Institute For Theological Encounter With Science and Technology
Volume 38 - # 1 Winter 2007 Bulletin

Opening Message

Ordinary Time! As I sit at my desk in the ITEST offices surrounded by the "ordinary' and the "not-so-ordinary," I wonder what was in the minds of liturgists who decided to call that gap between the Epiphany and Ash Wednesday, *Ordinary Time*. For the staff at ITEST this time has been quite out of the ordinary. These six interim weeks witnessed our move from Jesuit Hall, the home of ITEST for almost four decades, and relocation to the Cardinal Rigali Center, ten miles west of the city of St Louis City, where we have been welcomed warmly. Perhaps the liturgists sense that we all need this time to catch our breath, spiritually and physically before the season of Lent which occurs this year during the third week in February. While catching our breath, however, we have not been idle; the faith/science ministry and mission is alive and well. Among our many projects is this issue of the bulletin containing articles that treat technology from different viewpoints: Paul Grabow "…possesses an alternate view of technology based on the concept of transcendence…"; while Father Angelo Serra deals directly with the life sciences as they relate to reproductive technology. We ask, "What is the controlling element in any technology? And further, "What responsibility do we have as `consumers' of these technologies: morally, socially and religiously?" No ordinary task!

But getting back to the Ordinary Season – can the common or ordinary things and events in our lives numb us to the underlying reality? For instance, under the appearance of common or ordinary bread and wine dwells the mystery of the Eucharist, the body and blood of Christ. C.S. Lewis states it well in *A Grief Observed*, "Tomorrow morning a priest will give me a little round, thin, cold, tasteless wafer. Is it a disadvantage – Is it not in some way an advantage – that it can't pretend the least *resemblance* to that with which it unites me?"

And so, a blessed Ordinary Time (with Lent soon to follow). May it reveal to you all the glories and treasures it holds within.

M. Postiglione, RSM

Marianne Postiglione, RSM
Acting Director: ITEST

Photo by Bob Greenley

In This Issue…

Announcements

1. Please mark your calendars and reserve the dates for our September 21-23, 2007 conference, Father Bob Brungs, SJ, suggested this topic at an ITEST Board meeting in 2005, echoing the thought of a well-known deceased Jesuit, Walter J. Ong, who claimed that "…the central intellectual (and emotional) problem in the Church's realization of her mission in the world today is that we have no cosmology." (personal note to Fr. Brungs, 1984.) Is that statement still true 23 years later? We have already engaged three of the essayists, Brother Guy Consolmagno, SJ, astronomer and curator of meteorites at the Vatican Observatory Research Group in Arizona, Neyle Solle, MD, lecturer on general astronomy and founder of the Sangre Observatory in Arizona and Stephen M. Barr, a theoretical particle physicist at the Bartol Research Institute of the University of Delaware. To view interesting background on the speakers, click on "www.sangreobservatory.com" for Neyle Sollee, "http://clavius.as.arizona.edu" for Brother Consolmagno and "www.bartol.udel.edu/facstaff/briefbios1.html#barr for Stephen Barr.

We can guarantee that, after reading these accounts, you will be enticed to register for this weekend. If you simply enjoy reading popular literature about astronomy or if you have delved into the more academic aspects of the science, this conference will provide enjoyable and instructive interaction with speakers and participants alike. A necessary aspect of this topic not to be ignored is theology. We need a theologian and a cosmologist – or a theologian who could address the cosmological issues. If you have any suggestions, please contact us at the ITEST offices. Although we will be spending much of the weekend gazing into the wonder of space and all it contains, we will have our feet planted firmly on the ground discussing what the advances and discoveries in the science of astronomy mean to the Christian particularly for what it means to be human in the 21st century. Since we have limited capacity at the venue for the weekend: Our Lady of the Snows Conference Center, Belleville, Illinois, we urge you to register as soon as possible. The invitations and registration materials will be sent to all ITEST members in the Spring. However, if you wish to register early, simply send an e-mail to S. Marianne Postiglione, RSM at mariannepost@archstl.org and your registration will be secure. We have 35 rooms at the hotel. Those who register early will qualify for a single room. More detailed information will follow. The fee for the weekend, exclusive of meals, except breakfast, is **$225.00 for members**; $250.00 for non-members and $140.00 for students. Scholarships will be available for students who qualify.

2. Second renewal notices have been sent to those who have not renewed for calendar year 2007. We accept payment either by check or MasterCard and Visa. We do not accept Discover or American Express. All members will receive a copy of the program created for the November 18th memorial dinner in honor of Fr. Brungs, SJ. Listed are the names of the donors to the Robert A. Brungs, SJ Memorial Foundation established to further the ministry of ITEST and to develop the thought of Fr. Brungs. Two projects are in progress: a book of Fr. Brungs' edited letters, lectures, reflections on faith and science and a surprisingly up-to-date 35 minute DVD of an interview conducted with Fr. Brungs on faith/science issues in 1990. If you have suggestions for other projects we could support in this area of faith/science, please let us know. If you would like to contribute to the Fund, you may send donations to the ITEST offices c/o S. Marianne Postiglione, RSM. Please make the check payable to "The Robert A. Brungs, SJ, Memorial Foundation."

3. The Board of Directors has established a search for a full-time director for ITEST. Ideally we prefer a man or woman, lay or religious, with credentials in the life sciences. However, that is not set in concrete. We welcome your suggestions. Information upon request.

In Memoriam

Dr. John F. Hall, Justice Charles B. Blackmar
Father Eugenio Matis, SJ
We also ask your prayers for ITEST members who are ill. May they feel the restoring hand of the Lord.

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ITEST Bulletin - S. Marianne Postiglione, RSM, Editor
ISSN 1073-5976 • Copyright © 2007

An Alternative to an Instrumentalist View of Technology

Paul C. Grabow, PhD

Abstract

Students in technology disciplines often naturally adopt an instrumentalist view of technology. However, Instrumentalism can easily inflate the importance of the one "controlling" the technology, it fails to acknowledge the momentum of technology, and it does not facilitate a moral understanding or evaluation of technology. Substantivism, Determinism, and Critical Theory are alternate viewpoints, but they too have major drawbacks. This paper proposes an alternative view of technology based on the concept of transcendence, which facilitates a threefold moral evaluation technology based on means, motive, and ends.

Introduction

The word technology can be traced to the ancient Greek concept of technê. Technê was something that was created (i.e., an artifact) and that did not occur naturally. The technê was also associated with the knowledge or discipline used to create the artifact and technology as technê implied that the artifact had a purpose and a meaning that originated "beyond" the person who produced it.[1] Contrast this with the concept of Instrumentalism.

Instrumentalism represents the standard, modern view, "according to which technology is simply a tool or instrument of the human species through which we satisfy our needs." Here technology is neutral and humanly controllable. "This view corresponds to the liberal faith in progress which was such a prominent feature of mainstream Western thought until fairly recently."[2] This viewpoint "… does not realize objective essences inscribed in the nature of the universe, as does technê. It now appears as purely instrumental, as value free. It does not respond to inherent purposes, but is merely a means serving subjective goals we choose as we wish. For modern common sense, means and ends are independent of each other."[3]

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Paul received a BA from Luther College, Decorah, Iowa in mathematics and physics and an MS and PhD from Northwestern University in computer science. Prior to graduate school he taught high school math and science, first at the American School in Ft. Dauphin, Madagascar and then at St. Augustine's College, Nassau, The Bahamas. Since 1990 he has been on the computer science faculty at Baylor University in Waco, Texas where he teaches software engineering, "Computers in Society" and the "Cultural Impact of the Computer."

Students in technology disciplines (e.g., engineering, computer science) often naturally adopt an instrumentalist mindset, i.e., technology is neutral (not value-laden) and humanly controllable (not autonomous). To them this seems natural because technology is something that you manipulate; the opportunity to manipulate technology probably attracted them to the discipline; and their success in that manipulation will often result in personal and professional satisfaction. Also, since their academic experiences are usually limited to controlled settings, an instrumentalist view is not surprising. Consequently, to suggest to them that they do not (or cannot) control technology would be seen as an affront.[4] However, for more complex problems – with even more complex "solutions" – the instrumentalist mindset proves inadequate, especially for the Christian.

An instrumentalist view can easily inflate the importance of the one "controlling" the technology – to the point where the "creator god manipulates his/her creation" – and can result in a "faith" in the technology as an extension of its creator/manipulator, a form of idolatry. Also, the technologist can ignore the momentum of technology and its own (possibly hidden) set of values. If the momentum goes unrecognized and its values are undetected, then the technologist will likely not only fail to control the technology but will be manipulated by it.

Furthermore, the instrumentalist view is not connected to concepts that would facilitate a moral understanding or evaluation of technology per se. Ends and means are completely separate for the instrumentalist. Consequently, the goodness of the ends is effectively not connected with the goodness of the

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means. And since a moral evaluation would typically involve an evaluation of the ends, there seems little moral connection to the technology per se. This is not to say that there cannot be a moral evaluation of a situation that involves technology. But any moral evaluation would only look at the use of the technology, i.e., the ends and the motives (of the one controlling the technology), because technology is considered "merely a tool" with no inherent qualities of goodness or badness.

A Classification

The above definition of Instrumentalism comes from Andrew Feenberg's classification which is based on whether technology is autonomous (i.e., not humanly controlled) and/or value-laden (i.e., not neutral),[5] as shown in Table 1 *(above)*. Although the classification is a simplification, it does provide a context for considering different common viewpoints.[6]

Table 1. Feenberg's Classification Scheme

Technology	Autonomous	Humanly Controlled
Neutral (complete separation of means and ends)	**Determinism** (e.g., modernization theory)	**Instrumentalism** (liberal faith in Progress)
Value-laden (means form a way of life that includes ends)	**Substantivism** (means and ends linked in systems)	**Critical Theory** (choice of alternatives means-ends systems)

Determinism. This view regards technology as neutral, similar to Instrumentalism, but it is not seen as humanly controllable. It involves two aspects: technical "advances are on a fixed track from one stage to the next"; and social institutions have to adapt to technology.[7] Here technical development is seen as a "predetermined passage from traditional to modern society as followed, for example, by the United States."[8] This position has been widely held in the social sciences since Marx, i.e., that the driving force of history is technological. "Determinists believe that technology… shapes society to the requirements of efficiency and progress."[9]

Determinism is similar to Instrumentalism when it comes to a moral understanding or evaluation of technology. The difference between the two concerns "the one responsible." With Instrumentalism the one responsible is the one controlling the technology. But since Determinism does not believe that technology is controllable, it appears that a moral evaluation is limited to the ends only. If technology is not controllable, then it seems silly to evaluate the motives of someone who is not in control. So, we are left to evaluate the goodness (or badness) of technology's effects, with no connection to any moral agent.

Substantivism. For the substantivist, technology is autonomous and not neutral. Here technology is seen as predominantly negative, where means and ends cannot be separated. Consequently, choosing a particular technology involves accepting (intentionally or not) the values inherent in that technology. Jacques Ellul[10] and Martin Heidegger[11] represent this viewpoint.

> "Heidegger argued that modernity is characterized by the triumph of technology over every other value. He noted that Greek philosophy had already based its understanding of *being* on technical making and argued that this starting point culminates in modern technology. Where the Greeks took technê as the model of *being* in theory, we have transformed *being* technically in practice. Our metaphysics is not in our heads but consists in the real technical conquest of the earth. This conquest transforms everything into raw materials for technical processes, including human beings themselves."[12]

Feenberg clarifies the concept by asking whether technology is "more like religion or more like money." Money "can be used to buy an infinite variety of different things and integrated to different and contradictory ways of life without prejudice. In principle, it seems as though money carries no particular substantive value in itself but can serve any value system…" On the other hand, "religions are based on substantive value choices, choices that reflect a preferred way of life and exclude other disapproved alternatives. Money is a purely formal basis of social action."[13] Consequently, from the Substantivism viewpoint technology is more like religion than money.

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A moral evaluation here is colored by the belief that a technology choice is a value-laden decision. When you choose a technology (the means) you choose a result (the ends). Consequently, the choice itself has moral implications. And, as a result, goodness (or badness) can be associated with a technology based on that connection. However, any moral evaluation is colored by the belief that technology has become autonomous – that it has effectively taken over and we are along for the ride. It is not simply that we cannot control technology, but we have woven technology into the fabric of life to the extent that we are compelled to use it. Consequently, the technology choice is not really a free choice.

Critical Theory. The fourth category represents Feenberg's theory of technology, i.e., Critical Theory[14] where he argues that "technology is not a thing in the ordinary sense of the term, but an 'ambivalent' process of development suspended between different possibilities." As the table indicates, he believes that technology is value-laden (causing technology to become a way of life), yet capable of human control (through the political process). He also believes that technology is "not the product of a unique technical rationality but of a combination of technical social factors." In other words, he treats technology as "frameworks for ways of life."[15] Consequently, it is no surprise that he regards technology-related problems as socio-political problems and he suggests that liberal democracy should (and can) be used to curb the undesirable aspects of technology.

A moral evaluation here is similar to aspects of Substantivism and Instrumentalism. Any technology choice represents a value choice. But unlike Substantivism, the choice is supposedly a free choice (because it is assumed that technology is not autonomous). So, a free moral choice appears to be possible. However, the concept of value-laden technology that is controllable primarily through the political process seems to be a hard sell. Consequently, we will set Critical Theory aside for the remainder of the paper.

An Alternative View

As an alternative to the categories of Feenberg – and, in particular, as an alternative to Instrumentalism – we propose the following definition of technology:

> Technology is anything with a physical manifestation that allows someone or something to transcend their limitations to reach a particular goal.

This includes what has historically been called technology (e.g., tools, machines, or artificial structures) but it also involves methods of organization and algorithms. It is similar in scope to Ellul's definition of technique ("the totality of methods rationally arrived at and having absolute efficiency")[16], but the basis here is not efficiency and the focus on transcendence provides more context (i.e., goals, limitations, and implied actions).

It is possible under this definition for something (rather than someone) to transcend a limitation. For example, an existing computer system may "choose" another technology in order to complete a task. Therefore, it is not necessarily human limitations that are at issue, but limitations in general. Also, the definition includes things not necessarily created. What matters is the use to which they are placed. For example, a rock may be used to transcend human limitations to crush grain husks.[17] However, the rock is not something created by the user, but simply employed in a manner that transforms it into a technology.

Transcendence. Transcendence obviously has more than one usage and we do not attempt to sort them out here. Suffice it to say, the word "transcend" originates from the Latin *transcendere*, where *trans* refers to "across" and *scandere* to "climb." Consequently, there is the notion of going beyond existing limits, which could involve the enhancement or extension of given capabilities, or the creation of entirely new capabilities.

Limits. Limits can be associated with our physical attributes (such as strength or height) or our five senses. For example, the limits of our strength can be transcended with a simple lever; limitations of poor eyesight transcended via glasses; limitations of memory transcended using a note pad; and limitations of space transcended using the telephone. But limits can also be related to things, e.g., other technologies that need enhancement to transcend recognized limits.

Means. The means associated with a technology include resources plus a "manner of application," i.e., a praxis. Examples of resources are: physical objects, information, social conventions, or human capabilities. The manner of application identifies how the resources should be used to transcend the limits (to achieve a goal).

Ends. In addition to the sense of "going beyond", transcendence implies a direction or purpose, i.e., the ends. If simple overcoming is undirected it may lead nowhere in particular; or if misdirected it would likely cause an undesirable result. Consequently, we assume that transcendence has an identifiable goal, i.e., something to strive toward, and we also assume that "identifiable" means that the goal can (and has been) adequately specified. This "specification" serves as the target for the transcendence, guiding the effort to reach the goal.

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Some Examples. Consider the following examples that fit our definition:

- **Ordinary hammer:** transcends a human's inherent limitations associated with driving nails
- **Cochlear implant**: transcends a severe hearing limitation so that the person can hear
- **Spreadsheet software**: transcends the ordinary capabilities of a computer so that a user can define relationships among data items; also transcends the limits of the user that are associated with remembering and manipulating data
- **Prozac**: transcends the limitations of human depression so that the affected person can lead a more normal life
- **Written language**: transcends the temporal limitations of speech so that the words existent long after they were spoken (Note: languages do not necessarily have a written equivalent)
- **Train schedule**: transcends the normal disorganization of society so that trains, people, and train stations can cooperate to move people about

Now consider some examples that do not qualify as technology under our definition:

- **Human language (verbal)**: does not transcend a limitation; the human capability for verbal language is inherent[18]
- **Chunk of pure iron**: although it could be useful as a tool, since there is no specification/goal it would not qualify as technology
- **Human DNA**: does not transcend a human; it defines a human
- **Stonehenge**: even though it may have enhanced human understanding at one time, its actual purpose remains a mystery

Analysis. An analysis of a technology would first answer questions related to limits, means, and ends, i.e., the preparatory analysis. The answers to these questions would then serve as the starting point for a moral evaluation of the technology. For example,

1. What limits does the technology transcend?
2. What characterizes these limits?
3. What is the motivation for transcending the limits?
4. What reasons are there to not transcend the limits?
5. What is the desired end result of transcending the limits?
6. How does the technology allow the limits to be transcended?
7. What is necessary for the limits to be transcended?
8. What are some possible side effects when the limits are transcended?
9. How long are the limits transcended?
10. Who can (or should) act to transcend the limits?

Moral Evaluation. The moral evaluation of technology then flows from the information collected during the preparatory analysis. Compared to the previously identified viewpoints, the means and ends are not constrained by their connectedness, or lack thereof. And focusing on transcendence fosters a connection between the "why" (the motive) and the "what" (the means and the ends). Consequently, a subsequent threefold moral evaluation seems quite natural, whereby the ends, the means, and the motive associated with the technology can be evaluated.

Threefold Moral Evaluation

A threefold moral evaluation has been characterized by David C. Jones[19] as follows:

1. "The end [that] the agent seeks to realize must be good, intrinsically worthy of human pursuit
2. The motive of the agent must also be good, so that the end is sought because it is worthwhile, the mark of a good character
3. The means to the end must be good, conforming to the standard of what is right, since neither a good end nor a good motive is compatible with a bad means"

According to Jones, "ends are judged good or evil by criteria of intrinsic value; agents are judged good or bad by criteria of moral virtue; actions (including mental acts or attitudes) are judged right or wrong by criteria of moral obligation."[20] Consequently, the most pressing question of ethics is "What are those criteria?"

> "The answer is necessarily dependent upon some broader philosophical perspective, some view of human beings and their place in the universe." … "From a biblical point of view, the question of criteria for goals, person, and practices comes down to this: 'What is God calling us to be and to do?' Since God's salvific call is not a bare invitation but a manifestation of his sovereignty and power, the question is more

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> fully: 'What is God summoning and enabling us, his redeemed people, to be and to do?'"[21]

Consequently, for the Christian a moral response is a response to God, not simply to societal standards or demands. "The biblical view of values is that they are objective and normative. It says, 'These things are valuable and therefore ought to be desired and sought.' This stands in opposition to the subjective or descriptive view, which says, 'These things are desired and sought; therefore they are valuable, at least to those who seek them.'"[22]

Furthermore, the Christian realizes that human nature is fallen and consequently even our best intentions are tainted. So, only God's enabling allows us to do the good that He desires in our fallen condition.

An Example

Chorionic villus sampling (CVS) is a prenatal test that is "better than 99% accurate at detecting hundreds of genetic disorders and chromosomal abnormalities, such as Down syndrome[23]. The test analyzes cells taken from tiny fingerlike projections on the placenta called the chorionic villi, usually between 11 and 12 weeks into the pregnancy (compared to 15 to 20 weeks for amniocentesis). The test is not performed routinely because it carries a small risk of miscarriage. Consequently, only women in particular risk categories, e.g., 35 years or older, would opt to have the test.

The following suggests how the various views would morally consider this technology.

Instrumentalism. An instrumentalist would not make a connection between the test (the means) and what occurs after having the test (the ends). They could make a moral judgment concerning the ends, e.g., whether the test results would sway them to abort the baby. However, that moral judgment would not be connected to the test itself.

Determinism. The determinist would regard the technology as neutral, similar to Instrumentalism, but its use within society would probably be viewed as "inevitable" and beyond human control. An individual may choose to avoid the test, but the "steady march of technology" would assure its continued use within society.

Substantivism. The substantivist would make a direct connection between the test (the means) and anything that results from having the test (the ends). The technology would not be considered value-neutral and the momentum of technology overall would assure its continued use. "Choosing" to have the test would be a value-based decision because the technology is value-laden. But the choice would really not be considered free.

Technology as Transcendence. First, consider the answers to the analysis questions.

1. What limits does the technology transcend?
   Limits of knowledge, i.e., our inability to determine the genetic characteristics of a child prior to birth.
2. What characterizes the limits?
   The lack of foreknowledge.
3. What is the motivation for transcending the limits?
   A desire to know what will happen and/or to decide whether to abort the unborn child..
4. What reasons are there to not transcend the limits?
   Perhaps we should not know, i.e., by using the technology we are playing God.
5. What is the desired end result of transcending the limits?
   At minimum, simply knowing the results of the test. But realistically it would probably be more than that, i.e., to decide whether or not to abort the baby.
6. How does the technology allow the limits to be transcended?
   Via advanced medical devices that allows the doctor to retrieve cells from the woman's placenta and then to evaluate the cells.
7. What is necessary for the limits to be transcended?
   Special equipment, trained personnel, and a willing patient.
8. What are some possible side effects when the limits are transcended?
   Possible miscarriage, possible abortion (as a secondary effect), and the possible alteration of what it means to be human (in terms of our ability to know and our attitude toward life itself).
9. How long are the limits transcended?
   Just long enough to gain access to the information.
10. Who can (or should) act to transcend the limits?
    This is undoubtedly the most profound question. If abortion is wrong, then you can easily argue that the answer should be "no one".

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The moral conclusions, based on this information, could be described as follows:

There does not seem to be a problem with the means, per se, and one could argue that the immediate ends, i.e., the results of the test, are not morally wrong; however, the motive and the secondary effects (i.e., a possible abortion and an alteration of what it means to be human) would be morally questionable.

Comments

It seems clear that the four views of technology identified by Feenberg's classification provide very little if any guidance for a moral evaluation of technology. Although we began by focusing on Instrumentalism, the other three views do not seem any better in this regard. Much of this seems due to the nature of the classification. Whether a technology is value-laden or controllable does not really speak to underlying moral issues. These parameters rely primarily on observable characteristics, ignoring motives and discounting the existence of any objective and normative moral standards.

A definition of technology based on transcendence, on the other hand, provides a framework that is compatible with what could be called "moral context". In other words, the concept of transcendence focuses attention on limits, means, and ends, which is compatible with a threefold moral evaluation that would employ objective and normative moral standards.

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2. Ibid.
3. Ibid.
4. Carl Mitcham refers to such a limited view of technology as technology in the "narrow sense", as opposed to the broad sense, as used by social scientists[4].
5. Ibid.
6. Feenberg's purpose is to more clearly define his position, i.e., Critical Theory.
7. "The Politics of Cyberculture: Critical Theory of Technology," [cited 2005]. Available from http://kerlins.net/bobbi/technology/cyberculture/feenberg.html.
8. Ibid.
9. Feenberg, "What is Philosophy of Technology?"
10. Jacques Ellul, *The Technological Society,* (New York: Vintage Books, 1967), 449, xiv.
11. Hubert Dreyfus, "Heidegger on Gaining a Free Relation to Technology," in *Readings in the Philosophy of Technology* (Oxford: Rowman & Littlefield, 2004), 53-62.
12. Feenberg, "What is Philosophy of Technology?"
13. Ibid.
14. Ibid.
15. Ibid.
16. Ellul, "The Technological Society," xxv.
17. Don Ihde would call this a "found technology". See: Don Ihde, *Philosophy of Technology : An Introduction,* (New York: Paragon House, 1993)
18. John Maynard Smith wrote the 1st edition of his classic, *The Theory of Evolution* in 1958 and the 3rd edition came out in 1975. In 1993 Cambridge University Press published the 3rd edition in its Canto series; the text was unchanged but the preface contains the following comments from the author: "I have been persuaded by my colleagues in linguistics that there really is something peculiar about the human capacity to talk, and that there is a deep difference between the proto-language spoken by the chimpanzee Washoe, and by very young children, and the language of adult humans. The difference lies in grammar." John Maynard Smith, *The Theory of Evolution,* 3d ed. (Cambridge: Cambridge University Press, 1993), 354.
19. David Clyde Jones, *Biblical Christian Ethics,* (Grand Rapids, Mich.: Baker Books, 1994)
20. Ibid.
21. Ibid.
22. Ibid.
23. "Chorionic Villus Sampling (CVS)," in BabyCenter [database online]. May 2006 [cited 2006]. Available from http://www.babycenter.com/refcap/pregnancy/prenatalhealth/328.html.

The Eugenic Prospects Of Technically Assisted Reproduction

The Pre-implantation Genetic Diagnosis

Angelo Serra, SJ, PhD

(Editor's Notes: This article first appeared in the Proceedings of the Tenth Assembly of the Pontifical Academy for Life, edited by Libreria Editrice Vaticana, 2005, and is reprinted with permission. We have retained the European spelling of certain words to preserve the original intent of the author.)

A Premise

The prospect of <<eugenic selection>> has emerged with full force with the growth in the advances in the field of genetics. The operational plan was launched at the Third International Conference on Human Genetics by the Nobel Prize winner Herman Muller[1] when he invited the two thousand or so participants "to engage in a strong offensive for the control of human evolution." And he gave the reasons for this: "Modern culture by maximal saving of lives and fertility, unaccompanied by a conscious planning which takes the genetic effects of this policy in account, must protect mutations detrimental to bodily vigour, intelligence or social predisposition. [...] If genetic defects and shortcomings were to be allowed to accumulate to an unlimited extent among us, as seems to be happening now, the condition would eventually be reached in which each person likewise would present an immense, yet in his case distinctive, complex of problems of diagnosis and treatment." He himself outlined the lines of this offensive. The first - *germinal* selection - was to lead to the "production" of a human subject of the "desired quality;" the second - *genotypic* selection - was to involve, after an early diagnosis during pregnancy, the elimination, through "abortion" either on demand or imposition of a subject who ran the risk of manifesting a serious illness; the third - *gene* selection – was to lead to the *improvement* of the human species, as soon as the advances in knowledge about the *human genome* had opened up the pathway to its realisation.

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In the early 1960's Fr. Serra worked as guest researcher at the Medical Research Council Population Genetics Unit at Oxford; then from 1964 to to 1965 he served as a Visiting Professor of Human Genetics at Harvard University. Father Serra holds membership in the New York Academy of Sciences, the American Society of Human Genetics and the American Society for the Advancement of Science, among others.

The first objective, the "production of a human subject," has been in part achieved with the creation of human embryos *in vitro*[2]. However, serious technical problems, which still today persist after twenty-five years since the birth of the first baby conceived in *vitro,* do not allow us to foresee an easy achievement of a given 'desired quality,' or even if this would be possible.

The second objective, the "genotypical selection," proceeds with dizzy exponential speed. Due to major scientific advances in the field of cytogenetics and genomics, there has been indeed a major spread of the 'prenatal diagnosis' (PND) of syndromes caused by alterations in the genetic information which are observable at the chromosomal level (chromosomal syndromes) or analysable at a molecular level (monogenic or polyfactorial genetic diseases). Unfortunately, however, given that in the majority of these illnesses the impossibility or difficulty of prevention or cure remain, a strong social pressure has developed - which has by now become a cultural fact - not to accept the responsibility of keeping alive a subject with a *quality of life* that is held to be not worthy of the human person. Hence the orientation towards *selective abortion*, which has by now become a legally recognised and often recommended practice, and which can be extended in some countries to the third month of pregnancy as well, and even to birth.

In 1990, the year in which A. H. Handyside[3] and his collaborators published their work on the first birth of twins whose sex had been identified through cells taken from the embryos before implantation, the new technique of *genetic selection*, known as preimplantation genetic diagnosis (PGD), was introduced. This is a technique that has by now become established not only as a precautionary measure in the medical practice of fertilisation *in vitro* but also, as an effective negative eugenic measure to be applied in all families where there is a risk present of having children afflicted by serious illnesses because of chromosomal or gene alterations present in the parents. From January 1999 to the end of August 2003, Medline assessed five hundred and seventy-eight scientific works in this area directed both to the improvement of this technique in itself and to the evaluation of the technique as a safe guarantee for a "healthy child" through the technique of *in vitro* fertilisation.

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A stimulating but reductive vision of the present-day situation as regards this new technology and its future was presented in December 2002 by A. Kuliev eY. Verlinski[4] who had been working in this field for years at the Reproductive Genetics Institute of Chicago. They wrote as follows: "More than 4000 preimplantation genetic diagnosis (PGD) cycles have been performed, suggesting that PGD may no longer be considered a research activity. The important present feature of PGD is its expansion to a variety of conditions, which have never been considered as an indication for prenatal diagnosis. [...] PGD has also become a useful tool for the improvement of the effectiveness of IVF, through avoiding the transfer of chromosomally abnormal embryos, representing more than half of the embryos routinely transferred in IVF patients of advanced maternal age and other poor prognosis patients. PGD is of particular hope for the carriers of balanced chromosomal translocations, as it allows accurate pre-selection of a few balanced or normal embryos [...] PGD may soon be performed for both chromosomal and single gene disorders using the same biopsied polar body or blastomere. The available clinical outcome data of more than 3000 PGD embryo transfers further suggest an acceptable pregnancy rate and safety of the procedure, as demonstrated by the follow-up information available for more than 500 children born from these PGD transfers."

In the face of this optimism, an examination of the features and results of this new technology can allow its assessment and evaluation in terms of what it really involves.

Pre-implantation Genetic Diagnosis (PGD)

PGD involves the genetic analysis of one or two cells taken from the embryo in order to detect the existence or otherwise of chromosomal aberration and gene mutations that, obviously enough, would impede normal development.

The general protocol can be summarised through an identification of the following stages:

1. *ovarian stimulation* followed by aspiration of oocytes; their *in vitro fertilization* through either the ordinary process or the intra cellular spermatozoon injection (ICSI); *culture* setting;

2. 72 hours after fertilisation - "the best moment in humans"[5] - *embryo biopsy* for the removal of one or two blastomeres (out of 7-8) at cleavage-stage, either by direct puncture or partial mechanical dissection of the zona pellucida, or through acidic tyrode chemical zona drilling, or laser-assisted zona opening;

3. *karyotyping* or suspected *gene* search; 4) *in utero transfer* of 'healthy' embryos. Two observations require especial emphasis.

The first observation concerns the *number of cells taken from the embryo* in order to obtain a reliable diagnosis of its normality and thus of its capacity for *in utero* transfer. A careful study[6] of 188 *cycles,* in which only embryos from which respectively one or two or three blastomeres had been taken, and which on the basis of the examination should have been thought to be 'normal,' led the authors to advise an analysis of *two cells* of embryos of seven or more cells so as to make the diagnosis more accurate and reliable. This indication was confirmed by the development of a mathematical model created to find new strategies by which to increase the accuracy of this technique.[7] From these data it also emerges that notwithstanding the manipulation that the embryos undergo during the process of PGD, the levels of pregnancy achieved appear to be comparable with those obtained in ordinary *in vitro* fertilisation (IVF). The results presented in the work indicate, in fact, a rate of pregnancies begun for each cycle of 29.1% (55); an implantation rate of 18.6% (35); and a birth rate of 14.2% (27). However, A. De Vos and A. Van Steirteghem in concluding their work emphasise with absolute clarity: More data are needed in order to reassure that none of the biopsy procedures applied clinically interferes with implantation rates on ongoing pregnancy rates, allowing the birth of healthy children.[8]

The second observation relates to the *methods of diagnosis.* There are essentially two goals to be achieved. The first is to define the presence in the cells that have been removed of *chromosomal aberrations* - aneuploidies, deletions, inversions and translocations - through the application of the FISH[9] (Fluorescence In Situ Hybridisation) technique, which, with all the advances that have now been made, allows a definition in an individual cell of the numerical and structural anomalies of the chromosomes. The second is to define the presence of *gene mutations* through the process called PCR (Polimerase Chain Reaction),[10] which allows, starting with the DNA of an individual cell, an efficient and rapid amplification of the fragment affected in a given illness and an accurate definition of its alteration. Obviously enough, errors are not absent due to a notable extent to allele-specific amplification failure or *allele dropout* (ADO)[11]. It has been estimated that for recessive illnesses two genotyping are required, that is to say genotypes derived from two blastomeres, in order to ensure a minimum risk (< 1%) of transferring an affected embryo *in utero*[12].

Another possible technique of analysis is offered by use of the *polar bodies*[13]. This technique has the major limitation that it can give information only on the genetic contribution of the mother. The possibilities of this examination are two in number:

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an examination only of the first *polar body* and an examination of the two *polar bodies*. In the first case, the mature oocyte can be used for fertilisation when it is demonstrated that in the polar body there is the certain presence of the expected chromosomal or gene alteration, given that the soundness of the information that remains in the oocyte is then certain. Because of the possibility of so termed *allele dropout* (ADO), any doubt can be settled through an examination of one or two more of the mature oocytes. In the second case the extraction of the two *polar bodies* can take place only after the fusion of the gametes has occurred. In the view of S. Rechitsky and his collaborators[14] this appears to be absolutely necessary in the case of the diagnosis of single-gene disorders in order to avoid the notable difficulties that are encountered in the analysis of the DNA of a single cell, amongst which may be listed DNA contamination, undetected dropout allele, and *preferential amplification*, which can all lead to *a misdiagnosis*.

The results of PGD applied to man

In the face of this new advance of the biotechnologies, welcomed by medicine as a further instrument by which to reduce the number of children born with serious or grave pathologies, the question immediately arises as to what the results of the application of this new technology have been in the fourteen years or so since it was first applied.

We have little data on the use and results of PGD through the technique of sequential *polar body removal* (PBR). From the work of S. Rechitsky and collaborators which has just been referred to, we learn that of 529 oocytes in 48 clinical cycles of 26 patients, only 106 embryos had been transferred in 44 clinical cycles, which were followed by 17 (10%) unaffected pregnancies. And C.M. Strom and his collaborators,[15] when presenting the results, and above all the state of health at birth and during the first six months of the first 109 children who were born following the application of the same technique for the diagnosis of Mendelian disorders and aneuploidies, concluded as follows: 'The data presented here demonstrate that PGD by PBR is a safe and accurate technique for couples at high genetic risk to avoid having children with genetic abnormalities, without the anxiety of awaiting prenatal diagnosis and the potential of having to terminate affected fetuses.'

A broader and more complete answer emerges from the analysis of a by now notable number of data obtained using the technique of *blastomeres biopsy*. Table 1 presents the most representative data published since 1999.

Table 1

Risk	Cycles (couples)	Biopsied Embryos			Born
		Total	Abnormal	Transferred	
Chromosome or gene mutation[16]	258,460			**638,508**	**87,347** (13.7%)
Chromosome or gene mutation[17]	183 (92)			**293**	**34** (11.6%) 23 s, 5 tw, 1 tr
Aneuploidy[18]					
FISH 6 chrom.	71	406	247 (61 %)	**159**	**7** (4.4%)
FISH 9 chrom.	45	236	146 (62%)	**90**	**4** (4.4%)
ICSI[19]	(72)	329	136 (41%)	**193**	**6** (3.1%)
ICSI[20]	71 (59)	312	185 (59%)	**127**	**18** (5.8%) 7 s, 4 tw, 1 tr
Translocations[21]	11 (7)	64	47 (73%) (mosaics)	**14**	**4** (6.25%) 3 s, l tw
Sex Determination[22]	30 (13)			**18** (XX)	**3** (10.3%)
Various[23]	100 (60)	473			**24** (5.1%)

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The first observation to emerge from the analysis of all these data regards the enormous quantity of embryos - human subjects at the beginning of their lives - that are sacrificed, that is to say literally *killed.* Table 2 presents the sum of data of the five works in which, as is observed in Table 1, were presented respectively:

1. the *total number* of biopsied embryos;
2. the *number of abnormal* embryos because of the presence of chromosomal aberrations -- which are the most frequent errors -- all of which were rejected, that is to say directly 'killed';
3. the number of embryos that were *transferred in utero;* and
4. the number that were *born.*

Table 2

Biopsied Embryos				
Total	**Abnormal**	**Transferred**	**Born**	
1,347	761	**583**	**39**	
			Total	**Transferred**
	56.5%	43.3%	2.9%	6.7%

The number of embryos that were born is, obviously, to be seen in respect both of the number *of biopsied* embryos, that is to say the *total* number of embryos that were produced and used, and the number of embryos that were *transferred.* It is clear that given that the percentage of births was 2.9% (39:1,347), 97.1% of the embryos that were produced were lost: 761 (56.6%) were directly *killed* because they had a chromosomal abnormality and 544 (40.5%) were consciously *exposed to foreseen and willed death.*

This situation is confirmed by a comparison between the number of *transferred embryos* and *those born* in two groups as presented in Table 3: group 'A,' which contains the data of another three works - which are also presented in Table 1 - in which only the number of *transferred* embryos and the number of born embryos is communicated; and group `B,' which presents the corresponding data of the sample examined above.

Table 3

Embryos		
	Transferred	**Born**
Group A	638,819	87,384 13.7%
Group B	583	39 6.7%
	x2 = 3.103	P > 0.05

It is evident, from the x2 value, that the difference between the two groups is not significant. It follows that given the notable information that comes from the enormous European sample the frequency of born embryos - despite the very high selection obtained through PGD - is to be seen as markedly lower than that obtained in the ordinary processes of FIVET and ICSI, in which selection by PGD is not carried out. This difference could be ascribed to various causes. It remains true, however, that the embryos, even if apparently selected following PGD, are in the same situation of high precariousness - indeed they are perhaps in an even worse situation - as the embryos produced and used in the ordinary processes in which selection occurs spontaneously.

In the face of these data, collected in a serious way by those who wanted, and want, to make a contribution of human comfort to so many situations of suffering and pain, but which indicate also a lack of understanding of the true reality of the human embryo which is reduced instead to a pure technological instrument, a very recent statement of a pioneer and protagonist in this field, R. L. M. Winston,[24] seems to me very correct and of great resonance. He concluded his analysis of the state of the technologies of technically assisted reproduction with the following statements: "Patient desperation, medical hubris and commercial pressures should not be allowed to be the key determining features in this generation of humans. Bringing a child into the world is the most serious human responsibility. We cannot ignore the clouds lowering over these valuable therapies. To do so could have a profound influence on the progress of medical science, not only in this high-profile field, but in others too."

The ethical prospects of PGD in the medical field

After a reference to the techniques of preimplantation genetic diagnosis and an analysis of the effects and the results of the application of this recently new technology, it is not only useful but also incumbent to engage in a reflection on the reasons that led to this new step in medical diagnosis not only in the field of *assisted reproductive technology* but also in that of *genetic pathology* and others which are now opening up. Certain statements, gathered from the writings of researchers in this field and from

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people working in the sector of public health care, allow us to understand the principles that are held to justify preimplantation genetic diagnosis - principles that have by now become widely accepted both in the scientific and medical fields and within society.

J. Savulescu[25] observes: "Eugenic selection of embryos is now possible by employing *in vitro* fertilization (IVF) and preimplantation genetic diagnosis (PGD). [...] I will defend a principle which I call Procreative Beneficence: couples (or single producers) should select the child, of the possible children they could have, who is expected to have the best life, or at least as good a life as the others." C. Camero and R. Williamson[26] argue that "PGD and implantation of an un-affected embryo is a more acceptable choice ethically than prenatal diagnosis (PND) followed by abortion for the following reasons: Choice after PGD is seen as ethically neutral because a positive result (a healthy pregnancy) balances a negative result (the destruction of the affected embryo) simultaneously." J. A. Robertson,[27] in a detailed work on the ethical aspect of the application of PGD in different situations, states: "While recognizing the strong objections of some people to PGD [...], the following discussion assumes that the use of PGD to screen for aneuploidy and serious Mendelian disorders is ethically and legally acceptable." And after discussing new uses of PGD for screening embryos for susceptibility to cancer, for late-onset diseases, for HLA-matching for existing children, and for gender, he concludes: "Except for sex selection of the first child, most current extensions of PGD are ethically acceptable and provides a framework for evaluating future extensions for nonmedical purposes that are still speculative." The concerns felt by J. A. Robertson in respect of sex selection was overcome by E. Dahl[28] who argues: "After considering five potential objections, I conclude that parents should be permitted to use PGD to choose the sexual orientation of their children." A similar openness to the justification of PGD has been ascertained in a social context by an empirical survey carried out by M. G. Katz and his collaborators[29] using suitable questionnaires given to 121 subjects after a previous accurate consultation. Of these: 41 had presented themselves for a PGD because of *gene disorders;* 48 for *aneuploidy screening;* and 32 that were about to commence their *first IVF cycle* as a control group. The authors concluded: "All groups found PGD to be a highly acceptable treatment. They expressed little concern about its extension to testing for non-disease states such as sex, and they were strongly in favour of a shared decision-making model in which couples have considerable autonomy over decisions about the embryo(s) to transfer." However, these authors also emphasised that: "Whilst our society supports reproductive autonomy there is also concern about the impact of genetic manipulation and genetic enhancement of embryos. There may not be the same community support if the move was towards embryo enhancement, eugenics and even HLA matching."

In relation to these positions, which are characteristic of a *negative eugenic approach* that is today prevalent and strongly sustained,[30] objections and forms of resistance, however, are not absent. The first, and the strongest, relates to the grave abuse of the human embryo, which is reduced to a mere technological instrument. This objection was formulated in 1984 by three members of the Warnock Committee and their opinion was included in the final report in the form of an <<expression of dissent>>.[31] It reads as follows: "It is in our view wrong to create something with the potential for becoming a human person and then deliberately to destroy it.

We therefore recommend that nothing should be done that would reduce the chance of successful implantation of the embryo." This position was openly recognised and emphasised at point n. 17 of the report of the Donaldson committee,[32] which had been established in 1999 by the British government for the regulation of research on embryonic stem cells, where it is stated that "A significant minority of people believe that the use of any embryo for research purposes is unethical and unacceptable." The second objection, emphasised by J.A. Robertson himself,[33] "arises from the fact of selection itself, and the risks of greatly expanded future selection of embryos and children. [...] Any form of selection or manipulation turns the child into a 'manufacture' and thus impairs human flourishing. [...] Increasing the frequency and scope of genetic screening of prospective children will move us toward a eugenic world in which children are valued more for their genotype than for their inherent characteristics, eventually ushering in a world of 'designer' children in which genetic engineering of offspring becomes routine."

From these brief notes the net contrast between the two ethical positions appears to the full: one position is fully in favour of the use of PGD not only for any kind of treatment involving *in vitro* fertilisation but also in any case in which a serious possibility of pre- or post-natal pathology exists for a wanted child; the other position is decidedly opposed. It is opposed not out of some whim but for the simple and clear reason that through such a procedure one seeks a 'good,' albeit justly wanted, through an action that involves a <<grave wrong>> -- the intentional killing, even in a single case, of one or more human subjects who have begun their lives. Whoever knows the scientific truth of the human embryo as a real human subject cannot but recognise the moral value and the correctness of this position.

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J. Habermas,[34] the famous philosopher of the Frankfurt School, dwells somewhat at length upon this subject in his recent work *The Future of Human Nature. The Risks of Liberal Genetics*. "For years the discussion about genetic research and engineering has continued to center uselessly round the question of the moral status of pre-personal human life. Thus I will adopt the perspective of an imaginary present, projected into the future, beginning from which the practices presently under discussion could retrospectively appear to us as a sliding into a form of liberal genetics, that is to say genetics governed by the law of supply and demand. Research on embryos and the pre-implantation diagnosis preoccupy spirits above all because they exemplify the dangers evoked by the metaphor of <<*selective genetics*>> in relation to the human race." Later on in his analysis he makes clear his thought on the matter: "Let us suppose that the experimental use of embryos generalises a practice by which the defence of pre-personal human life is seen as being of secondary importance in relation to other possible ends (including the to be wished-for development of noble <<collective goods>>, for example new methods of treatment). The widespread acceptance of this practice would render our vision of human nature less sensitive and would open the door to a form of liberal genetics. In this we can now see what in the future will appear to us as a *fait accompli* of the past, to which the proponents of liberal genetics will appeal as a Rubicon that we have already actually crossed."

One must admit that in reality, with this new step of pre-implantation genetic diagnosis, the very heights have been reached of the overbearing arrogance of science, which has wanted not to acknowledge the true reality of the human embryo, degrading it for the first fifteen days of its existence to a <<*pre-embryo*>>[35]: a mass of cells without any law synthesizing them into an *organised whole,* a cumulus of disposable cells for any kind of scientific or technological use. Faced with this situation, J. Testart himself[36] the technical father of the first child conceived *in vitro* in France, with evident worry was already writing in 1995: "What is in the making is a veritable revolution in ethics, transcending the frontiers of any given country." And he, with a sense of responsibility concluded: "Beyond technical performance, individual interest and naive desire, the problems are more complex than we are led to believe. We ought to approach these problems with a concerned effort and determined humility to uphold the ethical dimensions of human life."

One must honestly recognise that the great expectations that the progress of science and medicine seemed to have opened up in the vital field of procreation are being transformed into a serious threat to society, in which <<*values*>> and <<*ethical aspects*>> are losing their meaning. The reason appears clear: in the prevalent scientific-technological system the value of the constant <<man>> - which is indispensable in maintaining the equilibrium of the whole system - has been seriously altered, if not completely annulled. We urgently need to return to the recognition of his *real value,* and thus his *dignity* and his *rights*. However, science and technology cannot calculate or estimate the value of this constant with their own methodologies. It is necessary for scientists and technologists, who today have a notable power in directing and effecting social development, not to remain closed within their axiomatic reductive system but to become open to, albeit respecting their own prerogatives, and to welcome the stimuli of a 'sapiential' system that reflects thought and light that come from the deepest part of ourselves, critically explored, examined and assimilated. Only from this research can one obtain the value of the constant <<man>> and, as a result, rediscover a sense of limits and deduce from this what our responsibility towards him really is. It is man in his integrated reality that must dictate, from his interior being, the set of rules to apply to his action, the basis of every form of responsible behaviour. What is required is that it should be sought for and that there should be a will not to reject it.

It is necessary to transform the *closed* scientific-technological system, which today prevails, into an *open* system in which the real value of <<man>> is recognised, and thus his dignity and his *rights* but also his *responsibilities* and his *duties*. Only in this way can science and technology - and medicine in particular - find how to meet the needs of every human person, deciding when and in what forms *this or that behaviour is* ethically correct, and thus create real social progress.

John Paul II,[37] when addressing the members of the Pontifical Academy of Sciences, laid stress upon this aspect: "We must not allow ourselves to be beguiled by the myth of progress, as though the possibility of conducting research or of applying a technique would immediately qualify them as morally good. The moral goodness of all progress is measured by its genuine benefit to man, considered in relation to his twofold corporeal and spiritual dimension; as a result, justice is done to what man is; if the good were not linked to man, who must be its beneficiary, it might be feared that humanity were heading for its own destruction. The scientific community is ceaselessly called to keep the factors in order, situating scientific aspects within the framework of an integral humanism; in this way it will take into account the metaphysical, ethical, social and juridical questions that conscience faces and which the principles of reason can clarify" (n.5).

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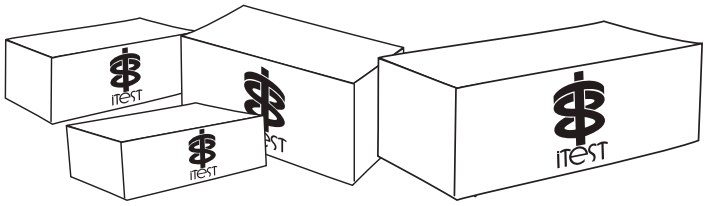
New Design

The ITEST Board of Directors decided that it was time to make a few New Year's resolutions, among them, to redesign our quarterly bulletin while keeping the content at the professional level in the faith/theology, science/technology areas. We've engaged Bill Herberholt, owner of Graphic Masters in St Louis to create the new layout and design which you have now seen, and read. We are pleased with the overall appearance and we welcome your comments and suggestions on how we might make this even more "readable" by noting anything that we could improve, for example, the size of the print and so on. Remember, though, especially for those who receive this via regular postal delivery, we must limit the number of pages to 18 in order to keep the package under two ounces. If necessary we will experiment with other formats, but at this time the editorial board considers this a "keeper." Just a reminder. We are working now on the Spring Bulletin and are accepting articles for publication.



New Location

We have finally settled into our new location at the Cardinal Rigali Center, approximately 10 miles west of Jesuit Hall, our former home. Moving the location of an office which occupied the same suite at Jesuit Hall for almost four decades was an experience testing our physical and mental endurance, particularly our sense of humor.. What to save? What to shred or dispose of? Those were questions that we encountered almost daily. Yet, with a comedic sense, at times, and grim determination at others, we managed to depart the premises on December 11 with a minimum of collateral damage either to us or to others. Evelyn Tucker, our project manager, of Exploring the World, Discovering God (EWDG), who now has an office where she can work efficiently, has been busy collating, editing and revising the K-4 educational science/faith interface modules for our project now in its second full year. In March Ms Tucker will gather all the teachers who have participated in the CTTT (Creative Teacher Think Tanks) for a session of analysis and evaluation of the modules in science/faith written by those teachers and critiqued by the Advisory Council to the EWDG project. We will have more information on the progress of this project in the next bulletin.

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