DEVELOPING THE HORIZONS OF THE MIND: REICH'S
RESPONSE TO THE COMMENTATORS

by K. Helmut Reich

Abstract.   Some aspects of my writing the monograph *Developing the Horizons of the Mind* (2002) are highlighted, the central characteristics of relational and contextual reasoning (RCR) are explained, and the contributions to this symposium by John Albright, Varadaraja V. Raman, and John Teske are discussed.

Keywords: John Albright; forms of thought; logic; Varadaraja V. Raman; relational and contextual reasoning (RCR); science and religion; John Teske.

"To be or not to be: that's the wrong question. The right question is whether it is enough in thinking to consider only two-valued logic, the zeros and the ones of Boolean algebra, or to consider also factors of context and relation, and by involving them enrich the question—to accept, to involve these other elements, and by doing that to enhance the human ability to be not only right but sympathetic and achieve greater understanding in a thousand different situations." This paraphrasing of my monograph by Varadaraja V. Raman after its presentation at the IRAS Book Seminar not only struck me by its originality but set me thinking about whether I agree with it in the light of what I have written on relational and contextual reasoning (RCR).

Rereading *Hamlet*, act 3, scene 1, I was reminded that Hamlet's issue was whether to commit suicide or not, at first blush an issue of Boolean

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algebra. But then Deirdre Kramer (2002, 117–18) came to my help. She makes the point that the opposite of suicide is not simply the act of not taking one's life but the act of living in some kind of full expression of it. Hence the issue is not just (a) to be alive or (b) to be dead, but also (a_1) to be fully alive or (a_2) to live in a way that substantially diminishes the quality of life, to accept or seek out inimical patterns or even self-annihilating patterns of living. Applying the RCR heuristic to this triple issue (a_1, a_2, b) would no doubt unearth interesting links and cross connections and perhaps even help us to deal more effectively with suicide candidates. Logically speaking, logical dependence between (a) and (b) is replaced partly by a conditional independence of (a_1), (a_2), and (b). So, in principle (not yet having done the exercise), I agree with Raman's comment and in fact find it most helpful for emphasizing a major characteristic of RCR: applying it even to "settled" issues may bring out unsuspected new aspects.

John Albright, Raman, and John Teske have gone deeply into the monograph, and I feel enriched by and thankful for their considerations. I am deeply impressed by all their examples of weaknesses to be improved, of further cases for future application of RCR, and of difficulties to be faced when applying RCR.

Before responding to the three participants of the symposium, let me comment on how my research and the writing progressed (as this may be linked to some of the difficulties in absorbing the results), summarize the distinguishing characteristics or RCR, and relate an experience at the IRAS Book Seminar and a similar occasion.

REVISITING MY WORK

While my (limited) understanding of quantum theory helped me to recognize RCR (initially labeled "Thinking in terms of the complementarity of 'theories'") as a distinct form of thought (previously not explicitly dealt with in academia), it took me about two years to realize that its core consisted in the use of a trivalent logic: two theories, such as nature and nurture, used to explain an athletic or artistic performance are neither simply compatible nor incompatible but *noncompatible*—that is, the explanatory potential of one theory is considerably greater in one spatial, temporal, or situational context and that of the other theory in another context. Also, during that time I understood that RCR developed from (1) a non-RCR level (only one theory accepted), to (2) a tentative RCR level (the other theory also comes into view), to (3) a basic genuine RCR level (both theories are needed), to (4) a more developed RCR level (here is how the two theories hang together) and on to (5) a complete synopsis or even overarching theory. The next eight years I studied theoretically and partly empirically the commonalities and differences of RCR, Piagetian operations, cognitive complex thinking, dialectical thought, thinking in analo-

gies, systemic thought, and so forth. I concluded that, whereas each form of thought is clearly distinct, they share a number of operational components. For a further five years I studied applications of RCR and taught it intermittently in various classrooms and lecture halls.

Finally, two years went into writing and rewriting the monograph. The main difficulty was about the order of sequencing the basics of RCR, including its metaphysical assumptions, its underlying logic, the developmental levels, and the relations with other forms of thought (the applications coming afterward in all cases). Clearly, all of these aspects have to be grasped to get the full picture. But which order most helps to foster understanding without too many hurdles? In an earlier version I had introduced the RCR levels (now chapter 2) and the other forms of thought (now chapter 5) earlier on, yet I became convinced that the current sequence is preferable. No doubt it has its advantages, but I wonder a little now whether it does not overemphasize RCR with respect to other thought forms and thereby renders more difficult its full understanding.

The reason for that questioning is the following. According to my experience, many people, including children and adolescents, use various (more or less well developed) forms of thought and even different logics, yet they are not necessarily aware of doing so and are even less in the habit of thematizing such issues. Thus, most persons find it normal that at school, (a) the results of solving tasks in arithmetic are assessed as *correct* or *wrong,* and (b) the overall result of attending a mathematics class is graded from A to F (or 1 to 6, or 20 to 0). Also, it is generally accepted that (c) the wheel of history cannot simply be turned back or a totally broken human relationship be restored to the status quo ante. However, how many will explain that (a), (b), and (c) are in conformity with binary, fuzzy, and dialectical logic, respectively? and furthermore explain, for instance, that binary logic applies only to items that are intrinsically independent of each other and constant in time (at least as long as a logical statement about them applies), which has inter alia the consequence that after a situational change one can always return to time zero and restart in the very same conditions, whereas dialectical logic applies to entities that determine each other (like employee and employer) and that evolve irreversibly? The upshot is that some readers of the current sequence of the chapters may not spontaneously recognize RCR from early on as playing in the same league as the other thought forms discussed.

Here, then, is a summary of the distinguishing characteristics of RCR, written in a different order from that adopted in the book:

1.   RCR is a distinct form of thought, categorically at the same level as Piagetian operations, cognitive complex thinking, dialectical thought, and thinking in analogies, with which it shares, however, certain operational components (such as isolating a given item among many others).

2.   A major difference between other forms of thought and RCR is its underlying trivalent logic, in particular the truth value *noncompatible*. (In binary logic a statement is necessarily either true or false; it is said to have either of two truth values. In RCR there are three truth values: compatible, incompatible, and noncompatible.) For instance, the explanatory potential of one theory is considerably greater in one spatial, temporal, or situational context and that of the other theory in another context.

3.   On the assumption that for best results in problem solving the thought form used should match the problem structure, a forte of RCR is to work out how the role of bona fide theories competing to explain a given entity or phenomenon can be understood and possibly transformed into an overarching theory. It is counterproductive to try using RCR for solving crossword puzzles or other problems with single correct answers.

4.   An eight-step RCR heuristic has been constructed to apply RCR systematically in line with this last point. Numerous cases show its benefits. Thus, RCR is in no way a license for a relativistic or postmodern "anything goes."

5.   RCR does not arrive fully operative at a person's birth but, given the right circumstances, develops from level 1 to level 5 (as defined above) into young adulthood and beyond. It starts functioning in earnest at level 3, reached sometime after age 11 (if at all).

REACTIONS TO THE RCR HEURISTIC

What has struck me at two presentations of my book is the type of problem chosen by the participants for an application of RCR. Disregarding other candidates offered for this exercise, at Star Island the choice was "ways to peace in Palestine." With the competing models "monolithic nation state" and "free determination of the habitants of the area," the eight-step RCR heuristic led to the state form of a single confederation covering Palestine yet involving far-reaching local autonomy (as in Belgium or possibly Bosnia); this after the historical, religious, geographical, economic, and other aspects had been taken into account. This solution is obviously theoretical, applicable only after the protagonists involved recognize that the solutions tried for the last several decades do not work and an international peacekeeping force is available. Note above all the difference with a compromise solution, which tries to please all involved as much as possible (at least in the short run) such as two separate nation-states. At the presentation in Chicago (meeting of the American Psychological Association), the spontaneous choice by the audience was surprisingly similar: how to improve the relationship between the government of Myanmar (Burma) and the mountain people living at its border.

How can RCR be helpful in the implementation of such lofty aims? If the reconciliation between France and Germany after hundreds of years of destructive wars is any indication, one of the ingredients is to overcome the enemy image. There are many ways to that goal, and probably all have to be traveled. RCR can be particularly helpful when it comes to writing a single history book on the common past that can be used in schools on either side of the border. Here the competing "theories" are constituted around *aggressor* and *defender* (or *terrorist* and *freedom fighter*). In the case of Germany and France, it took many years of careful work by experts and much good will to achieve that single history book. I am convinced that corresponding single books on the history of Northern Ireland or Palestine (or the Union and the Confederacy of the U. S. Civil War, for that matter) by authors of good will from both sides could only be beneficial for peace. Anyway, the totality of the change brought about in the relations between France and Germany since World War II is simply mind-boggling; viewing the bilingual common television station *Arte* is a rapid means to get a sense of it.

Comments by John R. Albright. Albright (2003) enriched the debate specifically by increasing considerably the opportunities for applying RCR. I fully agree with him that dealing with the form of logic used for solving a given task is a central issue in my monograph and that RCR is a helpful addition to the panoply of more generally known and used forms of thought. However, I would not evaluate other forms of thought with their differing logics as in all cases inferior to RCR, only as less promising when mal-adapted to the nature or structure of the task at hand and as superior when matching that nature or structure. Again, I agree that fuzzy logic is quite different from binary logic (as stated above)—and so is RCR logic—but I fail to see its helpfulness for resolving the kind of paradoxical or hotly contested issues most suitable for applying RCR. Fuzzy logic ("everything is a matter of degree"; "raising the machine IQ") seems more useful for solving problems in engineering, such as building more effective control-lers and the like (Kosko 1994), than for explaining truly complex phe-nomena. In contrast, there is more kinship between RCR logic and quantum logic.

I feel slightly embarrassed when I read "Reich's style of logic" or "Reich's system of RCR." I attempt to show, especially in chapter 8 ("The Archeol-ogy of RCR") that I more discovered than invented RCR. All the same, I would indeed welcome "a whole new intellectual industry" (Albright 2003, 439) around RCR, because I believe that it would benefit individuals and society alike.

Comments by Varadaraja V. Raman. Raman's comments (2003) have enlarged my mental horizon once more, in particular his extraordinary

way of connecting my work with everyday life. From his rich menu I would like to take up three points: (1) my basic metaphysical and epistemological orientation, (2) furthering RCR in education, and (3) applying it to AI.

Raman rightly counts me among the critical realists and not the radical social constructivists or the postmodernists. With, for instance, John Taylor (2002) and Donald Carson (2002), I see some good points of postmodernism but, all told, more negative than positive aspects for getting to reliable knowledge. Carson makes the point that postmodernism arose because of the intrinsic weakness of modernist epistemology (2002, 109). Without necessarily sharing his particular explanation, I basically find that argument of interest. However, my questioning of modernist epistemology would center on its almost exclusive use of binary (Aristotelian) logic— this despite, for instance, theologians' many-centuries-old insight that it can be used to explain neither the two natures of Christ nor the inner workings of the Trinity (God Father, God Son, and God the Holy Spirit— cf. Reich 1995). From that perspective, I now see my monograph also as a potential contribution to the development of modernist epistemology over and against postmodernist epistemology through the introduction of differing thought forms involving different logics matched to the problem at hand. This development, if pursued, could lead to a *transmodern* epistemology clearly distinct from a modern and a postmodern epistemology.

Obviously, I fully agree with the desirability of bringing RCR into the school curriculum. The difficulties to be overcome are considerable, however. To reach the minimum RCR level 3 requires one to have reached the transition to Piagetian formal operations, and mastering these operations is necessary (but not sufficient) for reaching level 4 (Reich 2002, 72). As many studies have shown, only about half of the adult population master formal operations. Peter Wason's selection task (to turn over a minimum among four cards, two with letters and two with numbers on the front, to test the statement "if there is a vowel on the front, there is an even number on the back") finds many persons turning over the even number instead of the odd number; finding a violation, not confirmation, of the rule is the order of the day (Wason 1968). RCR cannot be built on any existing foundation; the required foundation of formal operations needs to be put in place.

The idea to introduce the RCR heuristic into artificial intelligence (AI) seems seductive (Raman 2003, 456–57), particularly if we discuss embodied AI, or humanoid robots. It is characteristic of human beings to resemble machines more in some contexts and as having been made "in God's image" more in other contexts. Therefore, it may well be that becoming humanlike indeed implies that the robot we are discussing masters the RCR heuristic (see Foerst and Reich 2002).

Comments by John Teske.   Teske, in his customary insightful ways, ranges widely over my book. I much admire what he writes and find little to argue about (having written myself, for instance, that in places the book is not an easy read and having explained the difficulty of arranging the material in such a manner that all readers find it easy to grasp). As to the "delightful microanalysis of an impending partnership breakup" (Teske 2003, 442; see Reich 2002, 88, 90), it was added as an afterthought to facilitate the understanding of the central message and encourage readers to struggle on. I admit that my enthusiasm for RCR may show there, but, as Teske writes, the (much longer) subsequent treatment of five forms of thought is strictly neutral as to the superiority of one or the other form. Another point of agreement is that my hints about relationships other than causal ones (information transfer, symbiosis, mutual limitation, kinship, and so on) need fuller development. It is true too that defining the explanandum may be a source of conflict, but, I would add, it can also be the exercise of a widened rationality (cf. Reich 1995, 388–96). I particularly appreciate Teske's repeatedly pointing out the role and importance of an *iterative* application of RCR.

Finally, I would interpret in a less author-centered way some of the good things he writes about my book. To my mind, this also shows that it simply takes time and persistence to reach a state where research results are worth publishing in book form with some chance of not being simply another variation of a well-known theme without much novelty ("If there were no merit in mere publication, people might write less"—Rees 2002).

In closing, I trust that notwithstanding all that was said already, enough meat is left in *Developing the Horizons of the Mind* to make its reading worthwhile.

NOTE

I want to recognize the role of *Zygon* and IRAS in the evolution of the work on RCR. *Zygon* took an early interest in RCR (Reich 1990; 1995), and various discussions in the IRASnet have contributed to its better understanding, as witnessed inter alia by a number of corresponding footnotes in my monograph. Its selection for the IRAS Book Seminar at the 2002 Star Island Conference and the implementation organized by Carol Rausch Albright provided an occasion for further exchanges and an opportunity to become aware of where and how the presentation could be improved.

REFERENCES

Albright, John R. 2003. "Helmut Reich's Proposal." *Zygon: Journal of Religion and Science* 38 (June): 435–39.

Carson, Donald A. 2002. "Maintaining Scientific and Christian Truth in a Postmodern World." *Science and Christian Belief* 14 (2): 107–22.

Foerst, Anne, and K. Helmut Reich. 2002. "Welches Symbol für den Menschen: Roboter oder Abbild Gottes?" *Neue Sammlung* 42 (3): 379–403.

Kosko, Bart. 1994. *Fuzzy Thinking: The New Science of Fuzzy Logic*. London: HarperCollins.

Kramer, Deirdre A. 2002. "A Psychobiographical Analysis of Faith, Hope, and Despair in Suicide." *Journal of Adult Development* 9 (2): 117–26.

Raman, Varadaraja V. 2003. "Relational and Contextual Reasoning: Philosophical and Logical Aspects." *Zygon: Journal of Religion and Science* 38 (June): 451–58.

Rees, M. 2002. "Not Worth the Paper." *New Scientist* 176, no. 2370:27.

Reich, K. Helmut. 1990. "The Relation between Science and Theology: The Case for Complementarity Revisited." *Zygon: Journal of Religion and Science* 25 (December): 369–90.

———. 1995. "The Doctrine of the Trinity as a Model for Structuring the Relations between Science and Theology." *Zygon: Journal of Religion and Science* 30 (September): 383–405.

———. 2002. *Developing the Horizons of the Mind: Relational and Contextual Reasoning and the Resolution of Cognitive Conflict.* Cambridge: Cambridge Univ. Press.

Taylor, John L. 2002. "The Postmodern Attack on Scientific Realism." *Science and Christian Belief* 14 (2): 99–106.

Teske, John. 2003. "Varieties of Reasoning: Assessing Adequacy." *Zygon: Journal of Religion and Science* 38 (June): 441–49.

Wason, Peter C. 1968. "Reasoning about a Rule." *Quarterly Journal of Experimental Psychology* 20:273–81.