

BRIEF POSITION PAPER FOR
PANEL DISCUSSION ON RELATION
OF MATHEMATICS AND CHRISTIANITY

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Some people view a conjoining of Christianity and Mathematics as improper. They miss the point of the relationship. The content of mathematics is not affected by Christianity. The relationship does not concern what, or how (the Christian doesn't solve equations or differentiate differently), but it concerns why. It concerns such things as the interpretation and appreciation of the beauty, the symmetries, the coincidences, the remarkable properties, man's creative role, etc.

Basically your philosophy (theology) affects everything. There is no neutrality. There are no "brute facts." My concern is not with highly philosophical (often speculative) concerns dealing with various forms of non-Christian thought (Monism, Parmenides, intuitionism, realism, positivism, formalism, etc.), nor with the problems of the one and the many (unity and plurality) and of the discrete and the continuous. (Such issues have been dealt with by Vern Poythress in various papers.* I basically agree with Poythress, but disagree, for example, when he says that God's nature as three-in-one accounts for man's ability to handle the one and the many; this in effect dictates what kind of God had to exist in order for us to account for the unity and plurality we find in the world in general and in mathematics in particular.) Nor am I concerned with the impact of philosophical-theological differences on different constructions of analysis, nor with problems of a priori and a posteriori knowledge, of the implications of Godels proof, etc. These too are treated by Poythress (former mathematician, now a professor at Westminster Theological Seminary).

We do not use mathematics to "prove" anything about God. God sustains mathematics. Because of the Christian view of God and man, man can create, understand and use mathematics. We should be motivated by the love of God, commanded by the law of God, and directed to the glory of God.

See articles on "Mathematical Thinking and Christian Theology", "Mathematics in the Christian Philosophy of Life", in "Kronecker, Creation, and Christianity" by Verno.

A Christian view of mathematics is not

- 1) Using the Bible as a textbook (I Kings 7:23 could yield a value of π equal to 3)
- 2) Numerology (4 the number of the world, 7 the number of completeness, etc.)
- 3) Putting word problems in a Christian context
- 4) Artificial moralizing

*e.g. "Creation and Mathematics or What does God have to do with Numbers?"
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Most generally our goal is to glorify God via Mathematics as it is in all of life. Man has been made by God with the capacity for Mathematics, and mathematics is built into the very nature of the universe.

God's wisdom and glory are abundantly evident in mathematics. He did not let a body of mathematics down from heaven on a sheet but uses man in its creation and development. Man's creation of mathematics is not purely arbitrary. Many systems and axioms are suggested by experience. (e.g. we assume the commutativity of addition of natural numbers because that's the way they behave). Seemingly arbitrary and strange systems have turned out to be important in the universe (e.g. non-Euclidean geometries). God has given man the ability to create a variety of systems. The Christian must be open minded about the incompleteness of mathematical truth. Wonderful results are ultimately man's discoveries.

In mathematics we have analogues of or reminders of God's incomprehensibility (we know but we do not fully know). In Mathematics as in theology, we glibly speak of "infinity" and the "infinite". Study of infinite sets and levels of infinity should be humbling. There is thrill and challenge in unanswered questions of mathematics. Our reaction to these things should be analogous to our reaction to the incomprehensibility of God.

There is outright beauty in mathematics, in elegant proofs as well as in coincidences of figures, properties of number theory, etc. We must not have a strictly pragmatic or utilitarian approach. Mathematics is an art as well as a science, with much aesthetic charm, abundantly evident in its logical structure, consistency, symmetries, order, coincidences, etc. Note the attitude of ancient Greeks who studied conic sections for their sheer beauty.

Mathematics is also fantastically useful, which should give cause for praising God. How wonderful, e.g., that the conic sections the Greeks studied for beauty turned out to be of such tremendously practical importance.

The Christian philosophy demands recognition of the role of creativity, of the inquiring mind, of inductive reasoning, of developing imagination. This point has strong bearing on good pedagogy.

God is a God of order. Our work in mathematics should develop habits and characteristics desirable for the Christian: accuracy, precision, hard work, neatness, ability to abstract, clear definition, postulational reasoning, consistency, orderly logical thought, etc.

Our philosophy requires the best of mathematics and the best of pedagogy. Some of the many areas in which we can see beauty, charm, etc. are: properties of conic sections, rules for divisibility, Fundamental Theorem of Arithmetic, GCD expressible as a linear combination, varieties of proof (as in Pythagorean theorem), surprising things contrary to intuition (birthday coincidence), properties of conic sections, Pascal's triangle and its many applications, Fibonacci numbers and Golden Ratio, Platonic solids, coincidences in various lines related to triangles, Euler's formula for polyhedra, Desargue's theorem, Pascal's theorem, Pappus' theorem, etc.

We should frequently be thinking or saying, "Isn't that great!" "Isn't that amazing!" but beyond that the Christian can say, "How manifold are thy works O Lord; in wisdom has thou made them all", "how great thou art!"

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We are including in this collection two brief articles by C. Ralph Verno which were published in the Torch and Trumpet. This publication is no longer available and we have received permission to include them here. A third article, "Mathematical Thinking and Christian Theology," is contained in the June 1968 issue of the Journal of the American Scientific Affiliation.

Kronecker, Creation and Christianity
by C. Ralph Verno
originally in Torch and Trumpet

"GOD CREATED the natural numbers; all else is the work of man." This remark, one of the more famous quotations in the history of mathematics, is attributed to Leopold Kronecker, brilliant 19th century German mathematician. Since it seems to minimize God and exalt man, this quotation is likely to alienate the Christian, at least when he first hears it. Indeed, that was my reaction, and as a matter of fact I still do not like the sound of it out of context because the impression it leaves seems contrary to the emphasis of Scripture. Not knowing the full intent or motives of the author, I believe we should be careful not to be critical of Kronecker by reading into this statement all kinds of anti-Christian thoughts or bias. In fact it appears that he had the opposite of anti-Christian bias; according to E.T. Bell, noted mathematics historian. "Among other things Kronecker imbibed from Werner was a liberal draught of Christian theology, for which he acquired a lifelong enthusiasm. With what looks like his usual caution, Kronecker did not embrace the Christian faith till practically on his deathbed when, . . . , he permitted himself to be converted from Judaism to evangelical Christianity in his sixty-eighth year."¹

Kronecker in effect said that there is creation by the mind of man in the world of mathematics. Now there are some Christians, even in Christian education, who feel that we should not use that terminology in reference to man. They are jealous for the glory of God, emphasizing the Creator-creature relationship against various forms of heresy. Thus they say that creation is a uniquely divine activity, and consequently we should not speak of such activity by man the creature. Now is this a sound Christian position? Surely we would agree that only God creates ex nihilo, i.e., in the original, primary sense; but is this the only sense in which God creates? Is there no sense in which we may properly speak of creation by man? Is it contrary to Scripture and must we therefore refrain from saying that man creates?

Biblical Usage

It is helpful to consider Biblical usage in this connection. The Hebrew word *bara'*, which is usually translated by some form of the verb "create," means to shape and is used in many places in addition to Genesis 1:1, always of divine activity. However it is very clear that it does not always refer to what is usually thought of as the original ex nihilo creation. Genesis 1:27 uses the word in reference to woman in whose creation material was used. Many times individuals are referred to as created by God, obviously referring to their conception, formation or birth (Ezekiel 21:30, 28:13, 15; Malachi 2:10; Ecclesiastes 12:1). This word *bara'* is applied not only to what we might call secondary creation (in which material is used), but also to product of God's activity which came via human agency in a natural way. Neither the meaning of the word nor its contextual usage restricts it to original ex nihilo creation.

The Hebrew word *yatsar* is usually translated "form," and is used of activity by man as well as God. It, too, is used of God's activity which is not *ex nihilo* creation, and furthermore has the same meaning as *bara'* in the parallelism of Isaiah 43:1, 7. It is used of the human activity of the potter with clay, the carver of wood, and quite significantly of the forming of thought (even though evil) in Psalm 94:20. The significance of this is that the results of such action need not be physical object, but can be ideas in the mind.

Another Hebrew word, *'asah*, has many meanings but is often translated "make," and is used of both God and men many times. In Genesis 1:7, 16, 25, 26 it is clearly used as a synonym for *bara'*. Moreover, in Isaiah 45:7 it is used in parallelism with *bara'* as is also the verb *yatsar*. In Genesis 5:1 it occurs in parallelism as a synonym of *bara'*. Referring to men it is used of making the cherubim, a candlestick, images, a coat, and many other things.

There is nothing sacrosanct about the English word "create" and there is no reason to restrict it to translate only the verb *bara'*. In view of the incomplete evidence above, other verbs could just as properly be translated by "create." Furthermore there is no Scriptural reason not to use the word "create" of the similar activity of men. Yes, there is a real and proper sense in which we can refer to creation by man. He brings into existence things which did not previously exist as such. He brings to the knowledge of mankind new thoughts. He forms ideas and products not previously known to men. (We must remember that God is said to create that which actually came into being through human activity in a very natural way.)

Man's Creative Activity

Man's creative activity often involves the discovery of things built into the nature of the universe by God. Can we also refer to the products of man's creation as the creation of God, or is God's role minimized or neglected when we speak of creation by man, as is suggested by Kronecker's statement out of context? Ultimately in a broad and general sense we can speak of the products of man's creation as the creation of God. We speak, after all, of the world as it now is as being created by God when as a matter of fact in many respects its present form is the result of man's work. God has made man, his mind and his faculties, with all their potential. God is absolutely sovereign and omniscient as the Creator and controller of the universe. He does not learn from man. For example, God did not learn nor become aware of new mathematics when man created it. In the broadest sense, God is the author of all and can be said to be the Creator of mathematics (and other things) without denying man's creativity directly. Men should be properly commended for creative activity, and God should be praised thereby. We can give credit to creative men and still say to God, "How great thou art!"

There is, then, a good and proper sense in which we speak of human creative activity in a way which is quite consistent with the Scriptural view of the Triune God. As for Kronecker's statement, we need not and in fact should not discard it, even though it may have a crass sound to the Christian who believes "*solus Deo gloria*." Many people involved in mathematics interpret his statement to mean that the mind of man is naturally endowed with the ability to comprehend the concept of what we often call the counting numbers (namely, [1,2,3,4,5,6,7,...]) while other number systems are the result of the creativity of man. Mathematically speaking there is a basically important truth set forth in the Kronecker statement. It is that beginning with these counting numbers (or natural numbers) it is possible for the mathematician to construct other number systems; from the

naturals the mathematician can construct the integers (namely, [...-4,-3,-2,-1,0,1,2,3,4,...], what the layman usually thinks of as positive whole numbers, negative whole numbers and zero); from the integers he can go to the rationals (what the layman usually thinks of as all possible fractions, i.e., with numerator being an integer and denominator a non-zero integer); from the rationals he goes to the real numbers (which includes the rationals and irrationals such as $\sqrt{2}$, π etc.); from the reals he can move to the complex numbers and beyond. In the rigorous construction of these other number systems beginning with the naturals, there is genuine human creativity. Obviously creativity by man pervades not only mathematics, but science, literature, music, art, indeed all of culture. It is not insignificant that Bell says of Kronecker, "Music, he declared when he was an old man, is the finest of all the fine arts, with the possible exception of mathematics, which he likened to poetry."²

Christian Education is Creative

We should not speak of human creativity reluctantly; we should not simply be willing to use the language. Rather we should strongly encourage it and do all in our power to develop it in ourselves and others. This should be an integral part of good education. In fact it must be such an integral part, for if it is lacking then the education by my definition is not good, at least not good enough. Certainly, if anyone should promote and encourage man's creative activity, it should be the Christian. Especially this should be the case in Christian education, for such education must be good education; indeed it must strive to be the best education, and it cannot approach this goal without a good emphasis upon creativity in the students.

It is a tragic shame and disgrace that so much of what has been called Christian education has not been like this, but rather has overemphasized a unidirectional communication of a body of knowledge from teacher to student. The teacher gives, the student receives. Sadly it has been too often the case that such so-called Christian education has (like much of the church) failed to distinguish between true conservatism and dead traditionalism, and has continued to teach "like the good old days" with the authoritarian school-master-type pedagogue communicating a vast collection of facts to quiet and (hopefully) receptive students. No doubt this has been a consequence (but not a necessary one) of the Christian view of Scripture and a body of absolute truth to be proclaimed and received. This type of stilted and boring education need not be, and should not be in Christian education. A proper emphasis upon human creativity (student creativity, to be specific) is perfectly consistent with the Christian view of God and truth. In fact it is not only consistent; something is wrong if it is missing. If we have a sound view of Christianity and man's creative activity in relation to it, then this should permeate our entire Christian educational process and methodology.

1. E. T. Bell, Men of Mathematics, New York, 1937, p. 467.
2. Ibid, p. 468.