ARTIFICIAL INTELLIGENCE: WALKING THE BOUNDARY

by Anne Foerst

Abstract.   Theology and science generally conduct research independently, with no interchange. The possibility for mutual enrichment often is thwarted because people working in the two fields have very different worldviews, which are mostly held subconsciously. In this paper I will try to establish a dialogue of mutual enrichment. I have chosen artificial intelligence (AI) as an exemplary scientific discipline and the theology of Paul Tillich as a complement. I reinterpret Tillich's concept of sin to introduce a framework for a dialogue between the two. This framework aims to prevent people from either camp from assuming the existence of absolute truth and thus creating a dogmatism. Paradoxically, it also prevents people from being relativistic. The aim is to overcome mutual indifference and ignorance.

Keywords: artificial intelligence; dialogue; mutual enrichment; theology.

In one of the Frankenstein films, creator Victor Frankenstein finally meets his creature, and the creature remarks: "I can speak, I can learn, I can think. But do I have a soul, or have you forgotten to build it in?" (*Mary Shelley's Frankenstein,* 1994).

This dialogue between creator and creature is a good image for the dialogue between science and theology. On the one hand, scientists, with their hunger for knowledge and analysis, often display a lack of concern for the consequences of their work. In their research they look for materialistic explanations of such concepts as "soul" (e.g., Frankenstein thinks that the soul emerges from the complex relationships between the different parts of the body) and that scientific research cannot provide answers for questions like that of the creature.

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On the other hand, experts in the humanities, anticipating the conse-quences of scientific work, intuitively feel that a purely rational interpre-tation of the world is wrong (e.g., the creature knows how Frankenstein built him but still feels that he should have a soul. In consequence, they try to prevent scientists from doing research in areas beyond our intui-tive boundaries.

In my opinion, such a dialogue between science and the humanities will fail because neither side is able to understand the other. The world-views of science and the humanities are incompatible on this level. Sci-entists, for example, often say that this dialogue is not necessary because the humanities are more or less irrelevant to scientific research. But I think that both sides can learn from each other to face the fact that there is more than one possible interpretation of the world and that no single interpretation can be proven right or wrong.

What I am trying to do, therefore, is to build a framework for a dialogue that makes it possible for each side to accept the other side and its worldview. I have chosen one example from each side—theology from the humanities and artificial intelligence (AI) from science—and I am trying to lay the foundations for a dialogue between them. I am optimistic enough to think that most of the problems arising in this dialogue would occur in any dialogue between scientific and humanistic perspectives, so that solutions suggested here may prove helpful else-where as well.

EPISTEMOLOGICAL PRESUPPOSITIONS

Theology and AI are strong examples of their respective camps. On the one hand, theology is a part of the humanities to which people have heavy emotional commitment. On the other hand, AI is a part of cognitive science based upon the whole positivistic ideal of objectivity and proven truth. AI works not only with objects in the natural world but with the computers and machines that often seem more real than nature.

No doubt people will always work in the disciplines of the humani-ties. So creating a framework for a dialogue between science and the humanities means making it possible for people in these different camps to talk with, listen to, and understand each other. I can find some preconditions for the success of this dialogue in the work of Thomas S. Kuhn. Kuhn's book *The Structure of Scientific Revolutions* (1970b) has been much discussed since its first edition appeared in 1962. In describing the development of scientific disciplines he ad-vanced the concept of the *paradigm*: a system of general examples,[1] symbolic generalizations, laws, values, and nonempirical assumptions which create a scientific community and hold the members of this community together.

A revolution begins when single scientists break from this group and question the main assumptions of the present paradigm. If their questioning is reasonable a paradigm shift may occur. In this case a coterie of scientists creates a new system leading to a new paradigm. The members of the scientific group supporting the older paradigm have the choice of moving their scientific opinions towards the new paradigm or staying in the old one and losing their status within the scientific community.

Kuhn outlines the following causes of a paradigm shift:

- The new paradigm can solve problems that were not resolvable within the previous set of hypotheses. This criterion is the most important one, as a revolution will only happen if there are several unsolved problems and anomalies in the old paradigm.

- The predictions made within the new paradigm are more accurate than those made within the old one.

- Aesthetic arguments can sometimes promote a new paradigm. It will gain appeal if it is purer, clearer, and simpler than the older formulation.

- External considerations also can play a role. A scientist's background, life experience, or personality may influence loyalties. The charisma or reputation of a scientist who radically questions the current paradigm can move other scientists to make the shift as well. Finally, religious views and personal worldviews may promote a shift. (Kuhn quotes in this context Kepler's sun worship, which led him to the heliocentric worldview of Copernicus.)

In Kuhn's analysis, therefore, a scientific revolution may happen, for both scientific and metaphysical reasons. Because of the metaphysical aspects of the scientific world, Kuhn uses the word *faith* instead of *belief* to describe the attitude of scientists toward their worldview. Consequently, he names a paradigm shift *conversion*: "after a revolution scientists are responding to a different world" (Kuhn 1970b, 123). A paradigm shift is an apparent shift in the worldview of a scientist, including both scientific and emotional commitments.

The revolutionary character of a paradigm shift can be explained in terms of epistemological circularity: a scientist who steps outside of a system and radically questions its assumptions necessarily creates new assumptions that eventually will lead to a new paradigm.[2]

Following Kuhn I can express my main thesis by saying that researchers in any scientific field include their beliefs and hidden assumptions in their scientific worldview, so that one can find in every field unquestioned assumptions and unproven presuppositions. In theology those presuppositions tend to be obvious. But in AI they are hidden behind the positivistic belief that science is objective and without subjective elements.

Therefore, the most important part of my research is to prove the existence of these unquestioned assumptions in AI and to show their consequences for the worldview of AI.

THE METAPHYSICAL PARADIGM OF AI

Even without an exact definition or understanding of intelligence, artificial intelligence (AI) can be understood as a science that tries to build and program computers and/or robots so as to give them abilities and features that we intuitively call intelligent.

This definition of AI is vague. But to arrive at a more exact definition is difficult because the discipline is very young and many hopes and emotions are attached to it. In a German computer magazine, the term *AI* was described as a magic word that could lead usually dispassionate computer scientists into romanticized gushing (*DOS* 1988, 71). For example, AI has been described as "a turbulent, exciting, audacious research area with a multitude of different approaches and influences that should continue to gain in credibility and importance in the years to come" (Cercone and McCalla 1984, 289).

As interest in AI research has blossomed, two main concerns have evolved that shape its future:

- The first concern of AI is to build intelligent tools that will support man's and woman's work. These tools must be flexible, able to learn and to develop their abilities. They should contribute to more fields than computers "normally" do.

- The second concern of AI is to find out something about human intelligence by building intelligent computers or robots and watching their behavior (Brooks and Stein 1994, 7–25).

Both concerns are very ambiguous. On the one hand, it is fascinating to think about building machines with all the abilities of human beings —a very old dream of humankind. Also, we are intrigued by the possibility of analyzing exactly what's going on in us! On the other hand, both concerns are frightening. Many people fear that achievement of the aims of AI would threaten to make humanity both unnecessary and irrelevant.

These ambiguous feelings can be discerned in the Frankenstein story. Also, biblical tradition and Greek mythology tell us that gods and creators take offense when their creations try to imitate or exceed them (e.g., the tower of Babel and Prometheus stories) (Foerst 1995, 70). In current AI research we are the creators, the computers the creations. Yet, we fear that one day those computers will overtake us. This fear exists in an unhappy tension with the main appeal of AI—that we, like gods, can create intelligent beings. This ambiguity lies behind the strong emotions that arise in discussions of AI.

The main presupposition of AI is revealed in its second goal. One can only find out more about human intelligence through building intelligent computers or robots *if* they and human beings are potentially identical: if the relationship between the two is one of isomorphism. If this is true, then it is possible to emulate all human abilities on a computer and to replicate all human bodily skills in a robot. The behavior of the chosen technical entity thus can inform us about the structures of human intelligence. Such research could be very helpful on many levels (e.g., to check psychological theories or to remediate physical disabilities).

Technical entities are human-made. They are fully understood and can be analyzed and duplicated. By assuming isomorphism, researchers in AI interpret humans as technical entities of this kind.

At present the human body seems far beyond understanding; it is impossible, for instance, to correlate neuronal acitivity with intelligent tasks. Yet, AI researchers believe that their research supports the scientific approximation of a complete analysis of humans. They believe that there is a mechanistic and functionalistic explanation of everything that is going on in humans—and also in animals and in everything that happens on earth and in the universe. Only if one interprets the world and humans in a pure mechanistic fashion can one infer from a computer's or robot's behavior back to humans.

The assumption of a potential human-machine isomorphism has empirical evidence and within cognitive science seems to be reasonable. Nevertheless, this assumption is dependent on another assumption: that the empirical world is the only world that exists. This empiricism in AI also rests upon the so-called correspondence theory of truth; Thomas Aquinas described this theory with the words *adaequatio intellectus et rei.*

According to this theory, truth is the correspondence of sentences—and theories—to facts. Many AI proponents seem to assume that the combination of all scientific theories could provide a complete description of the truth: reality can be analyzed completely, and true and objective statements can be made about nature. Whenever a little part of reality is analyzed through experiment and thereby becomes a theory, a statement, it becomes a part of this objective reality.

Similarly, AI researchers try to simulate simple parts of human intelligence—e.g., learning, visual recognition, problem solving, heuristics. Because they implicitly support the correspondence theory of truth, they understand each of those modules as an emulation of the reality of the mind. Finally, they believe that when they put all these modules together, they will have produced a perfect simulation of human intelligence.

The philosophical problem arises when the qualities we have intuitively understood as uniquely human—individuality, subjectivity, or

"being a historical person"—are thus reduced to physical and objective forms. Conceptually, they say, such reduction opens the door for the creation of self-conscious AI systems. In other words, an intelligent AI system which had good techniques of representation and good learning strategies would also be "subjective" and "individual" and—after a time—would have its own history. And with the addition of self-reflection modules it would—within its history and individuality—become self-conscious.

With this understanding of humankind, AI not only supports Frankenstein's view of his creature but expands his theory, claiming that Frankenstein himself cannot be qualitatively distinguished from his creature; that he is, like his creature, a mechanical entity consisting of various mechanical parts.

THE ARGUMENTS OF THE OPPONENTS

People may find this self-understanding terrible, and try to prove this anthropology all wrong. But in their attempts, they simply discard the AI worldview with its presuppositions and replace it with opposite assumptions. The presuppositions of AI are judged wrong, those of its opponents right.

However, theologians need to face the fact that many arguments and many scientific discoveries support the AI worldview. For example, biologists are discovering more and more hormones or enzymes associated with particular feelings; neurologists have discovered brain acitivities that they correlate in a similar way. Thus, they interpret feelings as kinds of physical representations, much like the bit strings in a computer. It is not possible to prove this anthropology wrong; it is self-consistent and appropriate to scientific research. And whenever AI opponents have proposed a limit for computer abilities, computers eventually have surpassed it.

As scientific knowledge increases, arguments based on gaps in knowledge are defeated. Even more important, people from the AI camp cannot take seriously their opponent's insistence on a qualitative difference between humans and machines, for which there is no evidence within the scientific and empirical worldview of AI.

AI can easily ignore opponents because it has enough money for its research, while theological and ethical research has less funding and generally is not well integrated into scientific research. Therefore, one must ask:

• How can one settle the debate between supporters of AI with their worldview and opponents with their worldview, in which any mutual understanding is impossible? How can mutual prejudices and animosity be overcome?

Furthermore, there is no need for people from the AI camp to actually talk to theologians and philosophers, for in the context of power within academia, people with a theological or philosophical worldview are in a much weaker position. Therefore, one must ask:

*   How can people from AI—or any other scientific camp—be motivated to talk to people with a different worldview? How can one demonstrate to them that theological insight into humankind is not simply another worldview, but a storehouse of wisdom that can be combined with their understanding of humankind and can enrich their work?

THEOLOGY AS DIALOGUE PARTNER

The feelings surrounding AI have much to do with understanding ourselves—thus, these kinds of feelings will arise in people who work in either theology or AI. So crossing the divide between them seems to a great extent to involve a dialogue between their respective anthropologies. We can find the seeds for such a dialogue in the theology of Paul Tillich.

The main thrust of Tillich's theology is an attempt to talk with other humanities (e.g., philosophy and psychology). During his time at Harvard Divinity School he gave well-received lectures at the Massachusetts Institute of Technology, relating theology and the cognitive sciences. He was concerned with walking the boundary (one of the most important expressions of his theology) between the two, and not coming down on one side or another.

TILLICH'S CONCEPT OF SIN.   As a Christian, Tillich presupposes a very close relationship between God and humankind. He assigns to human beings two main states of being: First of all, a human being is a creature. God created man and woman in his image, so that every human being has the same value. Second, knowing that he or she is a part of the whole creation, a person feels responsible not only for himself or herself, and his or her neighbors, but also for the whole environment.

But this ideal picture is far from reality! The biblical story of Adam and Eve describes the Fall as their eating from the tree of knowledge of good and evil—they wanted to judge, to use their minds to decide what is right or wrong. Adam and Eve had to eat from this tree in order to realize their human nature. Before they ate, they had been in a state of "dreaming innocence." It was their fate that they could not behave differently, but on the other hand they really chose this behavior.

This correlation of active and passive elements leads Tillich to use the old-fashioned word *sin* instead of the more popular word *estrangement*. Estrangement refers only to the passive element, or fate; but sin also connotes the active element: we all, every day, act to estrange ourselves.

According to Tillich, this correlation of guilt and fate influences our whole life; the consequences of this correlation can be seen in the ambiguity of our daily lives and in the estrangement from God, our neighbors, and ourselves. Tillich gave many examples for this ambiguity of life. He showed it to lie fundamentally in the inability of human beings to live with polarities and dualisms.

For Tillich there are three fundamental polarities: individualism and participation, dynamics and form, and freedom and fate.

Individualization and Participation.   This polarity pits the wish to be an individual, to be someone special, against the wish to be part of a community and to adjust oneself to it. This tension leads humankind to morality, because we have to grapple with those different wishes and also to deal with being an individual on the one hand and a social being on the other. In the Bible this polarity is described in the dictum "Thou shalt love thy neighbor as thyself."

This polarity leads to two kinds of fears: (1) that one is too individual and may therefore lose one's group membership, one's social ties; (2) that one is too socially driven, putting one's personality and individuality at risk.

Dynamics and Form.   The wish to experience the new and even to leave behind all rules and traditions opposes the wish to live in structures, to be safe in traditions. This polarity leads humankind to culture. It creates new forms and epochs, which in turn lead to new styles and more new epochs. Again, two fears emerge out of this polarity: (1) fear of anything new, of losing one's roots; and (2) fear of being "stuck in a rut" and never experiencing anything new.

Freedom and Fate.   The wish to be responsible for all decisions, to use one's own free will, is unavoidably restrained by the knowledge that all freedom is relative because every decision is influenced by causal laws. This polarity leads humans to religion.

Related fears here involve (1) apprehension of the consequences of one's own decisions, and fear for responsibility, on the one hand; (2) fear of not being responsible, or of being controlled by something or someone else.

We can draw an anthropology from this theological discussion of sin. Human life can be described through its dealing with those polarities and fears and its inability to find a balance. At every point of human existence there is a risk of ignoring one partner in the polarities described above and absolutizing the other—a phenomenon that Tillich names *sin*.

When facing the question of sin, Tillich referred to justification, to the "Yes!" God says to every human. Martin Luther was the original

formulater of this theory. His so-called Reformation discovery was the recognition that "God's justice" does not mean that God judges humans. Instead, God makes them just; accepts them the way they are and gives them dignity. In the ongoing relationship between God and humankind, it is God who takes the first step. One cannot think of a god who can be reached by human effort or empirically proven; a god like this would be available to be manipulated. This is contrary to the Christian idea of God. But humans are free in their reaction: they can accept this revelation or they can deny it. God's gift of faith can be resisted by men and women.

Protestant teachings about justification recognize that no one is able to live with this acceptance of revelation and its consequences. In other words, even if God accepts everybody, humankind is still estranged from God, from the neighbor, and from self. Even people who recognize justification still live in the polarities described above. But at the time one experiences justification, there is a moment of wholeness. This time of grace gives one security and faith (cf. Luther [1520] 1982).

Released and salvaged in the knowledge of being accepted by God, one gains what Tillich calls the "courage to be"—the courage, not to ignore polarities, not to simplify life, but to live it with all its positive and negative aspects, with all its bright and dark sides, and to enjoy its multifarious variety.

AI AND SIN

Now, how does AI deal with the polarities?

- AI interprets individuals as systems. Within this understanding of humankind, a community represents a new, larger system in which single persons act as subsystems. All problems of interpersonal contacts can, therefore, be reduced to systematic principles.

- Dynamic phenomena can be interpreted as chaotic in nature. Chaotic elements happen to appear especially on the quantum mechanical level, where predictions are impossible. At other levels, the presence of many chaotic variables makes predictions difficult or only statistically satisfying. But the appearance of chaotic elements does not necessarily destroy a mechanistic worldview.

- In the worldview of AI, freedom is actually nonexistent because everything that happens can be explained in a mechanistic and functionalistic fashion. Because prediction is difficult or impossible, people may have the illusion of free will; yet if situations could be analyzed completely it should be possible to give an exact and complete explanation of all mechanisms that led a human in a given context to a specific decision. In AI, one proof for this theory is the inability to

predict computer or robot behavior after a certain level of complexity is reached.

Thus, one can conclude that AI resolves the Tillichian ambiguities by explaining them in functionalistic and mechanistic terms. However, AI itself presents many other ambiguities. For example, there is the distinction, described by Tillich, between self and thing. All technological objects are things and nothing more, having absolutely nothing to do with subjectivity. But AI has the hope that computers will increasingly converge with humans. Tillich would argue that AI gives computers a self and subjectivity with this hope. Conversely, AI proponents hope to analyze humankind completely. But if one could reduce human personality and subjectivity to computational and mechanistic processes, one would interpret humans—and thus the AI researchers themselves—as objects.

FRAMEWORK FOR A DIALOGUE

Tillich would now conclude that AI researchers, having made themselves objective, are estranged. Within his framework, Tillich would interpret the AI worldview as a consequence of sin, as the inability to deal with polarities, as the attempt to flee from these polarities into a worldview where everything is objective and to be analyzed. The main fears of human life can thus be rationalized away.

The emotionality of the AI debate may result, not only from the fears of AI opponents, but also from those of AI supporters: fear of living with polarities for which there is no static solution and never will be.

At this point a danger arises: the danger of being trapped once again in the fruitless argumentation described above. If one accepts Tillich's concept of sin, one can now show that the worldview of AI and especially its understanding of humankind is necessarily wrong; it can be seen as a result of sin. Naturally this outlook will make people from the AI camp feel unaccepted and misunderstood. Every dialogue with them will fail as they fall back upon the claims of their own worldview.

THE COURAGE TO DOUBT

Remembering the doctrine of justification, one can avoid this danger by realizing that the courage to be is given with faith. Because estrangement still remains, faith and doubt belong together. The security that comes with faith will provide the courage to doubt oneself radically.

A person who feels unsafe and insecure will cling to one worldview and refuse to think about the possibility of its falseness. But a person who is safe in God-given faith can afford to doubt a worldview. In the

belief that the presupposed relationship between God and oneself is stable, one can even doubt the existence of any god!

It is exactly this tension that overcomes the impasse between AI supporters and opponents. The following recommendations aim toward this end.

- Both dialogue partners need to admit the circularity of their own assumptions. This awareness will lead them to the insight that their own worldviews do not describe human reality completely and can therefore be enriched by contributions from the other camp.

- They must also admit the emotional character of many of their assumptions, the hidden hopes and fears and their own emotional ties to their own discipline. These insights will help them understand the reasons for animosity toward and prejudices against the other discipline.

- This recognition should lead both partners to an awareness that their respective researches create a worldview in which any reasoning depends on these assumptions and is thus biased.

- They can then recognize the possible validity of other disciplines with other assumptions, other purposes, other hopes and fears. Such tolerance would not emerge if they were to lack insight into the religious character of their attitude toward their own discipline and its assumptions.

- They are now opened to insights about reality from other academic disciplines. These insights can enrich and enlarge their own understanding of humankind.

- This enrichment includes the ability to entertain doubts about their own worldview while still being fully convinced of its validity.

- Constructive mutual enrichment will be the consequence of the dynamic arising from the polarity of being convinced of one's own worldview, having faith in it, and at the same time doubting it.

THE DIALOGUE AND ITS RESULTS

In the security of faith, theologians can venture to understand the AI worldview, which does indeed raise radical questions about the intuitive understanding of ourselves. They can be open towards people who believe in an AI worldview and need not be fearful in doing so. They can support the analysis of the mechanistic correlations between machines and humankind (for which, in my opinion, AI is a very good tool) in order to get better insights into who we are, what we are, and how we may understand ourselves. But at the same time, theologians will be aware that this worldview is built on the belief that the world can be described fully and completely in mechanistic terms, and they know that

this assumption—like the assumption of an ongoing relationship between God and humans—can be proven neither right nor wrong.

On the basis of justification, theology can advance its own understanding of humankind, asserting human dignity, the value of each person, the worth of each individual; the value of society, of friendship, of human interaction; the importance of moral thoughts and of cultural development; the notion of responsibility and the hope of changing the negative aspects of life. These concepts do not represent a purely mechanistic anthropology; they are the consequences of theological understandings of humans—and of the intuitive self-understandings of most people in this world.

By thus positioning the theories of *both* camps, we may reach a mutual enrichment and a mutual recognition of the limits of each field. Theology cannot address the questions of how the brain works. Theology also cannot give new insights into the underlying mechanisms of human persons. On the other hand, AI cannot address questions about the meaning of life. It cannot support humans in their intuitive understanding of themselves or aid in their struggles with their ambiguous and fearful life.

Theologian's courage to doubt, therefore, can lead both people from the AI camp and people from the theological camp to create, all together, a common perspective on reality in which both sides play their important part! In being justified, both sides will learn from each other; they will know that neither worldview describes human life completely and that other worldviews can contribute new insights to their own point of view.

The desired result of a dialogue within this framework would be acceptance, by people in both AI and theology, that their incompatible worldviews can be proven neither right nor wrong. Both sides can enrich each other, providing additional insight into the mystery of humankind—and Victor Frankenstein and his creature can finally become friends. Frankenstein will be able to accept that his creature—for him a kind of machine, an objective thing—has in fact become a human being with subjectivity, with ambiguities, with the need to be respected. The creature is able to understand Frankenstein and his wish to build it and can accept itself as a creature—like the rest of creation.

NOTES

1. Kuhn often names these general examples *paradigms*, thus using the term *paradigm* with a double meaning (Kuhn 1970a). I will use the term only in its first, broader meaning.

2. Kuhn himself does not refer to Kant; in fact it seems that he more or less ignores the whole epistemological discussion of circularity. This failure possibly reflects the fact that after Kant, the whole problem of epistemological circularity apparently no longer was understood (Habermas 1969, 48–103). Many Anglo-American academic disciplines (the sciences much more than the humanities) stand in the tradition of the Vienna Circle and positivism. This school often criticized Kuhn and his theory as subjective and irrational (Popper 1972). I will not pursue this debate, as it goes far beyond the scope of this paper.

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