself remains the property of the investing company; and worst of all, the only thing transferred *in globo* is pollution.

Other forms of detrimental sharing should be taken note of here: The fobbing off of obsolete and obsolescent technologies on less privileged countries comes to mind; so too the sale of drugs, banned in their countries of origin, to unsuspecting (or deceived?) poorer countries; and the dumping of toxic wastes on otherwise clean environments, etc. In all this there is a sharing more of evil than of good — a clear matter of justice between peoples.

C. Afterthoughts

In this latter portion of our discussion I would like to put down a few random thoughts stemming from what has already been said. And I'd like to center them on the simple idea of sharing. For it is, I think, at the heart of justice: In a very real sense, justice is the sharing of things that *have to be shared*.

1. Just Sharing

When we speak of non-transference — non-sharing — of technologies, it seems we reduce the problem to one of economic monopolies or trade protectionism. Also, we seem to be saying every-one has a

right in justice to all scientific or technological progress. Not quite. For there are such things as patents and copyrights, mechanisms whereby the rights of originators and innovators are protected — a matter of justice too. And as was brought out in the debate that went into the making of the law on generic drugs cited above, the demand is not that every scientific or technological discovery become at once public property and put to general use for the benefit of all. The least that can be said is that when innovations do indeed become public property, there should be more sharing of their benefits. That sounds very much like a statement on apple pie and motherhood, but the sad reality is that such sharing is more the exception than the rule. Or there would not be much ado about the transfer of technologies as a matter of justice in relations between rich and poor nations.

2. Areas of Sharing

Much of our attention in this colloquium will probably center on the unitary nature of truth, based on the premise that there cannot — or should not — be any contradiction between science and technology on the one hand and faith on the other. From the narrower perspective of the faith that does justice, however, there are a number of problematic areas, and it is these — some of them, that is — that we have been looking at here. As I stated in the beginning, the difficulties do not arise so much from science and technology as such as from the uses they are put to.

The four cases I have chosen to dwell on highlight some areas that cause problems of justice:

- (a) The area of concentration and hoarding of scientific and technological knowledge, their increment, their potentials for social change;
- (b) The area of knowledge-communication and knowledge-dispersal, their implication for power-building and control of development processes;
- (c) The area of economic growth from the way advances in science and technology are used or manipulated for profit; and
- (d) The area of sharing wealth-producing benefits that come from science and technology, of transfer of scientific and technological know-how in particular because of its currently abrasive nature.

The four areas dovetail into one another tightly and are not really all that distinguishable one from another. And the reason simply is that they are all at base a question of sharing, of *just* sharing; and hence asking the question should lead to some answers that will meet the demands of justice.

3. A Pastoral of Sharing

The question is probably outside the realm of pure science — if there is such a thing. But it does come fully within the purview of the pastoral perspective that I said I have assumed here. And if there is anything that a pastor in these times of quick and turbulent change has to learn fast in order for him to do his work reasonably well, it is this: His concern for the people and their spiritual welfare must translate into a concern for ideas, events, developments — for any change in the physical and social environment and for what these do to people here and now, for whether they help or not for the greater humanization — and hence, to use a traditional term, spiritualization — of people. In the final analysis, I take it, it is that same concern that is behind the holding of this very colloquium.

4. Holistic Sharing

I should end here on that note except that a niggling little thought bothers me at this point: Any discussion of justice questions somehow tends to be too negative — all too often an exercise in nitpicking without resolution. And I am aware I may have been doing just that here in my litany of woes, of unbalanced relations — unequal sharing, if you wish — between developed nations and undeveloped ones. They are all cases of oppression, exploitation, denial of rights, injustices piled on injustices. And when we take up the cudgels of justice — like knights on white horses going to the rescue of distressed damsels! — it is all too easy for the “champions of justice” to act as though all right is on their side, all wrong on the *other* side, and the victims of injustice, like themselves, are completely without guilt.

Let me just say here, without going too deeply into the matter, that the kind of approach to justice I have just caricatured is corrected quite effectively when holistic attempts at analysis of social realities are done on a wide basis — and by ordinary men and women. For when they look at structures of injustice in their social context and *also* at the cultural values that support those structures, they realize that “the enemy” is not only outside but also — and possibly more importantly — within themselves. It is a salutary realization and its net effect is not going to

be a one-sided self-righteousness (such as we often meet in social reformers of an ideological bent) but a more humble — because less one-sided — approach.

Let me end then on a more positive note with just one more case.

5. Community Sharing

The vast majority of the people in my former diocese are corn farmers, living for the most part on a subsistence basis and forever at the mercy of middlemen when they have occasion to sell, for needed cash, whatever surplus corn they can spare from their meager stores. It does not require any hard research to see that one of the basic reasons for their inability to get out of the economic rut they are mired in is their lack of storage facilities and know-how. In the primitive technology that is theirs, they can hang on to harvested grain for only about four months. After that length of time spoilage comes fast. They thus have to sell within that short period of time to grain merchants who have no scruples manipulating and dictating prices to their advantage.

A young missionary was assigned to the diocese in the mid-seventies and sent to open a parish in a most depressed part of it. He was a man with a background in the physical sciences, and from the very start he saw and understood what the problem was. He set about doing something about it. With a loan from a funding agency, he put up some silos and grain dryers. In the first year of operation, the farmers who timorously joined the program of grain banking he had worked out doubled their income by the simple expedient of storing their grain until, then selling it during, the hot months when corn was scarce and prices up. The venture has been a great success. From the profits made over the years (the original loan was paid up in two years), a number of community-benefiting projects have been completed, done with the people's joint planning and efforts: The village has been electrified, an all-weather road built to the main highway, a water-system installed, a new church constructed, etc.

It is a fine example of the opposite of the negative factors exemplified by the four cases cited earlier: Scientific and technological expertise was put at the service of people who lacked it, effectively communicated to them, transferred to them, and all for their improved well-being and greater control of the economic factors of their lives (necessarily, of the political too). Now all they need is for some researcher to go to them and make a scientific study, complete with statistics and

graphs, of how that one experiment in social engineering worked!

It is one of our few success stories and it illustrates well, I believe, what we have been trying to say here.

VI. THE MISSION OF THE CATHOLIC SCIENTIST IN ASIA

by Professor Lucien Morren

It is for me a very great honor to have been invited to deliver to this seminar a lecture on the mission of the Catholic scientist, and I would first thank the responsible authorities for having offered me this very interesting but delicate task. And I also immediately confess that I am somewhat disturbed, being a European, to have to address myself to a specifically Asian audience.

An explanation for such a paradoxical situation may likely be that I am responsible for the International Secretariat for Scientific Questions (better known as SIQS according to its French abbreviation) of the world-wide organization Pax Romana-ICMICA (or International Catholic Movement for Cultural and Intellectual Affairs). This position gives large possibilities of information. Moreover, science and technology are undoubtedly universal and their impact on the various cultures show at first sight more similarities than dissimilarities. However, this is precisely a question that we may further debate.

Witness to Faith as a Well-Founded Reasonable Option

It is an Asian study which will provide us with a relevant starting point for our lecture. I refer to an inquiry conducted in Bombay among 64 Indian scientists; 44 were of various religious denominations, Hindus, Christians, Muslims and others, while 20 (thus 31%) declared themselves atheists or agnostics. The survey was led by Dr. Hubert Monteiro, who is the major corresponding member of SIQS in India, and the Jesuit Father Aelred Pereira. The results of the inquiry, accompanied by very interesting comments, were published under the title "Attitudes of Indian Scientists to Religion" in the issue No. 1-2, 1983, of *Convergence*, the Journal of Pax Romana. We cannot of course analyze in detail this remarkable survey but we shall nevertheless pick out some indications.

For half of the non-believers the scientific method was the only approach to truth. The concept of God was created by man to explain whatever was not explainable by science, an ever-shrinking refuge. On the other side, among the believers, there were wide differences in their

religious attitudes. But only a small minority succeeded in harmonizing their scientific training and their religious creed. For the majority, science and religion constitute two completely separated, even mutually exclusive, domains. They were in fact "schizophrenics."

Were such a survey made in a Western country, I guess one would get quite similar results. We just heard that for an Indian agnostic scientist the scientific method provides the only approach to truth. Nearly at the same time, we read in an American publication the following assertion: "It is implicit in American culture that science provides the only valid way to knowing." And among scientists who remain believers the majority would also keep religion and science apart, being incapable of building up a harmonized world view. In the West, the proportion of non-believers would probably be higher than the believers, mainly Christians, but such differences do not alter the general trends. We live now in a world whose intellectual climate is everywhere more and more influenced by science and technology.

Are we far from our subject, the mission of a Catholic scientist? We don't think so, for in order to define its scope we have first to be aware of the present cultural context. And, as any scientist would do in his own work, to start from facts such as those illustrated by this Indian inquiry. But if science starts from facts, it has to interpret them — what Dr. Hubert Monteiro did as well. We shall adopt the same method; lessons have to be drawn from the present situation.

The Totalitarian Control of Scientism

One of these lessons, and an important one, is that, contrary to what is sometimes heard, scientism is not fully dead. One may give different definitions of scientism, but a short one found in a French dictionary will be helpful even if incomplete. It reads, in a free translation: "Doctrine according to which positive sciences are the exclusive source of knowledge." A statement which corresponds exactly to our quotations from an Indian scientist or the one picked up in America: science, the only valid way to knowing and thus to truth, as the Indian said.

In the Western world at least, the end of the 19th century and the beginning of our 20th century was the period when scientism reached its peak. It had two main characteristics: it was totalitarian, meaning that science would eliminate all other doctrines, the religions in particular, and would secure happiness for mankind; and, secondly, it was fully reductionist, meaning materialistic, everything being finally reduced to

matter. But in our world everything evolves and, even if scientism is not really dead, as already said, this does not prevent that it has also evolved, mainly thanks to the very developments of science and technology. Consequently, we have now to turn our attention to this evolution, considering successively each of the two main characteristics just mentioned.

What Remains of the Totalitarian Ambition of Scientism?

Experience, namely during World Wars I and II, brought the evidence that scientific developments could lead to frightful evils as well as to useful contributions. It was in Asia, in particular, that the effects of the atomic bomb were demonstrated and this will not be forgotten, especially in Japan. Thus, everybody would now agree, science cannot secure happiness for mankind; it has its limits, even without speaking of the affective or emotional aspects of life, where science has little or nothing to do.

However, previous totalitarian ambitions of scientism, if undoubtedly restricted, have not completely disappeared; they remain active in a well-defined and important field, namely, this pretension to monopolize the access to knowledge and to truth. Multitudes of minds, and not only of scientists, are still today impregnated by this totalitarian outlook which is a remainder of scientism. Accordingly, all things in the world are divided in two parts: there are those belonging to science and technology, which are governed by the criteria of true or false objectively determined; and then, all the others, which cannot be judged by these criteria, are left to mere feeling, to subjective option, to the appreciation that "it pleases me" or "it does not please me."

And this is disastrous for faith which, being surely not liable to be demonstrated like a scientific theorem, is then deprived of any sound foundation.

The "Reasonable and the Rational"

The situation is serious enough to deserve more comment. In other words, this monopoly of knowledge attributed to science means to restrict the exercise of reason to scientific rationality. But this is an unjustified closure: reason exceeds pure rationality. It comprises a practical reason for which the word "reasonable," thus distinguished from "rational," provides the best expression. Now, as the philosopher of science Jean Ladrière puts it: "the forgetting of the reasonable in front of the rational is a typical tendency of Western culture." And what

we heard from an Indian scientist seems to prove that such a tendency is not restricted to the West, at least for people scientifically trained. It lies at the root of scientism and, being contagious, it led huge numbers of believers, namely among scientists, to fideism, that is, to a purely sentimental and ungrounded faith, exposed then to all the dangers of a materialistic culture. In this perspective, scientism implies fideism, since both completely separate faith and reason, the first by excluding faith from reason, the second by excluding reason from faith. Thus both destroy man's integrity.

In such a context, restating the role of reason in the adhesion to faith appears as a task of prime importance.

The Movement of Faith

May I hope that the theologians here present will forgive me if I recall matters they know much better than I? But the audience is not composed of theologians only and a short theological glimpse will lead us to one of the main aspects of our mission. It is classical in theology to consider faith as resting on three pillars, grace, liberty and reason. But how their articulation works is a question which has raised long discussions throughout history. According to authorities, the best solution for this difficult problem was given at the beginning of our century by the French Jesuit Pierre Rousselot in a study significantly entitled *Les Yeux de la Foi*, the eyes of faith. An eye sees light when one opens it and when it then receives light from the outside. Similarly, for the adhesion to faith, the grace of God, acting as a perceiving faculty, illuminates our spiritual eyes provided, normally, that we open them so as to receive its light. But then, it is good that our reason perceives the soundness, the well-grounded character of its adhesion.

Such conditions show that we are not here in the compelling and autonomous sphere of the rational but well into the sphere of the reasonable, in which there is a mode of operation of particular importance for our specific object. We refer to the knowledge through the understanding of a sign. (Let us call it, in short, knowledge by sign.)

The Signs in the World

Allow me to speak a few moments on this matter. And first: What do we now mean by a sign? The shortest definition may be: "a fact, or an event, bearing a meaning." This fact, or this event, is consequently not neutral, and understanding a sign will then consist in discovering its signification, its meaning. But, being, as just said, neither compelling

nor autonomous, a sign, which can be proposed and never imposed, allows remarkably the three pillars of faith to play each its role, since its understanding requires the help of grace and a search for truth, for finally enlightening our minds.

Now, what is especially interesting for us scientists is that the understanding of a sign lies at the root of many, if not most, scientific discoveries. Let us recall a well-known example which at the same time will help us grasp what we mean by knowledge by signs. When Newton, as it is said, observing a falling apple, thought that such a trivial event and the movement of the planets around the sun were governed by the same universal law of gravitation, his discovery was not the result of a formal rational deduction but of an inspired induction. Many people before him had seen apples falling to the ground, but to establish such a link between two apparently so different phenomena requires one to be in a state of research and to be appropriately gifted. We find again the conditions for understanding a sign, keeping the eyes open and being endowed with a perceiving faculty.

In science, however, the two parts of a sign, the signifying fact and the signified meaning, remain at the same level, they are of the same order. But, for a religious sign, if the fact or the event still occurs in the observable world, the meaning they convey belongs to the transcendental sphere. One speaks then of a sign in the strong sense of the word. Thus, the sign becomes a bridge between what we may call the factual on the one side, and, on the other side, the transcendental, the realm of ultimate meaning.

All this illustrates how and why knowledge by sign is of such a prime importance in matters of faith:

1. It is through signs that God speaks to us in history. This is the very essence of the biblical message culminating in the life, the death and the Resurrection of Jesus Christ, who is the outcome, the achievement of the Old Testament and the founder of the Church, the whole building up a comprehensive sequence of meaningful events, of signs.

2. Knowledge by sign, as briefly evoked, allows us to harmonize the interplay of God's grace and of human faculties in the adhesion to faith.

3. A religious sign introduces to the spiritual sphere, starting from the factual, not from mere deductive reasoning. And even if this factual

element has to be well-established and interpreted, this is a feature liable to be much praised in modern culture which values facts.

After these general considerations, it would be going too far and out of our scope to review the great variety of religious signs, a variety which corresponds to the diversity of personal sensitivities. But all Christian signs point to the center of our faith, Jesus Christ, the Sign with a capital letter, when one discovers the transcendence of his message. And a multiplicity of converging signs is also a feature of great value for scientists, since in science the convergence of indications is the strongest basis for supporting a scientific conviction.

Still considering scientists in particular, we may add that they easily equate truth with verification. Hence, contemporary meaningful events liable to be subjected to inquiries would be privileged in this respect. We refer to the lives of saints and to miracles, namely those of Lourdes, not forgetting however that such events are quite diversely appreciated in the scientific area. Thus, these signs require preliminary considerations about the logic of the Incarnation, the anticipation of eschatology and God's love prevailing over natural processes.

Anyway, the previous considerations will have put to the fore, I hope, a first mission of the Catholic scientist in our present cultural context, namely, to testify that faith is not a mere ungrounded option but the response to the call of God addressed to man in his full integrity, a response involving all his faculties, reason included. And in this response man's reason is enlightened by the grasping of meaningful signs.

But if we have here a quite important task for overcoming the too frequent divorce of science and religion, there is more to do. Let us then turn our attention to the second major characteristic of scientism. We shall be led to further missions.

The Diversified Evolution of the Reductionist Character of Scientism

If the totalitarian aspect of scientism had to abandon most of its previous ambitions (except the one about reason that we discussed), the reductionist character has, on the whole, more lasting effects. It is not difficult to understand why, since it is closely linked to the scientific method itself. Any scientific explanation calls to immanent causes. When considering evolution for instance, any step ahead can only be explained by preceding stages, which if the word "progress" has any meaning, will belong to an inferior level with respect to the emerging

one. Thus, the new will be in a sense "reduced" to lower levels and, gradually, any reality, even the most developed ones, will finally be reduced to matter. We may accordingly rightly assert that science is methodologically materialistic. But then, of course, the temptation is strong to pass from a methodological materialism to a philosophical one. We may find here the root of the materialistic influence of science, which is universally experienced.

But by its very method also, if science is more and more powerful to tell us the "how" of things, it is quite weak, or even cannot say anything, about their "why" or their "for whom." In other words, science has little or nothing to say concerning the major question of "meaning," in the strong sense of the word. It even tends to eliminate such kind of questions. Science, fundamentally, searches for causalities; it ignores and even rejects any idea of finality.

However, the very evolution of science itself in the course of our century brought new elements — unthinkable before — which have altered the earlier picture. Science, broadly considered, has two major functions: interpreting the world and, through a presently scientific technology, transforming the world. Now, the extraordinary development of both functions has contributed to modify the previous climate. Outstanding scientific discoveries, on the one side, have raised more enigmatic questions than answers and, doing so, have restored the idea of mystery that the old scientism had the ambition to eliminate. Outstanding technological advances, on the other side, have given to man such powerful means of mastering not only nature but also himself, that questions of "why" and of meaning do unavoidably arise. In other words, ethical questions, unsuspected before, cannot be any longer ignored in the very sphere of science and technology.

We shall have to come back to these evolutions but let us first remark that, referring to reductionism as such, we have to record quite contrasting views, according mainly to the kind of sciences being considered. There are branches of sciences which tend to strengthen a reductionist outlook, while others lead many minds in an opposite direction.

At the risk of being rather schematic, we list among the first a few disciplines belonging to the large group of the so-called "human sciences": when sociology studies the collective behavior of man and psychology his individual behavior, they both tend to reduce man to an object obeying given "laws." And if such a vision, which may be partially

true, has no counterpart, then man is deprived of freedom and he is no longer a subject. Keeping a just balance is here a particular important mission for Christian scientists working in these fields.

It may be more astonishing to mention also in this respect a branch of the field of engineering. But the extraordinary development of the computer sciences has led many to a kind of neoscientism with the idea that the brain is nothing else than an extremely sophisticated computer, able in the future to be not only partly but fully simulated. The ambiguous but now popular expression "artificial intelligence" illustrates significantly this tendency. The expression is ambiguous for, if it may be understood in a more restricted and acceptable sense, it is too frequently misleading in scientific and, mostly, in extrascientific circles. Here again, man risks being reduced to an object.

Now, were we to stop at this point our review of the evolution of science in the course of our century, we would give not only an incomplete picture of it but a fully distorted one, leaving aside the most determining factors which have stirred up a change in the scientific climate, which is really a revolutionary one.

Here, we refer especially to physics and also to cosmology, which is now inseparable from physics. Physics is likely to be the most advanced science, surely the one, with cosmology, which has pushed the investigation nearer to the ultimate of the phenomenal world, in both the opposite directions of the microscopic "building blocks" of matter and the supra-macroscopic dimensions of our universe. One understands then that physics, and to some extent, cosmology, provide the keynote of the scientific intellectual climate — what physics did during the three centuries of classical science.

We may say that during this classical period science was seen as a bright area pushing continuously away the external dark area of the unknown, the last refuge for mystery, for inside the bright area of what had been explored we had the realm of logic and clarity. Moreover, mechanics provided the model for all the major sciences in such a way that an equation was frequently established between classical science and Mechanical Philosophy. The world was conceived as a huge mechanism; the world was disenchanted.

This vision has been completely upset by the astounding discoveries made during our century. The revolutionary novelty lies in the fact that the deepening of our knowledge of nature, instead of removing

enigmas, has led on the contrary to baffle our common sense. Mysteries are no more only external to science; they appear amazingly *inside* it, through the most outstanding discoveries: the Einsteinian relativity, the quantum theory, or the principle of complementarity compelling us to associate apparent antinomies, would provide here the best known examples. The present knowledge of the world is so strange that it could never have been foreseen.

This last sentence is drawn from a book which has impressed me to the utmost for its exceptional quality of presentation of today's science but also, alas, for its frightful deficiency in theological matters. Its title is well chosen: *The Wisdom of Science — Its Relevance to Culture and Religion*. Its author is Dr. Hanbury Brown, professor of astronomy in Sydney, Australia, Fellow of the Royal Society. His purpose is mainly given by the subtitle of his book.

Let us first consider the positive side of this work. A few quotations drawn from it will provide us with the best illustration of the present intellectual climate reigning in the scientific milieu. For instance: "If the Mechanical Philosophy is organized common sense, the quantum theory is organized uncommon sense." "One of the great surprises of the present century has been to learn from physics how limited our common-sense ideas about reality are." "Science leads us into new ways of thinking." "The conventional idea that science will eventually remove all mystery is an illusion. It is true, of course, that science does remove minor mysteries ... but, in doing so, it shows us where the major mysteries really are. It has shown us that all our ideas about time, space, particles, light, and so on, are symbols for entities which are fundamentally mysterious and seem to mark the boundaries of scientific understanding." And let us end this sequence of quotations with one summarizing the new situation: "If the Mechanical Philosophy has disenchanting the world, then modern science is well on the way to re-enchanting it."

A re-enchanting world is surely better for allowing room for spiritual values than a disenchanted one. Nevertheless, we should handle these ideas with care. To picture the quantum theory as organized uncommon sense might be quite dangerous as it may lead some minds to think that the world is absurd. That is of course not the conclusion of modern science! The major lesson it gives is that reality transcends the finitude of our minds. That is fundamental and fundamentally new; in this respect especially, modern science is just at the opposite of scientism; it may become a way leading to the acceptance of transcendence,

at least for those who remain open to the category of signs. For we are here in the realm of signs. But what a wonderful mission for Christian scientists appears with such considerations!

No, the world is not absurd; it discloses on the contrary a supreme astounding harmony, referring sometimes to details, between the various so-called physical constants. To show this, the most relevant science is undoubtedly modern cosmology, closely related, as already said, to physics. Everybody now has heard of the Big Bang. The expression comes from the cosmological vision, so widely accepted nowadays that it has been called the standard model, which sees the universe as an expanding one emerging from an explosive singularity that is simultaneously the origin of time and space, at least of our time and our space. Now, cosmologists have shown that the universe had an incredibly small probability to be as it is. Minor deviations of physical constants, for instance, would not have allowed us to appear, a first condition being a universe possessing the gigantic dimensions we discover, in order — since time and space are closely connected — to allow the huge durations required for generations of stars, and, at least on one of the planets, to allow another huge duration for a biological evolution. We are here at the root of the so-called “anthropic principle,” an expression derived from the Greek word *anthropos*, that is, man. According to this principle, the universe seems to have been “selected” (let us put the word between quotation marks) in order that such complex and extraordinary beings like man could appear. Even if the anthropic principle remains a controversial issue, the very fact that eminent scientists have devised and proposed it is already a significant event. It compels us to think about finality in the scientific area, rejoining again in this respect some views to be found in the vast domain of the life sciences, namely in paleontology. And the mention alone of finality is another revolution, for, as we mentioned before, any idea of finality was not only ignored but rejected by classical science.

Thus, our little and but partial survey of recent developments regarding science as interpreting the world have led us to discover in them signs able to reintroduce such a priori extrascientific words as mystery, transcendence, finality. Surely, Christian scientists must tackle the subject cautiously, and we shall have to come back to this question. But let us first take a look at science as transforming the world, that is a look at problems raised by technology.

A Few Words on the Role of Technology

Our civilization is often referred to as "scientific," but if the assertion is fundamentally true, most people see this only through the multiplicity of available artifacts, some of them being mere gadgets. What is right in speaking of a scientific civilization lies in the fact that these artifacts are the products of a scientifically-governed technology.

Historically, this situation is rather recent, for technology in the form of craftsmanship is largely older than science. But, at a pace unknown before, we experience nowadays the effects of a continuous interaction between science and technology, the one developing the other, and this in both ways. Fundamental progress in physics, for instance, is impossible without the tools provided by the most sophisticated technology, which itself is based on scientific advances.

Nevertheless, distinctions should be kept, and in the spiritual perspective which interests us at present, the respective influences of science, as such, and of technology are quite different. For science is a search for knowledge, thus ultimately a quest for truth. Transferred to the spiritual sphere, the major question, not for science but for scientists, will finally be: "Does God exist or not?" The debate is ultimately between atheism and religion. Technology, in contrast, essentially drives people towards action, not towards theory, be it an action for producing artifacts or an action for using them. It then tends to steer clear of the question of truth and to be satisfied with matters of good functioning. Technology concentrates the attention on objects, not on ideas. It favors thus not an atheism but, implicitly, an agnosticism, which is not so much a real doubt resulting from the impossibility of making a spiritual choice but a forgetting of ultimate questions, an attitude which raises the most severe difficulties for promoting the Christian message. As a distinguished Belgian Minister said recently: "Our civilization absolutizes the accessory and relativizes the essential," (if we may translate his words in this way).

However, as we have considered it, we experience today new situations such as allow us again to speak of a revolution. There are now some scientific-technical advances which raise the deepest ethical problems of a kind unknown before, reintroducing fundamental questions about man, his dignity and his status, which questions depend upon the accepted spiritual vision. We refer of course primarily to advances in genetics — for which a new word had to be created: bioethics. And here too we meet a paradox: science which tended to eliminate all questions

of meaning re-enacts them through the applications it makes possible. Moreover, of course, in the wake of ethics, religious problems do emerge. If they naturally cannot be ignored by Christian scientists, they require, probably more than others, an interdisciplinary approach involving, primarily but surely not exclusively, specialists in moral theology.

But ethical questions raised by technology are not restricted to genetics. For instance, these questions even began several years in advance in the field of armaments, where the names of Oppenheimer and Sakharov are paradigmatic for the dramatic problems of conscience that a researcher may meet. And besides nuclear bombs, we should also mention bacteriological and chemical arms. We do not see how a scientist could work in such domains without being deeply disturbed in conscience. Thus, the mission of a Christian scientist involves, in any case, the confrontation of ethics and research.

Once again we have had to mention the very title of our contribution. It is high time to arrive at a synthesis, and we introduce it now with the following comments.

The Missions of the Catholic Scientist

In the letter inviting me to speak here, the word "mission" is put in the singular. What already precedes and what further considerations will now confirm lead me to use now the plural, for the very reason that for a Catholic scientist we may distinguish at least three missions, or even better, three groups of missions: with regard to himself, his colleagues and the Church at large. Let us look at these groups of missions more systematically, in the light, in several cases, of our preceding attempt to picture some aspects of the present cultural context.

The Mission of the Catholic Scientist to Himself/Herself

With respect to himself, besides the mission common to all Christians of trying to live in accordance with the teaching of the Gospel (which is never an easy task), a Catholic scientist has a specific one requiring us to focus our attention on it. I would say that his first duty is to ensure a sufficient balance between the scientific and the spiritual aspects of his culture. I do not understand how a faith can survive if not nurtured, if it remains at the level of a child while one becomes a university graduate with a high scientific training. Some may answer that they remain Christians by fideism but, as we stressed before, such an attitude does not respect the integrity of man and is moreover quite

perilous in our intellectual surrounding. As regard fideism itself, we should not forget that it is condemned by the Holy Scripture if we recall the injunction of St. Peter in his first epistle: "be always ready to give account of your hope" (I Pt 3:15). We understand this as requiring a motivated faith and a level of religious formation harmonized with our cultural level in profane matters. If this is true for every Christian, it is particularly important for a scientist on account of the specific difficulties that a scientific training may raise for faith. And it is still more important for scientists who publish books on the relations between science and faith.

This remark brings us back to the book *The Wisdom of Science*, already mentioned. As I read it, it provides the most disappointing but typical example of the effects of the lack of a cultural balance we have just spoken of. After having shown exceptional qualities for rendering modern scientific issues largely understandable, the author aims, with the best intentions, to keep religion alive in our culture which is so deeply influenced by science. But the paradox, now, is that having so well stressed how science is presently baffling our common sense, he uses his own common sense to deny to God the right to intervene in history! He arrives at a contradiction in which, wanting to defend Christianity, he undermines its most essential grounds, the Incarnation and the Resurrection of Christ included, always with the view to render religion acceptable to modern minds. He seems unaware that he kills in order to save. And he seems unaware of a systematic contradiction, since he accepts and even welcomes the place of mystery in science and rejects it in religion.

This may be an extreme case but I can only explain it by a frightful lack of balance between the author's cultural levels in science and in religious matters.

The Mission of the Catholic Scientist to His/Her Colleagues

And here, we are already of course in the second group of missions we mentioned, missions with respect to colleagues in particular, but which can be widened to include all interested persons.

It is now to the point to recall aspects of such missions we have already met in our review above of the present cultural and scientific contexts.

A first mission is to assert that reason is not restricted to scientific

rationality, that we have to distinguish between the rational and the reasonable; that faith is not a mere unmotivated option but should for an cultivated adult person be the outcome of divine and human agents. Faith regards our whole personality; it normally requires a free quest for truth and the good, and grace illuminating our reason which then perceives the well-grounded meaning of spiritual signs. It is a point of great importance in a culture which has abandoned sound views about the exercise of reason.

A second mission consists in propagating an updated vision of science which should no longer be an obstacle to religion but on the contrary through its most outstanding discoveries discloses real mysteries unsuspected before, a cultural spiritual element. For science at present teaches us that reality exceeds the finitude of our minds and may then act as a sign able to open them to the very idea of transcendence.

However, such a mission requires us to remain cautious. The paradoxes of modern physics, for instance, lead some minds to irrationality or, at least, to ideas aberrant for any well-rooted Christian. Let us but mention the so-called "New Age Movement," powerful in some American universities but which is spreading elsewhere. It comprises a variety of trends, frequently pantheistic ones. The word "mystery" in particular, now often met in the scientific area, should be handled with care even when it is the correct one. A mystery, be it in science or in religion, should never lead us to abandon reason but, just the opposite, be seen as an incentive to pursue investigation, furthering our awareness of the transcendence. This is a lesson of great importance in our secularized world which has too frequently a quite false idea of scientific work.

We are here not far from the traditional theological view of the "two books," God speaking to us through the book of revelation and through the book of nature.

A third mission refers to the ethical problems raised by technological advances. Here, besides refusing to work and do research in fields that his conscience cannot accept, a Christian scientist has a mission to provide information to others about scientific and technological possibilities involving ethical problems, for the present or for the future of mankind.

The Mission of the Catholic Scientist to the Church

Now, with this term "information" we have, maybe, a key word for characterizing the mission of a Christian scientist with respect to the Church. In the world in which we live, the Church at large and its authorities in particular cannot ignore the scientific advances shaping our world view. The book of nature we just spoke of may sometimes influence our understanding of the book of revelation. The well-known and sad affair of Galileo might perhaps have been avoided if at the time Church authorities would have been more open to scientific discoveries; but this is of course a modern view, a rather anachronistic looking back to the 17th century. More recently, and after many difficulties, the theory of evolution and paleontological findings have deeply influenced our reading of the first chapters of Genesis, and scientists still have a duty of to share scientific information about the origin of man.

We have spoken at some length of a book written by a distinguished scientist whose theological understanding appears disastrous. May we now mention the opposite case of a distinguished theologian who rejects the modern cosmological vision because it does not allow room for angels, who, moreover, are deprived of freedom by the laws of physics! One may be tempted to smile but such ingenuousness constitutes also a real danger because it also supports the idea that science and religion remain incompatible. We come again to the necessity of balanced culture and mutual information.

Conclusion

All these questions are very important for the pastoral duties of the Church. In this respect, I cannot do better than to refer to the address of Pope John Paul II to the members of Pax Romana meeting in Rome in September 1987. I give an excerpt but in a free translation since the address was given in French: "One of the great preoccupations of the Church is a pastoral of the intelligence which takes into account the complex data of our present-day scientific culture, with all the new problems raised by the position that sciences have gained in the contemporary cultures."

Yes, our contemporary cultures, largely scientific, have to be harmonized with the Christian faith. And Professor Brown writes in one of his good pages: "The world that science explores has turned out to be infinitely more wonderful, complex and interesting than any writer, poet or artist could ever have imagined."

I fully subscribe to this picture of the world as disclosed by science, but I would end the sentence differently. There is no need to introduce a hierarchy between the scientist, the writer, the poet or the artist; they may all in their own way celebrate the wonders of creation. And secondly, I would add the saints to the list, thinking in particular of the well-known and marvellous hymn of St Francis of Assisi, thanking God for the sun, the moon, the water, the wind. It is like a symphony which results from the well-harmonized playing of various instruments. In this symphony, scientists have an ever richer contribution of their own. Science discloses the laws of various interactions or affinities. They are essential, for without affinities there would be no organized world. Now, affinity is a faint and far image of love and love is the core of Christianity. The major revelation of Christ is that God is love. And ultimately, love is the decisive and utmost reason for this creation explored by man through our scientific endeavor.

So, the scientist and the believer join their voices together to celebrate the glory of God. And such a celebration belongs also to the mission of a Catholic scientist, and is even its apex.

VII. RECOMMENDATIONS OF THE PARTICIPANTS

I. Introduction

We, a group of Catholic scientists and engineers from Asia, are grateful to the Vatican Secretariat for Non-Believers and the Federation of Asian Bishops' Conferences for sponsoring this seminar. Through the presentations of experts, reports from our respective countries, and especially from our general discussions, we have attempted to attain the goals set before us: "the study of the challenges (dangers and opportunities) arising for faith both from the impact of science and technology and from the mentalities generated by them, and the discernment of the possibilities of a dialogue between the Catholic Church in Asia and science and technology."

II. Our Asian Situation

Science and technology exert and will continue to exert a great impact on the peoples of Asia and our cultures. The particular religious and cultural traditions of our own countries shape our understanding of ourselves as scientists and believers, and determine the way we will integrate faith and science in our lives as well as our specific mission as Catholic scientists in our own cultural traditions.

Our Catholic faith recognizes the legitimate autonomy of the sciences. Our Catholic faith also excludes any understanding that science is the only source of knowledge and truth. In fact, a popular conception of an opposition between religious faith and science does not seem to affect seriously the religious lives of most people in Asia. In some of our Asian countries the Christian religious tradition is also seen as particularly supportive of scientific and technological development. However, while some scientists have experienced in their scientific endeavor an enrichment of their life of faith, others, we know, have experienced problems of bringing together their faith and science to the abandonment of personal religious faith or to a compartmentalization of religion and science in their lives, in effect treating each as if one had no relationship with the other.

As Catholics and as scientists we are aware of the uses of science and technology in aid of human development and their potential to help in liberating the people of Asia from poverty and ignorance. We are also aware of the abuses of science and technology — the threat to human life and dignity, environmental pollution, the development of armaments, excessive consumerism, and more fundamentally, the domination of technology by a mentality that makes technical efficiency and economic profit the sole criteria for decision making.

III. Our Mission

We have seen developing in our Church a theology of science and of the role of the scientist. We understand better our tasks as scientists to be a sharing in the very mission of Christ and to insure the presence of the Church in the world of science.

IV. Recommendations

1. To ourselves and our colleagues as Catholic scientists

— To avoid the compartmentalization of science and religion in our lives, we must continue to reflect on questions related to faith and science in discussion groups at the local and national level. We then witness to our colleagues in the scientific community and to others the compatibility of faith and science.

— In dialogue with scientists of other religious traditions, we together with them must attempt to continually deepen our religious faith and to collaborate with each other in the service of humanity.

— We must develop an ethical sensitivity, especially in those areas

related to our professional competence. We should make efforts to go beyond our scientific circles and seek to influence the decision-making process in our own societies and countries. On the local and national levels, Catholic scientists and engineers should work to insure that the benefits of technology accrue to the underprivileged. On the international level, through exchanges with colleagues, we must help the developed countries realize their moral obligations to the less developed ones.

— We must help the Church, especially its leaders and theologians, to be aware of developments in science and technology that will have a significant impact on our Christian self-understanding and purify and enrich our Christian life.

— We will share our vision as committed believers and scientists with students and other young people to help them obtain a well-rounded, integral education that understands that science is but one way of coming to truth and that recognizes the place of science in a balanced culture and its ethical implications. This task is especially incumbent on those of us who teach in Catholic or other institutions. Courses in the history and philosophy of science would be particularly useful for this purpose.

— In view of the benefits we have derived from this seminar, we have established a “core group” with representatives from different regions of Asia to develop communication and collaboration between Asian Catholic scientists and to organize similar conferences periodically to enable them to share their experiences. Such a group could also sponsor other international conferences in collaboration with like-minded organizations on subjects related to our concerns.

2. To the Church Leadership

The Church must recognize the special pastoral needs of Catholic scientists and engineers. She should engage in theological reflection on the issues raised by developments in science and technology, seeking to enrich her own teaching. Opportunities should be provided for scientists and engineers to develop their own Christian self-understanding and spirituality. A dialogue between Asian theologians and scientists could be very fruitful.

— To fulfill this objective, the Church must provide means in seminaries and house of formation for religious, for priests, brothers and sisters to acquire an understanding of science and technology and a positive appreciation of it. Those with particular scientific talent should

be encouraged to further specialize in this area.

— We suggest that the teaching of religion at all levels be done so as enable the students to face the challenges which science and technology could pose to their faith and spiritual lives. In many areas Catholic institutions of higher education have been witnesses of the support of science and technology by the Church. It is important that the students in these institutions be given an appreciation of science in its widest perspective, its interaction with other disciplines and its integration with their life of faith.

— We recommend that in bishops' conferences and in dioceses, especially those in which there are major centers of science and technology, the scope of existing commissions be expanded or new bodies established to facilitate communication between Church leaders and the scientific community.

V. Conclusion

We are hopeful that in a modest way we have worked toward fulfilling the hopes of the Holy Father expressed in his message to the seminar participants — “that the conference will provide guidance and encouragement to all who work for a progress and development that will genuinely serve the well-being of the people of Asia in full respect for their human dignity and spiritual vocation.”

VIII. LIST OF PARTICIPANTS

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 - l. The Laity in the World of Business
47. The Vocation and Mission of the Laity in the Church and in the World of Asia. A Report of the Fourth Plenary Assembly of the Federation of Asian Bishops' Conference, 1987.
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49. Living and Working Together with Sisters and Brothers of Other Faiths. An Ecumenical Consultation, 1987.
50. The Urgency of Mission. The All-Asian Conference on Evangelization, 1988.

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