THE DOCTRINE OF THE TRINITY AS A MODEL FOR STRUCTURING THE RELATIONS BETWEEN SCIENCE AND THEOLOGY

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Abstract. A strategy for dealing systematically with such complex relationships as those between science and theology is presented after a brief overview of the historical record and illustrated in terms of the concept of divinity. The application of that strategy to the title relationships yields a multilogical/multilevel solution which presents certain analogies to or isomorphisms with the doctrine of the Trinity. These concern mainly the multilogical/multilevel character of both conceptualizations and the relational and contextual reasoning required to conceive them. Furthermore, certain characteristics of the doctrine facilitate the dialogue between theologians and scientists on account of their similarity with such scientific concepts as diversity in unity, multiplicity of relationships, nonseparability, and nonclassical logic.

Keywords: cognitive complexity; epistemology; logic; metaphysics; science and religion/theology; systematics in the context of discovery; thought forms; Trinity.

A bewildering variety of conceptualizations has been proposed to characterize the relations between religion and science.[1] It is not too surprising therefore that none has become fully consensual.[2] It is agreed, however, that the discussion must draw from *three* disciplines (e.g., Barbour 1990, 3; Russell, Stöger, and Coyne 1988): science, theology (reflecting on religious life), and philosophy (particularly regarding epistemology and metaphysics).

One epistemological approach is via historiography, that is, trying to understand what actually exists from the process of its becoming

that way. As will be seen, in the present case that exercise is helpful, but not too conclusive. Explanations cannot be based on historical analysis alone but also must consider the presuppositions introduced; deliberately or unwittingly, they color the perceived relationship. That leads one to thematize the role of presuppositions and to continue from there.

RELIGIOUS BELIEFS AND SCIENCE IN HISTORICAL PERSPECTIVE

John Hedley Brook (forthcoming) argues that in order to study the historical perspective we need a map that sets out at least three dimensions: (1) different levels of interaction between religion and science, (2) types of theological discourse (which depend on differing functions), and (3) types of scientific discourse (again depending on various functions). For the present purpose it must suffice to point out the diversity pertaining to each dimension. In his volume *Science and Religion*, Brooke (1991) deals above all with the first dimension, the different levels of interaction. In his keynote address to the First International Pascal Centre Conference, Brooke (forthcoming) distinguishes and partly illustrates eight such levels: religious belief (*a*) as a presupposition of science, (*b*) as a sanction for science, (*c*) as a motive for science, (*d*) in its selective role, (*e*) as regulative principle, (*f*) in its constitutive role, (*g*) as a source of ethical values impinging on science, and (*h*) as a reference for discussing scientific methods. As to types of theological discourse, the second dimension, Brooke (forthcoming) distinguishes between the theologian as exegete and as evangelist, as systematist and as apologist, as pastor and as preacher. Similarly, as regards types of scientific discourse, the third dimension, he sees the scientist arguing from various standpoints: as investigator, as reporter, as popularizer, as philosopher, and as preacher (for scientism).

Concerning the need for such a systematization, Brooke points out that "during their history, the natural sciences have been invested with religious meanings, with antireligious implications, and, in many contexts, with no religious significance at all" (Brooke 1991, 16). For instance, Newton described himself as a natural philosopher whose business was to discuss such questions as the attributes of God and His relationship to the world (Brooke 1991, 7). Would Newton then not have found an explicit discussion of the relations between separate domains of religion and science to be rather artificial? To discuss such complex relations, which involve the very definitions of religion and science, an intricate framework is required.

Brooke (1991, 7-8) also points out the shifting boundaries between science and religion/theology in the course of history. For instance, Augustine, Thomas Burnet in the late seventeenth century, and present-day writers each in turn have been tempted to blame their predecessors for having invoked inappropriately the authority of Scripture in disputes about the natural world. One reason for this is that the domains of "science" and "religion" were separated by different boundaries in different historical periods, but that later generations have not necessarily been aware of the shifts. Social and political circumstances also have had and continue to have an impact on the relations under discussion (Brooke 1991, 8-11). For instance, if Galileo's writings had not occurred during the Counter-Reformation, would the Church have taken the stand it did? Similarly, would the response to Charles Darwin's writings have been the same if they had not appeared when conservatives still felt threatened by the sequels of the French Revolution?

Thus it is not too helpful to discuss a decontextualized "universal" relation between science and religion/theology. To progress, an analysis of the relevant presuppositions persons adopt (unwittingly) and a more systematic approach in the context of discovery are proposed next.[3]

RELATIONS BETWEEN SCIENCE AND THEOLOGY: PRESUPPOSITIONS

Present Situation and Consequences.   Science and religion cover not merely ideas and beliefs, but also institutions, practices, social processes, methods, and so on. That makes it difficult to speak about an all-encompassing model of their relationships; one that covered all aspects of interest throughout history might well become vacuous. However, the different aspects of religious (and scientific) life usually presuppose a structure of shared beliefs.[4] In what follows we primarily focus on those beliefs shared by fellow "members" when referring to "relationships" of science and religion/theology. Among the more commonly discussed relational models are conflict, independence, dialogue, and integration (Barbour 1990, 3-30). Which of these characterizations is considered appropriate depends primarily on one's presuppositions (and on the complexity of the argumentation). Thus scientific materialism, but also biblical literalism, easily leads to *conflict.* If religion is considered mainly as a matter of emotion linked to certain revealed truths, and science as the rational exploration of reality, each discipline having its own methods and language, the relationship may be seen as one of *independence.* If one starts from the assumption that the existence of a universe created by God calls

for a coherent worldview (providing intelligibility and meaning) that includes religion and science, then *dialogue* is not far away. Finally, if one posits that religious traditions need to be reformulated from time to time in the light of current (established mainstream) science (e.g., Wildiers [1977] 1982), *integration* is the word, leading—in the areas concerned (in particular creation, providence, and human nature)—to an aggiornamento. From a wider understanding, one might even argue that a *mutual readjustment* is called for periodically (e.g., Russell 1994).

Choices Made Here. Our first task then is to discuss and adopt basic metaphysical orientations and philosophical assumptions. What are some of the options? In an age of Gödel's theorem, Heisenberg's indeterminacy principle, chaos theory, and postmodern relativism, we may first ask, What can we know about reality, if anything? One option is provided by radical constructivism:[5] At best we can know what reality is not. Another broad option is given by the various shades of realism. While not denying that even today radical (classical) realism has its followers,[6] I adopt a conjectural/hypothetical, skeptical and qualified, or critical realism (cf. Drees 1994, 117-24).[7] Whereas data and experience count, the importance of a foundational concept is recognized.

In answer to the question, Which kind of worldview is it to be? I see basically three possibilities. First, one starts from the human person and broadly assumes that things are *not* without us. The required categories then include freedom, communication, historicity (Karl Jaspers), and so on. Second, one starts from the world and broadly assumes that things exist in themselves, *without* us. Third, one attempts to provide a framework that can house conceptually and with their particular categories the human person and humanity in its entirety, the universe, an Ultimate Being, and their mutual interaction (cf. Arbib and Hesse 1986). The choice then is between an encompassing philosophical system such as Whitehead's and a federated system of specialized "local" systems. I opt for the latter (cf. Welker 1992, Introduction).

Within a specialized context one usually adopts (unwittingly) a foundational concept both as a basis for detailed theoretical and empirical research and as justification for one's acts (e.g., Overton 1992). To illustrate: a foundational concept of most (early) cultures consisted in the division of the universe into holy and profane entities and areas, with appropriate behavioral rules pertaining to each (cf. Exodus 3:5). Another widespread concept from early times posited the existence of particularly significant (holy) numbers (as distinct

from numbers that carry "objective" meaning like the lengths of pipes or strings in musical instruments, or the dimensional ratios in aesthetics).[8] Roy A. Clouser (1991) discusses the consequences of assuming different foundational concepts in mathematics and physics, Bernard d'Espagnat (1991) in quantum theory.[9] James W. Fowler (1992) elaborates on the importance of an orthodox or a progressive "temper" in religion or politics. Each temper implies a wide range of differing positions.[10]

In the present context my preferred foundational concept has been that of "complementarity" (Reich 1990, 1992, 1994b), which in this sense involves the joining together of "contradictory" partial explanations for the understanding of the explanandum, symbolizes unity in diversity, and goes beyond the argumentative limits set by classical logic, in particular as regards any intrinsic linkage between the various partial "theories."[11] In my view, complementarity still is a fruitful heuristic (cf. Magnin 1993). However, some persons associate the concept primarily with quantum physics (or sometimes even only with its historical development), others with class-set logic, others with an intellectually nonrigorous analysis, and yet others with weak decision making. It seems that it would be didactically preferable to use a foundational concept which embodies (most of) the useful aspects of complementarity yet is less ambiguous and more familiar, in particular to theologians.

On which criteria should we base our choice of that foundational concept? I propose two: (a) adequacy to deal with that part of Brooke's findings which is under dicussion and (b) heuristic potential. Other things being equal, that potential is greater for a foundational concept in the form of an analogical model.[12] J. Robert Oppenheimer wrote,

Analogy is inevitable in human thought, because we come to new things in science with what equipment we have, which is how we have learned to think, and above all how we have learned to think about the relatedness of things. We cannot, coming into something new, deal with it except on the basis of the familiar and old-fashioned. . . . Science is an immensely creative and enriching experience; and is full of novelty and exploration; and it is in order to get to these that analogy is an indispensable instrument. (Oppenheimer 1956, 129–30)

For reasons which will become clear shortly, the doctrine of the Trinity is here proposed—at least for certain aspects—as a foundational concept/analogical model.[13] To anticipate: generations of theologians have wrestled with the concept of divinity and have accumulated treasures of reflections and conceptualizations, particularly as regards the doctrine of the Trinity, refining the thinking tools

in the process. A first reason to focus here on that doctrine is thus the wish to make use of the centuries of experience gained in dealing with a complex conceptual problem in theology in coming more deeply to grips with the relations between science and religion/theology as a conceptual problem. Second, there are some indications that the doctrine also may be useful as an analogy in a more "material" as opposed to a procedural manner. The steps of the argumentation are as follows: (1) a systematic strategy for evolving a conceptual frame in the context of discovery is presented and illustrated in terms of the concept of divinity, (2) that strategy is applied to the relationships we are discussing, (3) the result is compared to the doctrine of the Trinity and analogies and similarities are brought out.

A STRATEGY FOR CONSTRUCTING CONCEPTUAL FRAMEWORKS

The initial construction of conceptual frameworks, and at times later changes, is in the traditional view not infrequently shrouded in mystery: the researcher simply has a hunch or an intuition. Taking the cue from William Bechtel and Robert C. Richardson (1993), a more systematic general strategy applicable in the context of discovery is illustrated in the idealized flow diagram shown in figure 1. My changes concern mainly the description of choice point 4 so as to generalize its applicability. Whereas this chart is based on case studies of research on complex natural systems, in its generalization it seems potentially applicable also to conceptual work. First, however, a word on the key terms *decomposition* and *localization* is needed:

> Decomposition allows the subdivision of the explanatory task so that the task becomes manageable and the system intelligible. Decomposition assumes that one activity of a whole system is the product of a set of subordinate functions performed in the system. It assumes that there are but a small number of such functions that together result in the behavior we are studying, and that they are minimally interactive. . . . Localization is the identification of the different activities proposed in a task decomposition with the behavior or capacities of specific components.
>
> Decomposition involves establishing a division of labor according to which different tasks involved in the same overall process are identified. Localization entails a systematic and independent examination of the [various] processes . . . and a demonstration that these processes perform the functions specified in the decomposition. (Bechtel and Richardson 1993, 23–24, 119).

When dealing with complex systems, it may be necessary for the sake of efficiency to assume that the system is nearly decomposable, at least as a first step, given the resource limitations of human beings.

Begin → Segment a system from environment ⟸ Collateral theories suggest natural divisions

Segment differently

(1) Is the system locus of control for the phenomena in question?

N — Choice point 1 — Y

If needed

Go into system

Holistic approach required ← N — Choice point 2 — Y

(2) Are decomposition and localization appropriate?

Proceed to actual work

Analyze system into components ⟸ Collateral theories suggest reasonable analysis

Choice point 3 — N

(3) Is simple localization adequate, i.e., can different system activities be localized in different components? Does a single logic suffice?

Y

First order independence of subsystem activities ← Localize

First order interaction at higher level ← N — Choice point 4

(4) Can phenomena be described/explained in terms of a multilogical/multilevel system?
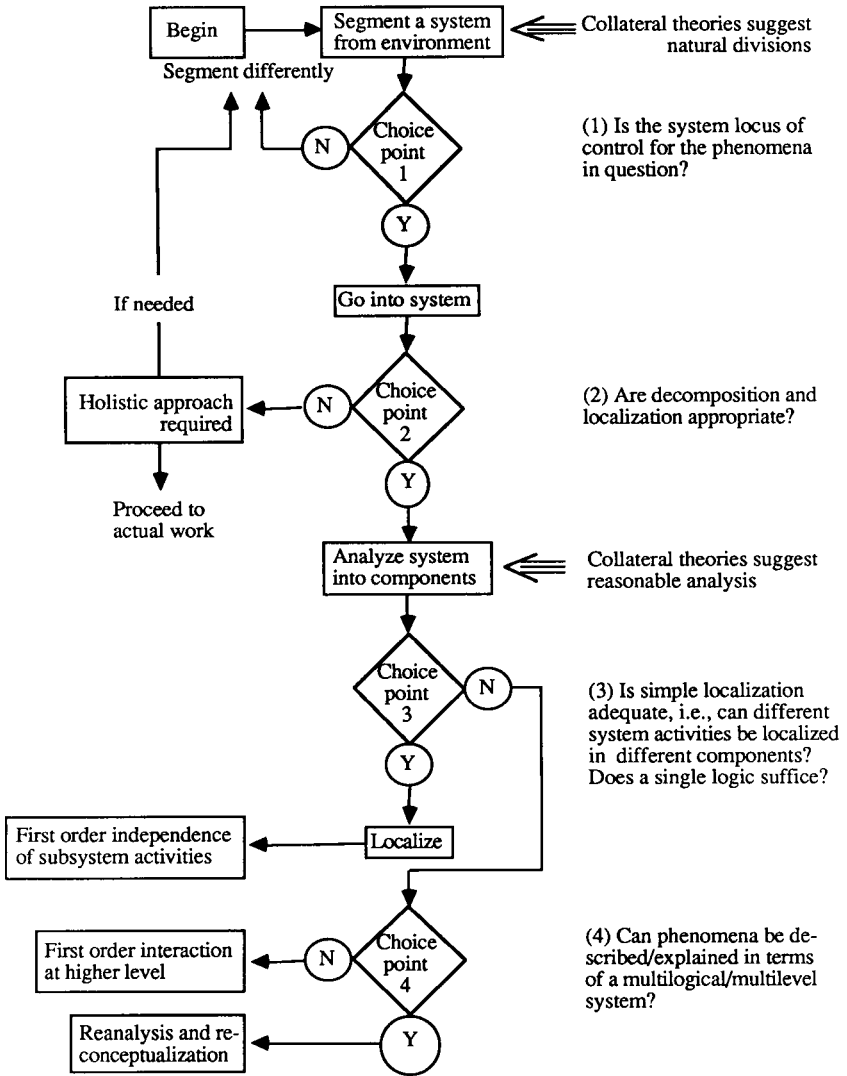
Reanalysis and re-conceptualization ← Y

Fig. 1. Approach to analysis of a phenomenon and theorizing about it through tentative decomposition of a relevant, controlling system into localized, functionally discrete components (based on Bechtel and Richardson 1993).

(Bechtel and Richardson 1993, 149). However, the possibility that one is facing a nondecomposable, connectionist system should be kept in mind and follwed up vigorously should indications point that way.

The initial choice in a research program (choice point 1 of the diagram) aims at segmenting a system from the environment such that the locus of control of the function(s) under study falls within that system. To illustrate this in terms of historical concepts of divinity: If one started out with just the Divinity, it soon would become obvious that the Divinity's relations to the world and in particular to human beings need to be included, as does the history of those relationships. Otherwise the Divinity will in all likelihood lack existential relevance for both communities and individuals. In contemporary Christian theology it has become clear that (in contrast to certain medieval teachings) the doctrine of God needs to be discussed notably in the context of (continuing) Creation and Redemption.

At choice point 2 the researcher has to decide whether decomposition and localization present a reasonable possibility. A candidate for a clear negative answer would be pantheism; if divinity is simply part of each component of the world (which includes living beings), then a "systematic and independent" examination of processes located in different parts makes much less sense than an analysis in terms of a connectionist self-organizing system. In contrast, polytheism, in which each god has a defined activity domain, is a good candidate for decomposition and localization.

At choice point 3 the search is for simple, direct localization involving basically a single logic. Thus, the polytheistic concept of God is analyzed in detail and the precise relationships between the various gods, other powers (such as Moirai, the fate in Greek mythology), and the world are established. That done, the aim is achieved.

However, if attempts at such simple localization prove unsatisfactory because (approximate) first-order independence does not obtain, searching for complex localization may follow at choice point 4. Such localization is multiply constrained; in the case of natural sytems, "it proposes a set of components that contribute differentially to systems function, and it incorporates independent constraints on allowable mechanisms from lower levels" (Bechtel and Richardson 1993, 125). In more general terms, we may face a system that calls for a multilogical/multilevel treatment. For some aspects of a system an Aristotelean type of logic may be needed, for other aspects a "logic of the *included* middle" (Kainz 1988, Magnin and Nicolescu 1994), and for yet others dialectical logic (the negation of a negation does not lead back to the point of departure). Depending on the issue, it

may be that the different logics underlie different levels of reality and/ or their connection(s).[14]

The doctrine of the Trinity illustrates such a case.[15] Whereas Augustine treated the internal relations between the three personae (God the Father, God the Son, God the Holy Spirit) on the basis of Aristotelean logic (LaCugna 1991, 82, 89), Thomas Aquinas became aware that such an approach did not yield satisfactory results and introduced a "logic of *real* relations" into the internal relations (*opera ad intra*), reserving Aristotelean logic for the relations between the Trinity and the world, the *opera ad extra* (LaCugna 1991, 153).[16] From the patristic beginnings in Christology (probably starting with Gregory of Nazianzus) the Greek term *perichoresis* was developed to designate the internal Trinitarian relationships. Its meaning becomes clear from its two Latin translations. *Circumcessio* (from circum-incedere) means to move around and refers to the dynamic part of *perichoresis. Circumsessio* (from circum-in-sedere, sitting around) refers to the static part. In all, these expressions refer to the way the three personae relate to each other and act together. As to the further subtleties of these terms and their uses and abuses the reader is referred to the literature (e.g., LaCugna 1991, 272–74; Johnson 1992, 220–22). More important in our context are the thought forms required to understand the non-Aristotelean logic of *perichoresis*. A recent empirical pilot study (Reich 1994a) demonstrated a clear correlation between that understanding and metalogical reasoning (Reich 1993), i.e., a grasp of the differences between various types of logic.

In the case of the Trinity, what are the "set of components that contribute differentially to systems function and the independent constraints on allowable mechanisms from lower level," referred to above as criteria for decisions at choice point 4? Robert John Russell (1994, 5–6) recently recalled the main arguments by Karl Barth ([1936] 1975), Elisabeth A. Johnson (1992), and Wolfhart Pannenberg (1991) as to the need for an understanding of God as an intrinsically differentiated unity (Pannenberg 1991, 405). This comes about notably because, according to Pannenberg, "Hebrew and Christian scriptures combine two distinct ways of describing eternity: as changelessness throughout all time and as inclusive of all time. God is unchanging, ever the same, as opposed to our mortal experience of being ever changing and corruptible. But *in addition*, the eternity of God embraces all time, all events, because eternity consists of unlimited duration. Thus eternity incorporates all that is past, present and future in the world into the totality of the divine life while preserving their distinction without corruption" (Russell 1994, 4–5). Barth ([1960] 1978, 611, 620) and Johnson (1992, 220–22), each in

his own way, make the point that the solution of the problem of that double description of eternity lies in the Trinitarian *perichoresis* (also Barth [1957] 1978, 593ff., [1960] 1978, 639).[17]

Although Arthur Peacocke's Trinitarian understanding differs markedly from that of Johnson, he too explains, albeit in a different way, the need for understanding God as a differentiated unity (Peacocke 1993, chap. 14). In the briefest of summaries, this comes about because of the need to conceive of God's being and becoming, of God's interaction with the world, of God's communication with humanity, and of what human being is constituted. God, a continuous and immanent creator, communicates to us through a human being, the complete person of Jesus Christ, and dwells in us as Holy Spirit (Peacocke 1993, 209, 211).

As a further illustration, Joseph Bracken (1991, 15, passim) argues from the standpoint of process theology that "only a Trinitarian understanding of God as a community of three divine persons who share a common field of activity with all their creatures allows for a genuine panentheistic understanding of the God-world relationship."[18] Bracken also points out that from a philosophical perspective the doctrine is itself an illustration of the relation between the One and the Many. The differing approaches by the Eastern and the Western fathers resulted in a tendency to subordinationism in the East (the Son and the Holy Spirit are not really fully God but are subordinated to the Father) and modalism in the West (God is Trinitarian only as far as God's outer works are concerned). The solution resides in the concept of *perichoresis*, which thus represents a new paradigm for the understanding of the One and the Many (also elaborated by Boff and Moltmann).

Finally, Karl Schmitz-Moormann argues for the Trinity from the perspective of natural theology. He first recalls that in many instances in the course of evolution a higher unity was built up from single "individuals": protons and neutrons from quarks, nuclei from protons and neutrons, atoms from nuclei and electrons, molecules from atoms, complex macromolecules from basic molecules, and so on to living organisms. Thus the Trinitarian God, the archportrayal of structured unity, seems to be the archmodel all nature seems eager to emulate (Schmitz-Moormann 1992, 130).

Thus we get a sense of how various ways of interpreting the doctrine of the Trinity illuminate various processes of reasoning at choice point 4. An additional article, if not more, would obviously be needed to show this in all desirable detail. The development of concepts for dealing with complex issues usually starts like this, in a simplistic way, and only with time and effort (and the development of more

adequate thought forms) reaches more sophistication (e.g., Bechtel and Richardson 1993; Piaget and Garcia [1983] 1989; Reich 1993).

APPLICATION TO THE RELATIONS BETWEEN SCIENCE AND THEOLOGY

We have already dealt with choice point 1: science, theology, and philosophy constitute the segment of interest. At choice point 2, two main options come to mind: either conflict/independence as candidates for simple decomposition and localization, or a holistic approach as advocated, for instance, by Pierre Teilhard de Chardin. For the following reasons none of these seems really satisfactory.

Conflict. This model implies that the objectives of science and theology are at least partly identical, and that in case of differing views only one can be correct. While there may be instances where this is true, as a general statement it is erroneous. First, science has limited itself to dealing with the world, whereas the central concern of theology is with God (the difference between "how the skies came about and work" and "how we can get into heaven," respectively— although God's involvement with *creatio* is a legitimate theological issue too). Second, to center on one simpleminded answer to a complex question usually indicates a low level of dealing with cognitive complexity.[19]

Independence. This model is at least partly true, as evidenced by Brooke's (1991, forthcoming) analyses. Yet as a generalization it does not stand up to scrutiny. If God is to have any meaning for leading one's life, there will be by necessity areas of overlap in anthropology and psychology, and possibly in cosmology, the theory of evolution, history, and so on. Once more, a failure to discover interconnections may be due simply to being at an early stage in a research program.

A Holistic Approach (Full Integration). This model does not observe the distinctness of science and theology; one might cite Albert Einstein's "*Der Alte würfelt nicht*" ("God does not play dice") as an argument in *physics*. As the distinctions between science and theology often are discussed in regard to evolution and Creation (e.g., Anderson and Peacocke 1987; Mc Mullin 1985) or cosmology (e.g., Drees 1990; Russell 1994), let us here illustrate the distinctive ways that religion/theology and psychology/neuroscience deal with religious experience (e.g., Peacocke 1993, 200–12).

We begin with Huston Smith's *Forgotten Truth* because of the encompassing approach used there. Drawing on the main religious traditions, Smith considers four levels of selfhood: the body, the mind, the soul, and the spirit. We concentrate on the latter two because they are more controversial. Smith states: "The soul (*psyche, anima, sarira atman, nepesh,* or *nafs*) . . . is the final locus of our individuality. . . . If we equate the mind with the stream of consciousness, the soul is the source of this stream; it is also its witness while never itself appearing within the stream as a datum to be observed" (1992, 74). This puts the finger on a major difficulty: How can one discuss the soul scientifically, if it is barely detectable by the methods of natural science? Smith's answer: We sense our soul (*a*) in our discernment of our individuality (we are the same person from conception to death) and (*b*) through its restlessness (1992, 75). The final object of the soul's desire is said to be "Being, if one thinks 'abstractly,' or God in his personal mode if one does not" (Smith 1992, 85–86). An adoring soul can lead to spirit. Spirit stands for the divine inside a human being (cf. Peacocke 1993, 211). It is mostly veiled by body, mind, and soul (Smith 1992, 87). "For Spirit to permeate the self's entirety, the components of the self must be aligned: body in temperance, mind in understanding (Gautama's Right Views), and soul in love" (Smith 1992, 92). The spirit thus may be unforeseeable by the mind.

As to empirical evidence about these four traditional levels, Smith (1992, 155–73) refers to Stanislas Grof's chemo-excavation by means of psycholytic (low-dose) LSD psychotherapy. Not only are the levels distinct, they also exhibit general characteristics. Whereas large variations in findings both intraindividually and interindividually are a characteristic of the body level, that is less true of the spirit level. Mystics have long anticipated the latter result; whatever their religious tradition, they were and are able to meditate together and have comparable (but not identical) experiences. One possible conclusion: "The nervous system is variably attuned to the spiritual realm" (Wulff 1991, 108).

What are theologians to do when they become aware that according to scientific research mystic experiences may either be invested with religious meanings (e.g., d'Aquili and Newberg 1993) or be interpreted as demonstrating pure naturalism (cf. *Gnosis* 1993)? In science, the concept of learning from experience involves (*a*) the complete and precise indication of the conditions under which the experience occurred, (*b*) willed repeatability, (*c*) testability by *any* (competent) third person, and (*d*) generalizable significance. Theologians who are aware of the distinctiveness of theology point out the

restrictedness of such a concept. It excludes, for instance, contemplative, esthetic, and similar experiences. As to religion, they explain that points (a) to (d) above represent inappropriately maximized requirements.[20] However, weaker forms of each point are maintained, most weakly for points (b) and (c). In particular, religious experience of witnesses from both earlier and present times is in principle admissible as justification (epistemic adequacy), even if not everyone has had or will in all likelihood ever have it. Also, religious learning from experience is based less on the robustness of single facts and more on an ensemble of experiences accumulated with time across situations and events (cf., e.g., Ritter 1988, 87–193). Thus, in addition to their own external and internal experiences with God and the world (e.g., Alston 1987), religious believers can learn from historical records of the experience of other believers, from communal life, and so on. Take, for instance, the scriptural texts "Let us make humankind in our image, according to our likeness" (Genesis 1:26), "No one knows the Father except the Son and anyone to whom the Son chooses to reveal him" (Matthew 11:27), and "Hope does not disappoint us, because God's love has been poured into our hearts through the Holy Spirit that has been given to us" (Romans 5:5),[21] as well as the lives and works of, say, Albert Schweitzer and Mother Teresa, not to mention any supporting personal experience. When considering all this, is it not reasonable for theologians (and believers) to invest the findings of brain research and psychology with religious meanings? Not only the starry sky above us, but also the intricate wondrous brain, mind, and soul in us can inspire awe!

Having argued that both simple localization and a holistic approach are unsatisfactory, we go immediately to choice point 4. Whereas others have dealt with the issues concerned, John Polkinghorne put them into statements which seem particularly pertinent in our context:

In the broadest sense, both [science and religion] explore aspects of the one world encountered in our experience. Moreover, there are clearly areas in which their concerns overlap. The physicist's account of cosmic process and the theologian's doctrine of God's continuing act of creation are viewing—to be sure from different perspectives—the same object (the cosmos). The questions they address are certainly not the same, and the answers given are of contrasting kinds, but at the very least there must be some degree of consonance between them. . . . Complementarity is not by itself an instantly explanatory concept. It is simply suggestive for a search for understanding which seeks to take an even-handed view of two accounts of what is going on. . . . The appeal of some form of complementarity-style understanding is even greater when we consider the most significant area in which science and theology impinge on each other, namely in their accounts of what it is to be human. (Polkinghorne 1991, 26–27).

One way to conceptualize this state of affairs is by way of a multilogical/multilevel scheme of the type discussed by Peacocke (1993, 214-44): the physical basis of human being (level 1), human beings as living organisms (level 2), human beings in the perspectives of sciences bridging the biological and the behavioral (between levels 2 and 3), the sciences and human behavior (level 3), the social sciences (between levels 3 and 4), and human culture and its products (level 4).

ANALOGIES AND SIMILARITIES

We come now to a comparison between what was said about the doctrine of the Trinity when illustrating the chart above and the result of applying that strategy to the relation between science and theology (and bringing philosophy into the process). Two points stand out: (a) in both cases a multilogical/multilevel solution, reached at choice point 4, seems to yield the most satisfactory explanation and (b) in both cases a particular thought form is required to get to that result. The choice point 4 solutions came about partly as a result of proceeding by exclusion—none of the others seemed as satisfactory (an assessment that will not be shared by everybody)—and partly for intrinsic reasons. The point is that really complex states of affairs as encountered here (as distinct from complicated states that simply have many components, either unconnected or related in simple, straightforward ways) often require complex conceptualization for a deeper understanding. (Obviously, this does not exclude the possibility of finding a satisfactory solution that is different from that described here.)

The need for an appropriate thought form springs from that state of affairs: to be productive, the inquiry system has to match the problem structure. If the problems are as complex as those we are dealing with, the thought form must be complex too, even if the result finally turns out to be comparatively plain. Empirical studies show that higher levels of relational and contextual (complementarity) reasoning can be helpful for insights into the relation between science and religion (Reich 1990, 1994b, 286-87) and into Christian doctrines (Reich 1994a). That reasoning is the expression of a composite mental schema conceived as shown in figure 2 (Reich 1993, 1995).

Parts of the mental structures handling Piagetian operations (which involve an Aristotelean type of logic) combine with those of metalogical reasoning (which involves the recognition of different types of logic), competence in dealing with cognitive complexity, thinking in terms of analogies, and elements of dialectical thinking (involving in particular an understanding of development by means
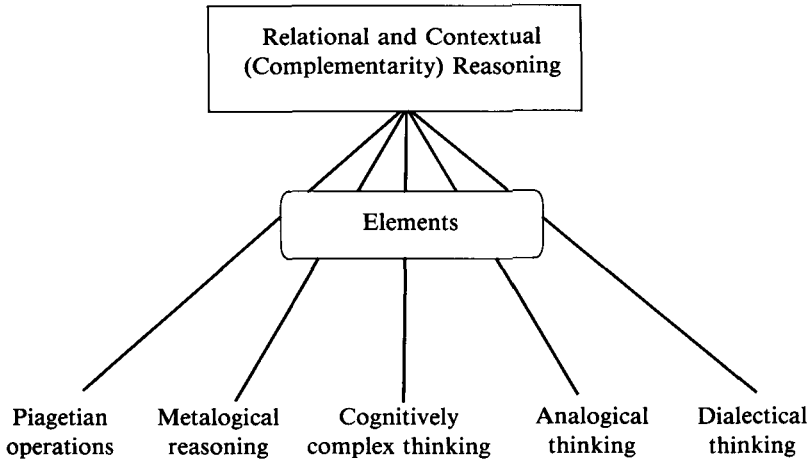
Fig. 2. Mental structures involved in relational and contextual reasoning

of a process of assimilation and accommodation). Dealing with cognitvc complexity means in psychology differentiating and integrating various aspects of a given state of affairs to a degree sufficient for an adequate solution.

Thus the analogies and/or similarities we are discussing are primarily in the epistemological and psychological domains. This may disappoint readers who are looking for a more direct connection between the doctrine of the Trinity and the relations between science and theology. But, first, I hope to have shown in the opening sections that adequate epistemological foundations and suitable thought forms also have their importance. Second, I do not rule out the possibility that further work will uncover more direct analogies and isomorphisms. Some of the concluding remarks may be interpreted as pointing in that direction.

CONCLUSION

Although not a central issue here—and to some extent independent of the issue of whether the doctrine of the Trinity is adopted as a model—it should be noted that focusing on that doctrine (rather than singly on, for example, conflict or independence) brings additional benefits. For instance, the unity of the three personae in spite of their diversity is a permanent reminder that unity does not mean

uniformity (e.g., Welker 1992, 33–34). If Trinitarian thinking is present, a search for a balance between diversity and unity should become a continuing undertaking (cf. McFague 1993, 91–97).

Furthermore, the Trinity is a model for relationships which differ widely from one another (e.g., Drees 1990, 94, 207; Heyward 1982; Johnson 1993, 27). Even the notion of dismay has its place within that doctrine; recall, for instance, Jesus' "Eli, Eli, lema sabachthani" on the cross (Matthew 27:46). If we include the relations to the world, also "no (apparent) relationship" obtains. Whereas the Bible tells us about God's profound involvement with the universe, there are many instances when even believers suffer from God's perceived absence. Job calls out to God, "I cry to you and you do not answer me" (Job 30:20). The psalmist asks, "Why, O Lord, do you stand far off? Why do you hide yourself in times of trouble" (Psalm 10:1). Even conflict is not absent:

You have turned cruel to me; with the might of your hand you persecute me. You lift me up on the wind, you make me ride on it, and you toss me about in the roar of the storm. I know that you will bring me to death, and to the house appointed for all living. Surely, one does not turn against the needy, when in disaster they cry for help. . . . But when I looked for good, evil came; and when I waited for light, darkness came. (Job 30:21–24, 26)

This then reminds one to be on the lookout for different relational possibilities.

The incarnation of the Son and his rising from the dead brings in an element of history. In the words of Holmes Rolston III (1992, 74), "A metahistory comes 'after' history and surveys natural and cultural history to detect actual headings in the past; it gives us stories, pathways, within which we may orient ourselves for a future that lies beyond." There is also the notion of *kairos*, the favorable moment in time (Gal. 4:4–5). Time is seen as being of intrinsic importance. Certain events are possible only "when the time is ripe." Thus an element of meaningful change, of evolution, is present. One is permanently reminded not to cling to obsolete ideas, but to look for emerging new developments, even in theology (cf., e.g., Clayton 1989; Miller 1992; Murphy 1990; Pannenberg 1976; Peters 1992; Welker 1992).

These considerations also, of necessity, give more exposure to the theme of faith and reason. A positivistic epistemology insists on a sharp distinction between these two paths to insights and knowledge, reserving rationality to the latter. However, a case can be made that *all* knowledge is a large and intricate web of experience, inference, and testimony. Polkinghorne (1991, chap. 1) discusses in detail the issue of rational inquiry. He insists in particular on the inevitability

of the hermeneutic circle: "We must understand in order to believe but we must believe in order to understand" (Paul Ricoeur; Polkinghorne 1991, 6) According to Polkinghorne, a physicist might understand this more easily in terms of an "intellectual bootstrap," the recognition that "any inquiry into our ultimate beliefs can be consistent only if it presupposes its own conclusions. It must be intentionally circular" (Michael Polanyi; Polkinghorne 1991, 7). The fact that the doctrine of the Trinity is not even accepted by all Christians adds weight to the issue of faith and reason. Dewey J. Hoitenga, Jr. (1991) argues at length that the solution consists in recognizing all knowledge as justified true belief. The doctrine of the Trinity thus encourages one to explore more deeply the important issue of the respective natures of faith and reason in regard to the relation between religion and science.

The Trinitarian *perichoresis* involves such concepts as nonlocality/ nonseparability and holism (e.g., Reich 1994a), which at present are also discussed in microphysics (cf., e.g., Kitchener 1988; Russell 1994). Those concepts apply also to psychoneuroimmunology and other fields, and their familiarity may thus facilitate dialogue.

Obviously, more elaboration has to go into this model before it can be considered established, let alone accepted. The reactions of professionals are not easy to foresee. For instance, Christian theologians, while feeling basically at home with the doctrine of the Trinity, may raise all sorts of theological objections against the present interpretation and its indicated use. Believers of other faiths may frown upon what might be considered a partisan choice (but see note 13). Nonbelieving scientists may consider this a far-fetched, debatable concept (cf. Welker 1992, 15).[22] The value of a model resides to some extent in its practical useability; time will tell whether it is heuristically helpful.

NOTES

1. Elsewhere (Reich 1992), I have ordered the various relationship proposals according to the five possibilities of class-set logic: (1) a single set (conflict), (2) two separated sets (independent coexistence), (3) overlapping sets (dialogue), (4) one set as a subset of the other set (hierarchy), (5) blended sets (integration), and a further, complementarist possibility that obeys a different logic, (6) sets connected by subtle, noncausal links; their explanatory power is context-dependent.

2. As an example, take the discussion of the complementarist model in *Zygon*: advocacy by Sanburn C. Brown (1[1966]: 14–21, 22–42) and critique by William G. Pollard (1 [1966]: 181–85); advocacy by Charles H. Townsend (1 [1966]: 301–11); advocacy by William H. Austin (2 [1967]: 365–81) and reply by James L. Park (2 [1967]: 382–88); assessments by Hugo Adam Bedau (9 [1974]: 202–24), Donald McKay (9 [1974]: 225–44), and more recently K. Helmut Reich (25 [1990]: 369–90), to which Kevin J. Sharpe replied (26 [1991]: 309–15).

3. Some of the considerations presented here are dealt with greater length in an

earlier publication (Reich 1994c), but the strategy of dealing *systematically* with the context of discovery is only discussed here.

4. This is not to deny that most religions have explanatory features (at least by way of metaphors) and expressive aspects, or that their strength lies in the transformation of lives.

5. See, e.g., H. von Foerster (1973), H. Maturana and F. J. Varela (1979), J. Richards and E. von Glasersfeld (1984), and H. Ulrich and G. B. Probst (1984).

6. The philosopher Richard F. Kitchener provides the following definition: "According to classical realism: (1) there is a reality independent of human ideas and theories; (2) scientific theories and the theoretical entities contained in them purport to refer to those entities, processes, or structures existing independently of the theories; (3) hence scientific theories can be judged to be true or false in some sense larger than 'they allow one to describe, predict, and organize the experimental data.' The latter could be called 'epistemic truth', whereas the former is 'ontic truth'" (1988, 17). Foundationalism followed from the purported ontic truth. Larry Laudan enumerates the corresponding epistemological program as "(1) a search for incorrigible givens from which the rest of knowledge could be derived; (2) a commitment to giving advice about how to improve knowledge; and (3) the identification of criteria for recognizing when one had a bona fide claim" (1990, 134). According to the contemporary philosophy of knowledge foundationalism can no longer be justified (e.g., Laudan 1990).

7. Arthur Peacocke (1993, 19) characterizes the latter as follows: "From a critical-realist perspective, both science and theology are engaging with realities that may be referred to and pointed at, but which are both beyond the range of any completely literal description. Both employ metaphorical language and describe reality in terms of models, which may eventually be combined into higher conceptual schemes (theories or doctrines)." From Larry Laudan's (1990, 19, 59, 85, 103) discussion one gathers that under the latter assumptions it remains possible to compare rival approaches in a rational manner. The approach (model, theory) to be preferred would (*a*) explain broader ranges of different kinds of phenomena, (*b*) have been tested in more areas, (*c*) already have led to more unexpected discoveries/applications, (*d*) yield more precise results, (*e*) be more dependable, (*f*) possibly be the only candidate for offering an explanation of certain phenomena, it being understood that no criterion is individually sufficient and that all criteria count jointly for a (defeasible) preference (cf. Reich 1992 for an application to various relations between religion and science).

8. For instance, in the naves of medieval cathedrals, one often finds arrangements of seven pillars, not infrequently explained as four (the points of the compass = the earth) plus three (the Trinity = heaven). In some cathedrals (e.g., Chartres), the passage between the two sets is marked by a labyrinth on the floor, symbolizing the difficulty of getting to heaven. With two rows of pillars in the nave, the via dolorosa then has 14 stops, corresponding to the stations of the cross, and the power of that numerology is in evidence in all Catholic churches, even if the narrative content of the individual stations is not the same everywhere.

9. In mathematics—specifically with regard to the questions (*a*) What do mathematical symbols represent? and (*b*) how can we know mathematical truths to be exceptionless?—Clouser (1991, 111-27) deals with the number-world theory of Pythagoras, Plato, and Leibniz, with John Stuart Mill's theory of numbers as sensory perception, with Bertrand Russell's (and Whitehead's) approach to numbers as logical classes, and with John Dewey's claim that numbers are "merely" socially developed tools for coping with the environment. In each case he explains which particular foundational concept is involved, and what difference that makes. In physics, Clouser discusses likewise the theories of Mach, Einstein, and Heisenberg (1990, 128-40), and in psychology, those of Watson, Thorndike, and Skinner, and of Adler and Fromm (1990, 128-40, 141-63). D'Espagnat quotes Einstein to the effect that "what is most basic in physics is not mathematics but rather the set of the underlying concepts" (1991, 151). In quantum theory d'Espagnat notes as ultimate referent "verification" (Werner Heisenberg); "meaning" (John Wheeler), which replaces "any physics hardware located out there" by a "meaning software located who knows where"; and counterfactuality-physical

realism (Einstein-Bell). "Counterfactuality" indicates that a (modal) logic of strict implication is assumed which holds in all possible worlds of the "sphere of accessibility" (d'Espagnat 1991, 154–56). After analyzing the consequences of the different foundational concepts, d'Espagnat feels forced to think that "we should make a sharp distinction between empirical reality—the set of phenomena—and independent reality. Empirical reality is all to which we have access" (1991, 166).

10. Although the respective positions on, e.g., the interpretation of holy texts, of freedom, justice, and abortion seem irreconcilable, Fowler sees a possibility of "integration" by means of relational and contextual reasoning (my terms).

11. See, e.g., E. Beltrametti and B. C. van Fraassen (1981), E. E. Harris (1987), H. P. Kainz (1998), T. Magnin (1993, 31–33), T. Magnin and B. Nicolescu (1994), and K. H. Reich (1989).

12. Mary Gerhart and Allen Russell extend this process in a special way, termed *metaphoric* understanding: "The metaphoric act distorts a world of meanings in such a way as to make possible an analogical relationship between one known and another unknown, an analogical relationship that was not possible before the metaphoric distortion took place. . . . The situation of interest is the one where there is no present analogical relationship, and where it is fruitful to create a metaphor, a distortion of the world of meanings, so that there will be an uncalled-for analogy between the two knowns" (1984, 119–20). Proceeding in such a manner may be fruitful in the present case once the possibilities of the model proposed have become clearer, but for the moment it seems wiser not to claim too much.

13. To avoid any misunderstanding from the start: In introducing the Trinity into the discussion I am not aiming at a "straightforward" relationship with the universe in the manner of John Hutchinson (Brooke 1991, 190) or even Bernhard Philberth (1970), i.e., no *vestigium trinitatis* is posited (cf., e.g., Barth [1936] 1975, 333–47; Jüngel 1976, 5–15). Nor are we discussing an allegory in the strict sense, that is, no one-to-one relationship between the three Trinitarian personae and science, theology, and philosophy is envisaged. Rather, the model proposed concerns primarily epistemological and cognitive aspects. The discussion here is based on a Christian tradition (leaving open, nevertheless, the possibility of a feminine Spirit, e.g., Johnson 1992, 121–49). However, different doctrines of a divine trinity exist(ed), in ancient Babylonian (Marduk, Zarpanitum, and Nabu) and Egyptian (Osiris, Isis, and Horus), as well as in Nordic religions (Urd, Werdandi, and Skuld) and Hinduism (Brahma, Vishnu, and Shiva—but see Peters 1993, 76, for an alternative). Separate studies would have to show the degree of generality of the present considerations (cf., e.g., Brück 1986; Pannikar 1973, 1990; Thomas 1987; Williams 1990).

14. Whereas Paul Tillich (1963, 12–15) argued against explaining reality in terms of hierarchical levels, invoking notably arguments by Thomas Aquinas, Nicolas Cusanus, and Martin Luther, such an approach (e.g., Peacocke 1993, 214–48) is widely supported at present. For instance, at both the First International Pascal Centre Conference on Science and Belief (van der Meer, forthcoming) and the Fifth European Conference of Science and Theology (Gregersen and Parsons, in preparation) working groups explored the potential of level schemes. Presumably, each case has to be judged on its own merits.

15. Thus the emphasis here is on illustration of the the strategy, not on application; in other words no reductionism is intended. The renewed interest in the doctrine of the Trinity (see, e.g., LaCugna 1991, 144, and Russell 1994 for references; Peters 1993, chap. 3 for a critical evaluation) has led to various interpretations. Those presented correspond to my understanding, which may or may not be shared by others, given the diversity.

16. Currently, the work of each of the three personae is seen as more differentiated and justified to higher degree by the respective mission than in previous times, God nevertheless staying the One (e.g., Russell 1994, 18).

17. The relations between the three personae are "radically equal though distinctly different from each other" (Johnson, 1992, 219). This state of affairs has been beautifully depicted by Rublov in his famous icon of the Trinity (the three angels of Genesis 18 : 2) painted in 1411 for the Trinity church of the Zagorsk monastery. The three persons are

so similar that no consensus exists as to who represents the Father, who the Son, and who the Holy Spirit, yet each is dressed differently and also differs as to gestures.

18. Espousing panentheism is not necessarily restricted to Bracken's process theology though (cf. Peacocke 1993, 371–72; Russell 1994, 16–17).

19. According to Peter Suedfeld and Philip E. Tetlock (1977) an analysis of the degree of complexity in the argumentation of government documents and diplomatic notes exchanged before the outbreak of World War I and during the Cuba crisis of 1962 yielded, on a seven-point scale, values of 2.07 (war followed) and 4.72 (no war ensued).

20. Cf. Alvin Plantinga's (1983) argumentation against extravagant forms of evidentialism.

21. These and all subsequent Bible quotes are from the New Revised Standard Version.

22. Immanuel Kant ([1798] 1917) was of the opinion that "to venerate Divinity in three or ten persons makes no difference to the educandus, because he has no notion of a God in several persons (hypostases), and, more importantly, because he cannot draw any different rules for leading his life from this diversity." (At least some of today's believers, even younger ones, implicitly contradict that view; see Reich 1994a).

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