

**A THEOLOGICAL STUDY INFORMED
BY THE THOUGHT OF PAUL TILlich
AND THE LATIN AMERICAN EXPERIENCE**

The Ambivalence of Science

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Commendatory Foreword

I have recently heard the good news that the ThD dissertation of Eduardo Cruz has been accepted for publication by Mellen University Press. I am delighted with this, for I consider this manuscript to represent a most important statement for our present situation. I am, therefore, very honored as well as pleased to write this brief foreword.

The ambiguity - or as he prefers, the ambivalence - of science in our age is now unquestioned. Almost against their will, so to speak, scientific knowledge and the application of that knowledge seem to spawn new forms of destruction as much as creative consequences. This evident ambivalence calls for interpretation and understanding, and any competent and intelligible analysis of this strange paradox - the good that is mostly intended is not what is done, nor is it what transpires - is thus to be welcomed. The scientific community itself is loath to carry out this analysis; in fact they visibly shrink from admitting this ambivalence, preferring to blame 'the politicians' (interestingly, not so much the industrialists!) for the misuses of what they intend as the benefits of science - much as many in the Church refuse to see the baleful as well as the creative effects in historical life of religion, even of their own religion. It is, therefore, salutary to carry out this analysis, as Dr. Cruz does so well, both on the theoretical side with a theological analysis and on the concrete, empirical side with a discussion of the 'ambivalent' situation of science in South America. I know of no similar study that so creatively unites these two sides of the current issue.

There is, however, one other aspect that makes Dr. Cruz's discussion unique. A goodly number of theological analyses of the social and historical effects of scientific/technological development: arrogance, pride, desire for power, greed, etc., all clearly manifest in the crises of the environment, of industrial development, of military and of medical matters. What is unique about Cruz's manuscript is that while he clearly agrees that 'sin' in this sense is also a factor, he concentrates on another factor, 'the tragic', what Paul Tillich called the inescapable 'ambiguity of life'. Whenever there is creativity - and science is perhaps the clearest sign in our age of human creativity - there is also destruction; the creation of the new brings forth also unseen, unintended and unwanted consequences; the

solution of old puzzles and the resolution of old problems generate new questions and new dilemmas. Thus there is no simple, direct 'progress' as modernity, and certainly the scientific and the technological communities in modernity, have believed; ambiguity, good as well as evil, reappear with each advance. Surely contemporary experience, political as well as technological, reveals the ambiguity of each apparent step forward. It is important that we begin to admit this strangest of the aspects of our common history, face it squarely, and ponder the many factors that help to create its most vivid contemporary illustration, the 'ambivalence' of science. Dr. Cruz's volume will help immensely in this important task.

Langdon Gilkey

West Boothbay Harbor, Maine

July 14, 1994

Eduardo Cruz's *The Ambivalence of Science*

In this dissertation, Eduardo Cruz offers a brilliant and original study of science in Latin American culture that is a quintessential example of the 'theology of culture' methodology that Paul Tillich and Langdon Gilkey have bequeathed to us. Cruz stands as a third-generation representative of this way of doing theology - all the more suggestive because he extends their program to cultural phenomena with which they were unacquainted, his own culture of Latin America, and he works from his own Roman Catholic theological resources, thus augmenting their neo-orthodox protestant tradition. What the author has produced stands as the most forceful and comprehensive theological interpretation of science as a cultural force in Latin America yet to appear. Furthermore, although it grows specifically out of his own cultural experience, and even though it is not directly transferable to other cultures, its investigations and conclusions transcend their Latin American roots. He propounds a thesis concerning the relationship between science and culture, namely that it is marked by ambivalence at a profound level, that can profitably be examined and elaborated with respect to other cultures, specifically those of North America and Europe.

Cruz's work is impressive both in its breadth of purview and in the depth of its theological interpretation. Among the disciplines of inquiry that he employs are these: history, sociology, philosophy of science, biblical studies, and theology. This puts his work in a class of its own, since even his mentors rarely brought such a full-orbed approach explicitly to bear on specific cultural phenomena in the way that he has.

The centerpiece of the work is its analysis and elaboration of the concept of ambivalence. In the hands of Cruz, this concept is shown to combine both subjective and objective perspectives. Furthermore, as the case study of science-embedded-culture clarifies so forcefully, the concept describes how a culture and its individuals can enthusiastically accept an institution, cultivate their dependence upon it, and at the same time never weaken in their skepticism of what the institution (in this case science) offers in its rhetoric and delivers in its practice. With the resources of biblical studies, and historical and theological disciplines, this encounter with science under the conditions of ambivalence is shown to be an

encounter with the transcendent. As such, the theological foundations of culture are illuminated, and with them and original insight into the relationships between science, religion, and society are brought into focus.

Cruz's work deserves the widest possible reading and attention - both within and without the walls of academia and church.

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Introduction to the Edwin Mellen Edition

Although the dissertation reprinted here is almost ten years old, the main argument has shown itself to be increasingly germane to contemporary reflections on science. It is one of the purposes of this new introduction to give a few signs of the up-to-dateness of the argument. It is true that 'ambivalence' has not become a concept of widespread usage, but the phenomena which it refers to have been studied in greater breadth and depth. In what follows we will indicate, following the order of the chapters, some outstanding contributions in the recent literature.

First of all, let me cite a passage from Thomas Kuhn that I regrettably overlooked in the dissertation:

Lifelong resistance [to paradigm shift], particularly from those whose productive careers have committed them to an older tradition of normal science, is not a violation of scientific standards but an index to the nature of scientific research itself.¹

It is easy to see from this quotation that Kuhn is speaking of an in-built trait of the scientific activity, one that indicates a nobility open to tragedy. Adherence to a current paradigm is therefore "ambivalent"--a virtuous and necessary attitude to keep the high standards of science, yet bound to failure because of its the very evolutionary patterns. It is this pre-moral, naturalistic understanding of ambivalence that is necessary for a fair judgment of what follows.

¹ Thomas S. Kuhn, *The Structure of the Scientific Revolution*, 2nd. ed., enl. (Chicago: The University of Chicago Press, 1970), p. 151.

In the original Introduction we made an overview and an assessment of the dialogue between science and theology. There are reasons to rejoice in this respect--since 1987 the number and soundness of the contributions in this field has only increased. We should only cite the works of Russell, Stoeger, and Coyne, and Paul Davies, to have a glimpse of these advances.² Other works are cited at the end of this work, in "Additional References." Since then, moreover, many works by and about Langdon Gilkey have appeared. As we indicate at p. 7, we stand in the tradition of Reinhold Niebuhr, Paul Tillich, and Langdon Gilkey, in the effort to develop a theology of culture. Our criticism to the latter is still valid (pp. 59 ff.), however, and we have recently stressed Tillich's advantage over Niebuhr's position when it comes to the ambiguity of nature.³ We also mentioned the advances in the "sciences of science" (pp. 8 ff. below) and in naturalistic epistemologies and cognitive studies (pp. 53 ff. below). Our insight proved to be correct, anticipating the importance of these new approaches for a contemporary understanding of science.⁴

The first chapter is a comprehensive attempt at an understanding of the concept of ambivalence, its adequateness for a good interpretation of the predicament of science in the modern world, and a plea for its usage in theology.⁵ Our main point is that, if people are ambivalent toward science, it is because this ambivalence is deeply rooted in nature in general, and in the nature of scientific activity in particular.⁶ This means that it is present in the very evolution of matter, life and culture. Needless to say, 'ambivalence' is an interpretative concept, not an explanatory one--

² From the first three authors, we should point out Russell, Robert J., William J. Stoeger and George V. Coyne, eds. *Physics, Philosophy, and Theology: A Common Quest for Understanding* (Vatican City/Notre Dame, IN: Vatican Observatory/University of Notre Dame Press, 1988); From Paul Davies, the most outstanding is his *The Mind of God: The Scientific Basis for a Rational World* (New York: Simon & Schuster, 1992).

³ Eduardo R. Cruz, "Is Nature Innocent? Reflections on Niebuhr and Tillich." Forthcoming in *Studies of Science and Theology*, vol.4, 1996.

⁴ See, for a critical assessment, Laudan (1990) and Brown (1994).

⁵ Inserted in a dissertation, this plea certainly did not reach a wide audience. But I feel reassured when I read the following assertion by a distinguished theologian, that resonates with mine: "The reality with which theology has to deal is primarily the *world* and all that constitutes the world in space and time Not an *heile Welt*, an "unbroken world," but the real world in all its uncertainty: with all its concrete conditions and natural disasters, with its social misery and all its pain; animals and human beings in their struggle for existence, rise and decline, "devouring" and "being devoured"; the whole world, so difficult to accept in its ambivalence (emphasis mine)" (Hans Küng, "Paradigm Change in Theology," in Musser and Price [1988]:67-105, p. 100). As we stress in our argument, however, the philosophical concept of 'ambivalence' can be dissociated from its mid-century Existentialism pessimistic overtones.

it is not strictly necessary to explain evolution from a scientific perspective, but it helps us to understand its painful and tragic character. Recent developments in chaos theory, anthropic reasoning in cosmology,⁷ and the nature of progress in evolution, have highlighted the double-facedness of any evolutionary process.⁸ In the realm of culture, the ruin of the so-called "communist" regimes, with the fall of the Berlin wall, has further shattered any confidence in the ability of humankind to provide for its betterment without a price exacted and a burden carried.⁹

Chapter Two starts using ambivalence as a theological concept. The more

⁶ The Mertonian school, whose views on 'ambivalence' are analyzed in this chapter one, has itself experienced a change that brings it closer to the position of the social constructivists--see, e.g., Stephen Cole, *Making Science: Between Nature and Society* (Cambridge, Mass.: Harvard University Press, 1992), pp. 4 ff. He also points out a fundamental ambiguity in the practice of science, that it is worth reproducing: "Science seems to tolerate high levels of ambiguity Ambiguous but 'interesting' theories will allow many different scientists to use them in varying ways. . . . This role might be referred to as the function of 'limited obscurantism.' . . .

. . . Tolerance for ambiguity is *necessary* (emphasis mine) if the work of science is to proceed." Ibid., 18, 19. See also Everett Mendelsohn, "A Programmatic Attempt at an Anthropology of Knowledge." In Everett Mendelsohn and Yehuda Elkana, eds., *Science and Cultures: Anthropological and Historical Studies of the Sciences* (Dordrecht: D. Reidel Pub. Comp., 1981, pp. 1-76), p. 37; and David L. Hull, *Science as a Process: An Evolutionary Account of the Social and Conceptual Developments of Science* (Chicago: The University of Chicago Press, 1988), p. 7. As it is argued below, we should also employ 'ambivalence' to cover the full wealth of meaning of this trait of science.

⁷ Cosmology deserves a special place in our comments, due to the boom of philosophical speculation around anthropic principles and inflationary theories of the Big-Bang in the last ten years or so. Frank Tipler's *The Physics of Immortality* (New York: Doubleday, 1994) is but one of the latest and most bizarre outcomes of this wave of speculation, stressing the religious and theological underpinnings of the subject. Two fundamental *ambivalences* seem to fuel up the debate: first, the revival of the old contention between Platonic and Aristotelian views of nature (see, e.g., Barrow 1991), revealing the ambiguous nature of the laws of nature (necessary or contingent?); second, the fact that the possibility of a singularity in time having either a positive or a neutral value for theological reasoning (see in this respect Davies 1992 and Craig and Smith 1993). Questions about symmetry and asymmetry seem also to be revealing in this respect--see, e.g., Gardner (1990).

⁸ The ambivalence of cosmic and biological evolution is nicely depicted in Morowitz (1987) and in Reeves (1986). This passage from David Hume, on the other hand, has been recently brought to my attention: "Nature is obstinate, and will not quit the field, however strongly attacked by reason; and *at the same time* reason is so clear in the point that there is no possibility of disguising her. Not being able to reconcile these two enemies, we endeavour to set ourselves at ease as much as possible . . ." (D. Hume, *A Treatise of Human Nature*, ed. L. A. Selby-Bigge [Oxford: Oxford University Press, 1958], p. 215. As cited in Ernan McMullin, "Enlarging the Known World," in Hilgevoord [1994], 79-113, p. 97; the emphasis is mine). Isn't this a nice way to present one ambivalence deeply rooted in science?

⁹ There are, for example, recent scientific developments that have a tremendous impact on the cultural realm. That is the case, for example, of current research on genetic evolution. For this particular ambivalence, see Dricla (1994).

we understand the Scriptures against the background of the history of religions, the greater is the need to qualify the assertion that the Judaeo-Christian tradition is one of "ethical monotheism" (see, e.g., Levenson 1988).¹⁰ We welcome, furthermore, new studies in the line of a theology of Nature, or Creation, stressing the continuity between human beings and their pre-human substratum (e.g., Hefner 1993). This helps us to understand why we should move from the "ambiguity of history" of neo-orthodoxy to the "ambiguities of life" of Tillich. Speaking about Tillich, we also welcome the recent publication of his *Marburg Dogmatik* of 1925. This further corroborates our assertion that his usage of *Zweideutigkeit* dates back to his relationship with Heidegger while in Marburg (pp. 114-115 below).¹¹ The scholarship on Tillich, however, is still far from recognizing the cruciality of the concept of "the ambiguities of life" for him. Emphasis on the writings of the German period, in any case, will eventually lead to a reevaluation of this concept. As for the ambivalence of nature, we should highlight the very fine essay by Holmes Roston, III,¹² which also contains a reflection on the "cruciform character of creation" (cf. chapter III, p. 175 below).

Chapter three is the most central, yet the least explored of them. It involves a very difficult (and easily falling into sheer speculation) interpretation of the symbol of the cross as the overcoming of ambivalence. In fact, it is not enough to point out the deep ambivalence of science—a theological assessment has also to contemplate this predicament in the light of faith, hope and love. "Theologies of the Cross" were more fashionable in the eighties than they are now. But many new studies, specially from the exegetical side, have enriched our understanding of what is at stake in the Judaeo-Christian tradition, when it comes to the redemptive suffering of God and the revelation of the ironic and paradoxical side of history (see, e.g., Cousar 1990, Hallman 1991, and Zagrebelsky 1996). One of the major presuppositions underlying the argument here is that a pre-moral outcome for the ambivalence

¹⁰ Here lies one of the shortcomings of our argument - not having explored the ambiguity of the sacred in the tradition of the phenomenology of religion, the argument became too much dependent on Judaeo-Christian sources. For the aforementioned tradition, see Eliade (1962), Callois (1950), and Westphal (1984).

¹¹ Two crucial essays by Tillich, "The Demonic" and "The Class Struggle and Religious Socialism," that are used in our argument, have been recently retranslated in Kegley (1989).

¹² Holmes Roston, III, "Does Nature Need to be Redeemed?" *Zygon: Journal of Religion and Science*, vol. 29, no.2 (June 1994), 206-229.

of science is needed. In other words, scientists should not be told what to do by people foreign to the scientific activity. They rather need an interpretative framework out of which they themselves can draw conclusions of the reasons why science is double-faced, and what could be done to bring this trait to their own advantage. In other words, we argue that ambivalence has to be overcome from within, in a dialectic fashion, and that the cross is a proper symbol for this process.

Much has been said, furthermore, about altruism in recent times, as a concept and as a trait of human behavior that would be suitable for the dialogue between science and religion. Although the validity of this approach is not denied, we think that the argument in chapter three sets the appropriate presuppositions to an understanding of the "golden rule" in Christianity (Matt. 7:12). The main point is that, in an important respect, the Cross is "God's own doing" (see below, pp. 177 ff.). This means that the love for one another may easily become unbearable if not motivated by and grounded in God's unfathomable self-emptying for the glory of his creation (Philp. 2:5-11). Without this primordial act, human concern for the other becomes voluntaristic and ambivalence not overcome.¹³

The next chapter tries to bring the discussion closer to the theology of culture of Paul Tillich. One cultural aspect of modern science is brought to the fore, namely, its allegiance to the spirit of *progress*. This commitment to the emancipation and amelioration of humankind reveals, on the one hand the deeply religious understanding that scientists have had of their own activity, and on the other, the ambivalence that science shares with any utopian, messianic, and millenarian movements.¹⁴ Many recent studies have deepened this important contribution of science to Western culture, and the entanglement that ensued with the latter's contradictions. Among them, we may cite Olson (1982), Olson (1990), Latour (1991), Thuillier (1983) and (1988). Some utopian dreams of science, moreover, are forcefully criticized in Midgley (1992). We do not feel the need, on the other hand, to add anything to the careful analysis of Tillich's account of *utopianism* that makes the second half of chapter four.¹⁵ Additional research is needed however, to put

¹³ See, again, Zagrebelsky (1996). Our discussion on sacrifice, on the other hand, should have included the work of René Girard. See, in this respect, Girard (1987), Hammerton-Kelly (1992), and Williams (1992).

¹⁴ An amusing account of the scientist's high hopes can be found in a book by Anthony Standen (Standen 1950), that was overlooked when the dissertation was written.

Tillich's account to work in order to enlarge and enrich many empirical analyses and interpretations of the role of modern science in our culture.

The last chapter, on the vagaries of modern science in Latin America, is certainly the most pregnant one in possibilities, not only for research, but also for lessons on how to develop science worthy of public trust.¹⁶ A good account of the development of science in Latin America is still to be written, but analysts today are more appreciative of the possibilities and limits of science there, as we can see by reading the works of, e.g., Solomon and Lebeau (1993) and Fernandes and Sobral (1994). Nevertheless, agencies of development, such as UNESCO, still operate with the same basic frames of mind of fifty years ago, becoming increasingly irrelevant. The role of these agencies after World War II is the theme of our current research, with the aim of explaining why the religious enthusiasm with which their actions were carried worked both to enable and to defeat their basic goals. In a way our assertion of ch. four, that utopianism is followed either by skepticism or resignation, is being corroborated in Latin America today. After the fall of the Berlin wall, some feel that history (in the Hegelian sense) has come to an end (see the famous thesis of Francis Fukuyama), and that neo-liberalism is the only "natural" way to build social and economic structures. Even evolutionary considerations are called in to explain why dreams of autonomous development are no longer tenable (see, e.g., Radnitzky 1990).¹⁷

¹⁵ In terms of bibliography, we should add that the dissertation by J. Mark Thomas was published in the form of a book (*Ethics and Technoculture* [Lanham, MD: University Press of America, 1987]), and the same author edited (and translated, if that is the case) several of the hitherto unpublished works by Tillich, many of them cited in our argument. See Paul Tillich, *The Spiritual Situation in our Society*, edited and introduced by J. Mark Thomas (Macon, Ga.: Mercer University Press, 1988).

¹⁶ Recently the consequences of the century-old separation of the scientist from the "layman" came once again to the fore, when the SSC project came abruptly to an end. In the words of a witness deeply involved with the project, we have: "What I'm finding, particularly since the SSC failed . . . that's been a shock to the [scientific] community. Not just the SSC as such, but what it revealed was an underlying mistrust, a lack of appreciation, a lack of valuing of physics research and the whole notion of the quest for knowledge that really lies behind the whole academic pursuit. . . . It has been lost to the general public. They don't believe in it anymore. And that's come as a shock. (Toohig 1995, 4)" Considering the claims of superiority of which abundant evidence was given throughout our argument, this shock comes as no surprise. If this true for the United States, with greater force it is also true for Latin America.

¹⁷ For this reason, a *moral* evaluation of the presence of science in contemporary society is always needed to provide for a proper balance to the pre-moral approach that we are employing.

Yet, the poor and the outcasts are still there, in ever greater numbers. We should mention the work of Franz Hinkelammert as representative of a line of thought, within the broader framework of Liberation Theology, which is concerned with the deleterious effects of this "natural" globalization of transnational economic interests. In a more positive tone, we should highlight the recent spurge of works on popular culture (see, e.g., Parker 1993), and even the widespread usage of a neologism in missionary studies, "inculturation" (see in this respect Azevedo 1981 and Suess 1989). The "new world order," in any case, has represented a serious challenge to the development of a meaningful "theology of liberation" (Libanio and Antoniazzi 1994). Our indication that a "two-way" mentality is needed (pp. 276 ff. below) seems to be all the more represented in contemporary studies, making the patronizing distinction "first-third worlds," (the latter being a source of needs) increasingly outdated.

I would like to bring this New Introduction to a close by emphasizing that today, more than ever, any analysis of the ambivalence of science should be unequivocally committed to a defense of rationality. Indeed, ours is a very credulous age, with many "sirens of the irrational" at large, to borrow the title of a recent book (Terré-Fornacciari 1991).¹⁸ We have argued in a recent work that science and theology are allies in the uphill battle against gnosticism in the garb of science, that is a mark of the *laissez-faire* that is even supported by some epistemologists (Cruz 1995). Reenchantment of the world is both cause and effect of the present disenchantment with established science, allowing for the proliferation of bizarre forms of pop science (the works of Capra and Zohar are by no means exceptions in this respect -- see an evaluation in Thuillier 1989). It is our understanding that science is in need of a new "religious substance" (an expression from Paul Tillich that is explained below), respectful of its autonomy, pregnant of genuine creativity, and yet aware of its ambivalence: the attachment of science to our human condition in all of its creatureliness and receptiveness to that Grace which bestows dignity to the lives of men and women of all ages.

¹⁸ The reaction of the scientific community to a book authored by Brian Appleyard, *Understanding the Present* (New York: Doubleday, 1993; paper: Anchor Books, 1994) is very revealing of the present mood: scientists are very sensitive to any criticisms to their craft (one of the reviewers called Appleyard a "flat-earthier!"), yet they do not clearly understand what is at stake in these romantic reactions.

I would like to thank Philip Hefner, director of the Chicago Center for Religion and Science, for his support and encouragement in all stages that led to the publication of this work. Without his initiative and practical spirit, this work would not be available to a wider audience.