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Preface

There are a number of things happening in the Polanyi Society. This issue of *TAD* includes the annual financial report on the Society (p. 4). We are an efficient low budget operation; we remain solvent, but it is imperative that members pay the very modest annual dues. Stuffed in this issue is a colorful flyer that reminds you that now is the time of the year in which dues are collected. You can write a check or use a credit card; dues can be sent to me by post, by fax or by e-mail. In this issue, there is information about the November 19 and 20 annual meeting in San Antonio (p. 5) There are details on the two programs; papers to be discussed (but not read in the sessions) are or soon will be available for downloading from the Polanyi Society web site. There will be a meeting of the Board of Directors in San Antonio. Feel free to write Walter Gulick (WGulick@msubillings.edu) about any issues you want discussed. Notice also that the Society is setting up a travel fund that seeks donations (p.6) and that some changes are in the making for the Polanyi Society electronic discussion list (p. 50). There is also a note about a survey that solicits input on a possible Polanyi Society summer program (p. 50). Finally, please read the letter from me that describes the new effort to produce an on-line edition of *TAD* and a digital archive (p. 5). A pdf version of this issue of *TAD* (as well as other issues since 2000) is now available for download on the Polanyi Society web site. Paper issues of the journal will continue to be distributed but the Society's Board of Directors has decided the time has come to explore alternatives since the cost of printing and mailing are increasingly burdensome.

This issue of *TAD* is primarily focused on reviews. There are review articles by Gulick and Smedes that cover several books. There are also three interesting reviews of individual books. But don't miss YU Zhenhua's essay in which he offers especially interesting commentary on parallels between some Kantian ideas about judgment and Polanyi's tacit knowing.

Phil Mullins

Tradition and Discovery is indexed selectively in *The Philosopher's Index* and *Religion One: Periodicals*. Book reviews are indexed in *Index to Book Reviews in Religion*.

NEWS AND NOTES

Andrew Grosso recently completed a Ph.D. at Marquette University with a dissertation titled "Personal Being: Polanyi, Ontology, and Christian Theology." The primary purpose of his study (according to the abstract) is "to examine the value of personhood as a means of engaging questions of divine and human existence, knowledge, and action within a unified conceptual horizon." In the first half of his project, Grosso examines Polanyi's post-critical philosophy and assesses its "usefulness as a foundation for personalistic theological inquiry." He then explores potential points of correspondence between, on the one hand, a Polanyian understanding of knowledge, language, and reality and, on the other, key areas of theological reflection, especially trinitarian theology. Grosso is currently serving as Curate at Grace Episcopal Cathedral in Topeka, KS, and can be reached by e-mail (at grosso@gracecathedraltopeka.org).

Polanyiana: The Periodical of the Michael Polanyi Liberal Philosophical Association recently published a double issue: Volume 12, Numbers 1-2 (2003). Included are papers from a Budapest conference on Polanyi's contribution to science. Although many essays are in Hungarian, John C. Polanyi's essay (which is reprinted in this issue) in English is part of Number 1. In addition, the Hungarian language essay by Istvan Hargittai includes extensive and fascinating selections in English from Eugene Wigner, Melvin Calvin, and others, plus selections from Hargittai's interview with John Polanyi taken from Hargittai's *Candid Science: More Conversations with Famous Chemists* (London: Imperial College Press, 2003). The essays on topics in science by Erno Keszei ("Michael Polanyi's Pioneering Contribution to the Most Successful Theory in Chemical Kinetics," 63-74) and Gabor Somorjai ("Michael Polanyi, the Father of Catalytic Surface Reaction Mechanisms and the Mentor of Hungarian Scientists Abroad," 127-129) are also in English. Two essays in Number 2 are in English: C. P. Goodman, "The Tacit Dimension"

(133-158) and Phil Mullins, "Polanyi on Science Policy" (159-178). The double issue is not yet on the *Polanyiana* web site (<http://www.kfki.hu/chemonet/polanyi/>) but it should soon be posted.

Appraisal is now the journal of The Society for Post-Critical and Personalist Studies (SPCPS), which was formed earlier this year, and took over the publication of *Appraisal*. The Society aims to promote interest in and further application of, the work of Michael Polanyi and similar thinkers through its endeavors, which include publishing a journal, organizing conferences, and other activities. All individual members of the Society receive the journal, which is published in March and October each year. *Appraisal* welcomes articles, working papers, discussion items and book reviews, on all aspects of philosophy and on the application of philosophical ideas to other areas of thought and practice. SPCPS is sponsoring a conference Saturday, April 5, 2005 at Hugh Steward Hall, The University of Nottingham. Proposals are invited. For more information about SPCPS, *Appraisal* or the upcoming conference contact R. T. Allen (rt.allen@ntlworld.com).

The October 2004 issue of *Appraisal* (vol. 5, no. 2) is just out. The following are the main articles in this issue: R. J. Brownhill, "The Organization of Experience and Making Judgments" (59-64); Tony Clark, "Polanyi Among the Theologians" (65-74); C. P. Goodman, "Human Excellence" (75-83); David Britton, "Poetic Inspiration and Metaphysical Knowledge" (84-90); Wendy Hamblet and Giorgio Baruchello, "Is Violence Always Cruel?" (91-94). Additionally, there are reviews.

Polanyi Society

Financial Statement

September 1, 2003 – August 31, 2004

Beginning Bal. Checking	\$422.14
Income	
Membership dues, gifts, & dividends	\$3000.58
Expenses	
Travel award	\$300
TAD 29:3 + 30:1	\$1248.74
TAD 30:2	\$954.38
Total Expenses	\$2503.12
Year End Checking	919.60

Beginning Bal. Savings	\$2070.82
Income	
Dividend + interest	\$9.45
Other income	-0-
Expenses	
	-0-
Year End Savings	\$2080.27

John V. Apczynski, Treasurer

Polanyi Society Travel Fund Established--Donations Solicited

At the suggestion of a Polanyi Society member, the Board of Directors has set up a special travel fund. Money in this account will go to persons who are interested in attending the Polanyi Society annual meeting but who do not have access to sufficient institutional travel funds or other resources. Those interested should apply by October 1 in a letter sent as an e-mail attachment to the President of the Polanyi Society.

The Society is now actively seeking donations to this fund. If you wish to contribute, send a check or credit card information to Phil Mullins (mullins@mwsc.edu) History, Philosophy, Geography, MWSC., St. Joseph, MO 64507. If donations are combined with membership dues, please clearly designate how many dollars are intended for the travel fund.

A Second Open Letter to *TAD* Subscribers

In the last issue of *TAD*, there was an open letter from me describing the problems that the Polanyi Society now faces in handling and affording mailings of *TAD* going outside of North America. In a word, the price has gone up and will go up more; the processing necessary for small packets in the era of terrorism is laborious and promises to become more so. This situation led the Board of Directors of the Polanyi Society to authorize producing not only a printed version of *TAD* but also an electronic pdf version of each issue that will be available on the Polanyi Society web site. The idea, of course, is to encourage at least some members of the Polanyi Society living outside North American to try printing their personal copy of *TAD* from the web site.

I am very pleased to report that about 15% of those receiving *TAD* outside of North American have been in contact with me and have agreed to retrieve their personal copy of issues of *TAD* from the electronic versions that are now posted for downloading on the Polanyi Society site (<http://www.mwsc.edu/orgs/polanyi>). If you go to that site and scroll down you will see the link for the digital archive. When you hit this link, you will be asked for a user name and a password. I shall be delighted to send a user name and a password to anyone living outside of North American who reads *TAD*; just contact me by e-mail. If your computer does not have installed the free Adobe Acrobat Reader software that is now broadly used to access pdf files, you simply hit the Adobe button at the bottom of the web site page and this will be installed on your computer.

The project of putting together an electronic version of *TAD* is well ahead of schedule. I originally thought that a pdf version of *TAD* would not be available on the web site until this issue. However, the experiment during last summer had very few glitches. Not only is the last issue of *TAD* (30:3) already on the web site along with this present issue, but there are also all the issues of *TAD* back to the fall of 2000 (27:1). The plan calls for expanding this collection over the coming year. Eventually, there should be at least the last thirty issues of *TAD* available electronically to anyone who needs to access them for scholarly work.

The web site version of *TAD* is the full version, identical to the printed version, although the print size is slightly larger. You can download and print on your local printer an entire issue or whatever article in the issue that you need. The electronic material is thus packaged in a way that should prevent some of the problems that sometimes occur in downloading large pdf files if you have a printer with a small buffer.

Those who responded to my open letter in the last *TAD* I invited to go into the digital archive and download the July 2004 issue. Several who did reported that they were pleased to see how easy it is to retrieve the pdf version of *TAD*. As I emphasized in last issue's open letter, the Society's Board is presently committed to a policy of sending a paper copy of *TAD* to any Society member anywhere in the world. It is clear, however, that we will need in the future to make some adjustments to remain solvent. Already *Polanyiana* and *Appraisal*, *TAD*'s two sister journals, economize by making electronic versions available.

My hope is that more readers will try the electronic version. If you are willing, send me an e-mail. It is perfectly acceptable to continue receiving the printed edition while you experiment with the pdf version.

Phil Mullins, Editor
mullins@mwsc.edu

2004 Polanyi Society Annual Meeting in San Antonio

The year's Polanyi Society annual meeting will be held in San Antonio, Texas on November 19 and 20, 2004. As in past years, meetings are to be held in conjunction with the annual meeting of the American Academy of Religion. To secure hotel reservations in the immediate convention area, it is necessary to register for the AAR annual meeting. However, anyone who is interested is welcome to attend the Polanyi Society meetings, whether or not they are attending the AAR meetings. Other hotels in San Antonio are not reserved for the AAR. If you want information about registration for the AAR meetings, go to <http://www.aarweb.org/> or phone (1-404-727-3049) or fax (1-404-727-7959) or e-mail (aar@aarweb.org). Information about the program is listed in the AAR Annual Meeting Program as Additional Meetings (pages 200 and 204) Information about the meeting is also available on the Polanyi Society web site (<http://www.mwsc.edu/orgs/polanyi/>). Papers will not be read in session so be sure to download papers from the web site by clicking on the title.

Program

*Friday, November 19, 9 - 11 P.M.
Convention Center 007B*

Topic: Polanyi and Whitehead

Joseph Bracken, Xavier University
"Emergent Monism and Final Causality: A Field-Oriented Approach"

Respondents:
Walter Gulick, Montana State University-Billings
Richard Moodey, Gannon University

Polanyi Society Annual Business Meeting: 10:30 PM

*Saturday, November 20, 9:00 -11:30 A.M.
Marriott Rivercenter Hotel, Conference 16*

Topic: Responses to Esther Meek's *Longing to Know*

Respondents:
Dale Cannon, Western Oregon University;
Jere Moorman, Resident Fellow, Center for Studies of the Person, La Jolla, California
David Rutledge, Furman University

Comment: Esther Meek, Geneva College

For additional information contact Marty Moleski, Religious Studies, Canisius College, Buffalo, NY 14208. Tel.: (716) 888-2383 FAX: (716) 886-6506 Email: moleski@canisius.edu

Michael Polanyi, The Scientist¹

John Polanyi

ABSTRACT Key Words: Michael Polanyi's education, Michael Polanyi's scientific work
This short reflection comments on Michael Polanyi as a self-educated scientist and reviews the areas of science to which he contributed.

If he were ever boastful, Michael Polanyi would have described himself as a scientist of the second rank. The first rank, in his terminology, constituted the pillars on which the edifice of science rested. It was the plentiful existence of this first tier in Michael's generation that made it possible for one so casually educated in science as he to make the contribution that he did.

Remarkably, in every subject in which he had success — chemistry, physics, economics and philosophy — Michael was self-educated. He performed indifferently only in the endeavour for which he was trained — medicine. Science he learned at first in the intervals of his pre-World War I medical studies, and later when invalidated out of the Austro-Hungarian army during the war years.

He did not learn entirely on his own since in 1913-1914, he had a year in Karlsruhe (Germany) as a student of chemistry. Nonetheless, of his first fifteen scientific papers, fourteen bear only his own name, and none were co-authored with a mentor. The papers in question cover the period 1910 to 1917, through the ages 19-26.

There is a lesson to be learned from this solitary activity. Michael, in his intellectual endeavours, cultivated the position of an outsider. He worked for years as an amateur, in the spare time from his profession of medicine. Later he would be an amateur economist, an amateur on patent law (on which subject he published, and testified before a Committee of the House of Lords in the UK) and, most conspicuously, an amateur philosopher.

What did all this amateurism mean? Many things. A gentlemanly disdain for the professional. A belief in the special ability of the outsider to see beyond cant and convention. Perhaps a romantic admiration for the lonely cowboy.

Michael was 18 when George Pólya, the great-mathematician-to-be (then in his 20's) made the memorable remark, "Michael walks alone, he will need a strong voice to make himself heard." At the age of 75, Michael lamented, "My voice has not yet carried far." All his life, however, he was convinced that it would do so. The fact that I am asked to write this memoir over a century later, suggests that he may have been right.

His science is still of interest, in part because of the philosophical writing it engendered. I propose (as I already have) to reflect on his science as an indication of his thinking.

He was bold in choosing to be an outsider. He was equally bold in his choice of topics. He was anxious to make use of the freedom that his amateur status gave him. His family (first rich, then poor following the failure of his father's railway in the 1890's) cultivated young Hungarian painters, poets, novelists and scholars. "I grew up in this circle," Michael wrote, "taking it for granted that I could do great things."

This is how it came about that in his twenties he was attempting to extend the reach of one of the great philosophical generalizations of the physics of his day, the Third Law of Thermodynamics. This 'law' embodies a prohibition, namely the unattainability of the absolute zero of temperature.

Michael's early attempt to extend that prohibition was ultimately a failure. Nonetheless, his boldness caught the eye of the newly-crowned monarch of modern science, Albert Einstein. Einstein corresponded at length with the totally unknown army officer Michael Polanyi on this topic, and the related one of 'osmosis' (the tendency of liquids to pass through membranes toward dissolved material). This correspondence, with its pages of writing and its neatly sketched diagrams in Einstein's hand, survives.

Invalidated out of the army, Michael spent the later war years (1916-1917) developing his theory of 'adsorption,' the attachment of gases to solids. Once more the theory was based on thermodynamics. This meant that it was statistical in nature, relevant only to molecules *en masse*. It was, however, an insightful theory, of importance to this day. But because it failed to take account of contemporary thinking it was destined to be rejected for decades. This is the price of amateurism.

The failure of this theory, initially, to gain acceptance could easily have been the end of my father's scientific career, had he not then taken a step in the direction of becoming a professional. Following a year in Count Karolyi's Ministry of Health in post-war Budapest, the young MD used his Karlsruhe connections to get a position as a physical chemist in Berlin, then the global capital for science.

Working in government research laboratories there, he found his *métier*. It was not in the statistical world of thermodynamics, but in the emerging domain of molecular science. Here was something he could visualize. Molecules, however diffuse the new 'quantum mechanics' made them, were, as he felt, tangible. If you put your faith in their reality, they would reward you by giving new insights. Believing in them passionately, he was well-rewarded.

The topic his first Institute offered him was the study of natural fibres. Within months of arrival he succeeded in interpreting the X-ray diffraction pattern of cellulose. This was the first analysis of the molecular structure of a natural material by X-ray diffraction. Additionally, it inaugurated the rotating crystal method that proved central, for many years, to the field of structure determination.

From the shapes of molecules he was led to their mode of stacking in solids, and to the explanation of the weakness of large-scale materials as being due to molecular 'dislocations'; that is to say, to imperfect molecular stacking. He was now moving confidently to and fro between the macroscopic world of materials and the microscopic one of the molecule.

It was time to turn to the central question of chemistry: why are some chemicals stable and others not? Differently stated, why do chemical reactions occur? The rates of the chemical reactions must be linked at the molecular level to the rates of molecular collisions, to the strengths of chemical bonds, and to the collision

energies required to sever those bonds.

It was his good fortune that the new mechanics required to describe molecular motions — quantum mechanics — was being developed nearby. The equations of quantum mechanics were, however, famously insoluble. With Henry Eyring, an American visitor to Berlin, he used experimental evidence ingeniously to calibrate the equations so that they could be solved. The outlines of the hills over which the molecules would have to travel in progressing from reagents to products then emerged from the mists in which they had been hidden.

Incredibly, the years of greatest political turmoil, 1933-1934, which marked his resignation from the Kaiser Wilhelm Institute in the face of Nazi legislation and the transfer of his laboratory equipment to Manchester, were his most productive (32 papers published, dated Berlin and Manchester).

On arrival in Manchester, Michael collaborated with a young colleague, later his successor as professor, Meredith Evans, to apply thermodynamics to the calculation of the rates of progress across the barriers, recently revealed. Unknown to them, Henry Eyring was engaged in a similar intellectual odyssey in Princeton. The so-called ‘absolute theory of reaction rates’ was being born on both sides of the Atlantic.

Henry Eyring threw himself into the elaboration of this theory. Michael Polanyi viewed it with mild distaste, wishing he had not been forced back into the arms of thermodynamics and hence statistics. Surely, he reasoned, the details of the molecular collision could tell the whole story. Reaction would occur if molecular collisions took place in the correct geometry and with sufficient energy.

Like all-right thinking people, he preferred the clean lines of causality to the haze of probability. This despite the fact that in his *Personal Knowledge* he was to insist on the need for the viewer to project himself onto the viewed. In his science he strove nonetheless for the ideal of untainted vision, as we all do.

In fact, Michael’s culminating scientific insight was mechanical rather than statistical. It had a difficult birth, beginning with the perplexing observation in 1929 that certain chemical reagents reacted more often than they encountered one another. This “reaction at more than every collision,” as he described it, turned out to have a simple and elegant explanation.

Michael described it to Dudley Herschbach in an interval between lectures on philosophy in Berkeley, around 1960. The central concept was ‘harpooning’. Dudley Herschbach, they realized, had demonstrated it most vividly. The elements of the concept had, however, been present in Michael’s publications with Richard Ogg and Meredith Evans, a quarter of a century earlier.

‘Harpooning’ occurs when a charge-carrying ‘whaler’ molecule comes within range of a charge-attracting ‘whale.’ The electron leaps the gap between the molecules, giving rise to a residual positive charge on the whaler and a negative one on the whale. Since plus and minus attract over large separations, the whaler pulls in the whale. A ‘reaction’ has occurred binding one molecule to another, while the two remain at a large separation. The hurled electron is the harpoon.

Though Michael may not have suspected it, variants of molecular harpooning are highly important in nature. I can attest, however, that he sensed this to be a powerful insight into the mechanics of chemical reaction,

since he tried, gently but insistently, to persuade me to make it the subject of my research. Like most of the young, I only heard his voice much later. I am, it would seem, among a number who continue to hear it.

Notes

¹This essay was first delivered as a paper (“Michael Polanyi the Physical-Chemist”) in absentia at the September 26-27, 2003 Michael Polanyi Liberal Philosophical Association (MPLPA) Conference at Budapest University of Technology, Budapest, Hungary. Subsequently, it appeared in *Polanyiana: The Periodical of the Michael Polanyi Liberal Philosophical Association* Vol. 12, No. 1-2 (2003): 117-121. It is reprinted with permission of Professor Polanyi and *Polanyiana*

Submissions for Publication

Articles, meeting notices and notes likely to be of interest to persons interested in the thought of Michael Polanyi are welcomed. Review suggestions and book reviews should be sent to Walter Gulick (see addresses listed below). Manuscripts, notices and notes should be sent to Phil Mullins. Manuscripts should be double-spaced type with notes at the end; writers are encouraged to employ simple citations within the text when possible. MLA or APA style are preferred; because the journal serves English writers across the world, we do not require anybody's “standard English.” Abbreviate frequently cited book titles, particularly books by Polanyi (e.g., *Personal Knowledge* becomes *PK*). Shorter articles (10-15 pages) are preferred, although longer manuscripts (20-24 pages) will be considered. Consistency and clear writing are expected.

Manuscripts normally will be sent out for blind review. Authors are expected to provide a hard copy and a disk or an electronic copy as an e-mail attachment. Be sure that electronic materials include all relevant information which may help converting files. Persons with questions or problems associated with producing an electronic copy of manuscripts should phone or write Phil Mullins. Insofar as possible, *TAD* is willing to work with authors who have special problems producing electronic materials.

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Polanyi's Scholarly Influence: A Review Article

Walter B. Gulick

ABSTRACT Key Words: Michael Polanyi, Harry Redner, Trevor Pinch, Susan Haack, John Ziman, Israel Scheffler, Peter Dodwell, Eugene Webb, James Loder and W. Jim Neidhardt, Iain Paul, Lothar Schäfer, Ian Barbour, Holmes Rolston, John Brooke and Geoffrey Cantor, John Haught, Randy Barnett.

This essay critically discusses books not previously reviewed in Tradition and Discovery yet making significant use of Michael Polanyi's thought. These works suggest Polanyi's thought continues to play an important, if limited, role in contemporary scholarship.

What does the scholarly literature of recent years reveal about the continuing impact of Michael Polanyi's thought? This is an important question for those who believe, as I do, that Polanyi's thought has resources for addressing contemporary issues, resources that seem not yet to have been fully tapped. It would be helpful to know what persons are exploring what issues and continue to cite his thought. Especially interesting would be to see where Polanyi's ideas have contributed to innovative explanations and insights.

One way to survey Polanyi's contemporary influence is by examining the book reviews in this journal. One could reasonably expect that major works dealing explicitly and extensively with Polanyi's thought would be reviewed in *Tradition and Discovery*, but there are many works manifesting a Polanyian influence that slip by unreviewed. The purpose of this article is to call attention to some of the more notable Polanyi-hued fish that have bypassed the net of review. A number of the most relevant and interesting of such works come from ten to twenty years ago. Some of these works are now out of print (cited as OP), but that need not imply that their insights have perished or they are no longer worthy of attention.

The works discussed here have to meet two criteria.

1. They have not been the subject of any *Tradition and Discovery* book review.
2. They make some significant use of Polanyi's thought.

The purpose of this article, then, is not dependent upon a thorough reading of each work cited or an analysis of its unique contributions. Its focus is first upon the Polanyian influence each work manifests and secondarily upon how that influence impacts the course of the work's argumentation.

Harry Redner's *The Ends of Science: An Essay in Scientific Authority* (Boulder: Westview Press, 1987 – OP) is a useful work to begin with because it suggests how Polanyi's thought is situated historically. Redner, influenced by Prigogine and Stengers' *Order Out of Chaos*, postulates the existence of three basic periods in the history of Western science: the ancient-medieval period (encompassing Renaissance science as well), Classical science (commencing with the scientific revolution of Galileo, Descartes, and Newton in the seventeenth century and concluding with Bohr, Heisenberg, and Einstein in the mid-twentieth century), and contemporary World science. In contrast to theories of scientific progression that see relativity theory and especially quantum mechanics as initiating a break with the past, Redner sees the demise of the deterministic dream as an end phase of Classical science, a period marked by the significance of the individual scientist searching "for fundamental laws and unifying schemas" (23). Polanyi indwells the framework of Classical

science. World science blurs the previous distinction between pure and applied science, and “the needs of technology have become a motive force for research and development” (15). In particular, the military-industrial complex has taken over much funding of science. In World science, teams of scientists (rather than outstanding individuals) conduct research attuned to specific purposes. A pragmatic rather than a truth-oriented (or reductionist) approach has become dominant in the scientific Establishment, a process Redner discusses under the rubric of “finalization” (84ff).

It will be evident that Redner’s portrayal of World science contrasts starkly with the vision of science Polanyi offers in a work such as *Science, Faith, and Society*. The political considerations intruding upon and shaping World science seem analogous to the Soviet agenda of planned science that Polanyi objected to so strenuously in *The Logic of Liberty* and other writings. And indeed Redner suggests that the new pattern of science has given rise to pathologies that require reform. Redner states that “the authority structure in the multiversity-research institute complex is very different from that previously prevalent in the university” (169). A patron-client relationship has replaced the older master-disciple relationship with the result that those who have attained grants may have their name affixed to papers produced by those employed to carry out research projects even though the patron-funder may know virtually nothing about what has been produced. The patron, to keep the grant money flowing, must cultivate the appearance of success, whether the results warrant such a judgment or not. Journals proliferate to generate the appearance of progress, even though journals often systematically reject genuinely new discoveries or theoretical perspectives (178). And when the funding agencies are corporations, the results of scientific inquiry may be privately exploited rather than enhance public understanding.

Redner brings Polanyi fully into the picture in his discussion of the reform of science. Redner appropriates language from the Protestant Reformation in describing alternative approaches to reforming the scientific Establishment. Polanyi is seen as a “High Church” conservative reformer. Both Low Church (Methodist) and High Church (Catholic) conservatives “wish to call science back to its ideal image as elaborated during the nineteenth-century Classical era of science” (211). Low Church reformers espouse a logic of scientific rationality, the objectivism that Polanyi rejected. High Church reformers, who tend to be practicing scientists, are “averse to scientific method and methodology, regarding them as specious forms of idle philosophizing; instead they advocate an approach to science based on a study of traditions of informal procedures or the art and craft features of practical scientific work” (211). Both types of conservatives adhere to a separation of the pure from the applied sciences and advocate a rational pursuit of truth to grasp an objectively real world. Redner’s portrayal of Polanyi as a High Church conservative seems at first glance to be appropriate and adequate.

The moderate (or liberal) position, suggested as analogous to Lutheranism, sees “the history of science as an evolutionary sequence from simpler and lower to complex and higher grades of scientific organization. The Classical sciences figure in their historical scheme as an already superseded epoch made up of the sciences of organized simplicity” (212). The moderates propose two further stages: unorganized and organized complexity. Polanyi’s views are quite consistent with these stages as well; his vision has systemic aspects and emphasizes emergence to higher levels of organization.

The scientific radicals (Anabaptists) “see science as inherently value guided and value determined at every stage of its procedure” (213). A social constructivist like Bruno Latour would be an example of such a radical. But again, Polanyi should not be seen as wholly opposed to such a viewpoint. While he would firmly

resist reducing reality to a social construction, his notions of personal knowing and the importance of communal consensus acknowledge the inevitable place of values in scientific work. In sum, it seems too facile to constrict Polanyi to the realm of the High Churchman alone. Part of the power of Polanyi's vision is its ability to encompass compelling aspects of a variety of usually mutually exclusive alternatives.

While generally showing respect for Polanyi's contributions, Redner offers a well-developed critique of his notion of authority in science. Under attack is Polanyi's vision of a republic of science in which mutual supervision is carried out in a series of overlapping neighborhoods of expertise. "Polanyi's republic of science is an utopian vision of an idealized liberal democracy based on a free-market economy of competing individuals. . . .He sets himself against all science policy measures to allocate funds and guide research" (228). Redner, on the other hand, claims there are Establishment power brokers in the realms of resource allocation, article acceptance, and appointment to positions. World science gives rise to an oligarchical struggle for power; it does not support a republic exhibiting shared authority according to a principle of spontaneous order.

Furthermore, Redner sees Polanyi's insistence on science's autonomy from any outside authority as opening the door to the hegemony of the scientific Establishment, a status quo conservatism. Redner believes some sort of authoritative intervention in the Establishment is needed if movement towards Polanyi's utopian view is to be realized. While praising Polanyi's arguments against Low Church methodism (such as Popperian falsification), he claims Polanyi sets up a number of dualisms that he seeks unsuccessfully to hold together, such as realism versus relativism and tradition versus autonomy. That is, Redner questions Polanyi's success in encompassing those contrary positions that earlier I praised as one of the strengths of Polanyi's philosophy of science. In sum, Redner displays a nuanced understanding of Polanyi and raises questions about his thought that deserve a thoughtful response.

Redner's work sets the stage for considering what has become known as the science wars, essentially a conflict between scientific realists and constructivists. Worth mentioning in this regard is *The One Culture? A Conversation about Science*, edited by Jay A. Labinger and Harry Collins (Chicago: University of Chicago Press, 2001). This collection of discussions about the science wars includes as lead essay a piece by Trevor Pinch entitled "Does Science Studies Undermine Science? Wittgenstein, Turing, and Polanyi as Precursors for Science Studies and the Science Wars." Pinch argues that a view of science is needed that avoids the extremes of regarding science as a sacrosanct procedure producing certainty or as merely a form of fraudulent conniving that legitimates political ends. He suggests that science is best regarded as a body of expertise with a human face to it (22). Polanyi's notion of the scientist as one who employs skills and other forms of tacit knowing in the search for understanding is cited as exemplifying the sort of expertise Pinch has in mind. Book knowledge is not the core of science; skill in practice is.

To my ears, Susan Haack offers the most thoughtful response to the turmoil surrounding the interpretation of science in recent decades – turmoil initiated by Kuhn and Feyerabend (and in the eyes of some, Polanyi) and carried through by the "Strong Programme" in sociology of science and by social constructivist theories. Haack's *Defending Science – within Reason: Between Scientism and Cynicism* (Amherst, NY: Prometheus Books, 2003) argues for what Haack terms, after Peirce, "Critical Common-Sensism."

Critical Common-Sensism acknowledges, like the Old Differentialism, that there are objective standards of better and worse evidence and of better and worse conducted inquiry; but proposes a more flexible and less formal understanding of what those standards are. Critical Common-Sensism

acknowledges, like the New Cynicism, that observation and theory are inter-dependent, that scientific vocabulary shifts and changes meaning, and that science is a deeply social enterprise; but sees these, not as obstacles to an understanding of how the sciences have achieved their remarkable successes, but as part of such an understanding. (23)

Haack opposes what she calls “the narrowly logical conception of rationality shared by the Old Deferralists, both inductivist and deductivist, *and* by the New Cynics” (51), and I want to cheer. Among the philosophers that she sees as relying in inappropriate ways on logic as the sine qua non of scientific progress, are Carnap, Hempel, Popper, Kuhn (who wrote Haack that he never meant to impugn the rationality of science [44]), Hesse, Lakatos, and Quine.

And where does Polanyi fit into her understanding? Unlike Redner, she really appreciates “The Republic of Science” and quotes from it several times. She acknowledges that to many (especially to the New Cynics), “Polanyi may sound old-fashioned, even quaint” (180). But she sees his analysis of scientific authority as being consistent with her “sensible program, that social and evidential aspects of science interlock” (196). She also affirms his appreciation of the tacit skills and connoisseurship that go into finding a good hypothesis or project, although she wishes this view could be stated in less metaphorical terms (144). Thus both Pinch and Haack use Polanyi’s notion of tacit knowing, but in support of quite different views of the scientific enterprise.

The next work to be discussed is easily the oldest book to be cited, yet it is so imbued with a Polanyian spirit that it virtually calls out for inclusion. This work is John Ziman’s *Reliable Knowledge: An Exploration of the Grounds for Belief in Science* (Cambridge: Cambridge University Press, 1979, reprinted 1991). No doubt Redner would classify Ziman as a High Church exponent like Polanyi, for he honors social practice, the goals of unified scientific understanding, and other aspects of Classical science. However, in attending to the social dimension of science he does not support the role of the individual scientist as is glorified in Classical science. “The objectivity of scientific knowledge resides in its being a social construct, not owing its origins to any particular individual but created cooperatively and communally” (107). Indeed, Ziman (like Haack) accepts Polanyi’s characterization of how scientific communities work quite uncritically (135), never suggesting, as does Redner, that it is a utopian construct.

Ziman begins by offering a model of science that provides reasons for regarding it as reliable (not certain or indubitable) knowledge. His book is therefore basically an epistemological exploration in which the role of consensus is highlighted. It articulates the role of belief as the ground of all knowledge (109). It is thus consistently congruent with Polanyi’s philosophy of science.

Ziman’s model takes math as the ideal language that transcends cultural and linguistic barriers to communication. But he also emphasizes that there are limited realms within which math can be utilized, necessitating the use of models as heuristic aids. He relies upon Polanyi’s thought to argue that while there is no necessary correlation between a model and what it refers to, tacit powers rooted in scientific practice help span the gap and render the models useful. At several different points Ziman reverts to a quotation from Polanyi to argue that some tacit or intuitive skill grounded in experience is essential to scientific discovery or practice. Pinch and Haack later make much the same use of Polanyi. All of this is to say that *Reliable Knowledge* functions in many respects like a gloss on *Personal Knowledge* without the depth and detail that Polanyi provides.

Israel Scheffler’s *Symbolic Worlds: Art, Science, Language, Ritual* (Cambridge: Cambridge Univer-

sity Press, 1997) also traverses territory covered in Polanyi's writings (especially *Meaning*). In the several pages he devotes to Polanyi's thought, Scheffler quotes with approbation the same material on authority in science that Ziman quotes (PK 163-164 – Scheffler's quotation omits the ellipsis marks that should properly be present). Thus Scheffler does not raise the sorts of questions about Polanyi's thought that Redner does. Scheffler uses Polanyi to make the point that because art is expressive rather than primarily cognitive and denotative as are science and religion, art does not come into systematic conflict with science and religion the way that science and religion sometimes combat each other.

I find Polanyi's way of speaking about the relations between these disciplines (PK 220) less open to possible objections than Scheffler's discussion. Scheffler writes, "Art has no experts or doctrinal authorities to lay down corporate items of belief or make decisions for the community. The community of artists is in fact not a community of belief. Art has styles, to be sure, but these styles do not bind" (124). But is art as individualistic in practice as he makes out? In past centuries, in order to be employed, visual artists had to please patrons. Nowadays in order to be recognized and make a living, visual artists must please such arbiters of taste as gallery owners (what sells), museum curators (what will attract viewers), and art critics writing in such journals as *Art Forum*. In some respects, art, insofar as its organized communities adhere to different standards, functions socially and competitively much like the world of religious denominations. Polanyi acknowledges that competition between artists and their communities is conducive to artistic health (PK 220). Moreover, some religious communities are not creedal, and few are binding to the degree Scheffler suggests. In sum, not all religious communities conflict with science, and some religious communities come into conflict with some artistic communities, as the antagonism of some conservative denominations to the NEA illustrates.

The flavor of Scheffler's book is quite different than that found in *Reliable Knowledge* or any other book considered so far. Scheffler writes out of a perspective that honors above all the American pragmatists and secondarily the analytic tradition. Nelson Goodman's thought is especially engaged. Because Scheffler writes out of a nominalistic viewpoint (6), his sense of the real is narrower than Polanyi's understanding. Yet I find much in Scheffler's writing (such as his notion of mention-selection in Chapter 2) that can be used profitably to supplement and refashion the ways Polanyi treats symbols, metaphor, and art in *Meaning*.

Peter Dodwell assays a rather specialized field of scientific inquiry, cognitive science, in his *Brave New Mind: A Thoughtful Inquiry into the Nature and Meaning of Mental Life* (New York: Oxford University Press, 2000). But one of the burdens of his message is to promote a "widening of the field of cognitive science to include some well-documented features of mental life that have suffered neglect over the past many decades but that are nevertheless valid topics of inquiry. I characterize these as the *drama* of the mind" (vii). When one sees that the drama includes such things as creativity in math, music, and language, and novel ways of understanding the world, it becomes clearer why he draws upon Polanyi's thought. Dodwell does not refer to Polanyi reluctantly, for he states that Polanyi's work, "which has been sadly neglected, is chock full of interesting ideas, compelling descriptions of the nature of deep research creativity, and commentary on the human condition" (217).

As a first step toward broadening the scope of cognitive science, Dodwell sets forth in chapters 2 and 3 what he terms the standard model of the mind. This model

treats the mind as a product of brain function and of the evolution of that wonderfully complex organ under the demanding priorities of natural selection. All mental activities,

whether conscious or not, can be understood in principle on that basis, and the job of cognitive science is to find appropriate explanations in those terms. In recent decades the aims and methods have become more and more “computational”. . . (59).

After offering a broad survey of leading theorists in psychology and cognitive science to show where the field is at present, Dodwell cites Polanyi approvingly as one who understands the “passionate commitment of scientists to the discovery of the ‘hidden world’ of ideas and phenomena” (179). He turns to Popper’s model of three worlds in order to speculate on where cognitive science might look in order more effectively to embrace the whole drama of life. World three, the social world of ideal forms and ideas, is of special interest to Dodwell. He begins by quoting Roger Penrose’s comments concerning the way mathematical forms in world three play a decisive role in understanding the physical laws and properties of world one. Then he turns again to Polanyi, utilizing his distinction between the principles and functions of a machine and the laws of chemistry and physics to suggest that such principles in world three may play a constitutive role in worlds one and two that to date has been mostly ignored. Dodwell particularly affirms that ideals of many sorts have an objective quality that is ignored to the detriment of cognitive science.

Brave New Mind is far more effective as a summons to a broadened vision than as a source for understanding what that vision might look like. Dodwell’s pleas would have gained greater traction in my view had he adhered to a yet greater reliance on Polanyi. The quasi-independence of world three is a pretty weak frame upon which to hang new scientific insights. Better to see the terms, laws and principles of world three as symbol-dependent emergent insights constituted by humans, who are influenced not only by the impact of sense data, but also by evolutionary, historical, and social pressures and by a passionate commitment to truth.

Perhaps a book entitled *Philosophers of Consciousness* would prove to be a helpful place to explore if one wants to make progress in the direction Dodwell argues for. The fact that the author of this work was a professor of English would not be a problem for Dodwell but rather consistent with his interest in exploring the drama of life. That author is Eugene Webb, now a Professor Emeritus in the Henry Jackson School of International Studies, and in recent years primarily a teacher of courses in Religious Studies. The subtitle of Webb’s book indicates its seminal interest to Polanyians: *Philosophers of Science: Polanyi, Lonergan, Voegelin, Ricoeur, Girard, Kierkegaard* (Seattle: University of Washington Press, 1988 — OP).

It would be misleading to think of Webb’s book as having much of anything to do with cognitive science. Webb is interested in “reflective inquiry into what it means to function consciously as an inquirer and as a responsible agent” (3). More specifically, though, Webb is interested in the set of six individuals whose thought he analyzes because “all of them have been in some manner or another closely associated with the tradition of Christian thought and have tried to point directions for its future development, even if in some cases their relation to it has been somewhat problematic from the point of view of the orthodox” (19). Webb’s interest in exploring new paths for Christian theology marks a transition in the concerns of the books under consideration in this review; almost all the remaining works exhibit a theological orientation to some degree.

Webb discusses Polanyi first among the six thinkers because he “introduces in a fairly basic and straightforward manner some considerations regarding the way thought and systematic inquiry demand to be understood” (14). Webb’s introduction to Polanyi as the only one with the possible exception of Voegelin “to offer anything especially colorful in the way of biographical background” (26) is peculiar, to say the least. The color comes from using Peter Drucker’s notoriously unreliable *Adventures of a Bystander* as the source for a

Polanyi family mythology. Fortunately, Webb shows signs of distrusting the source he quotes – but why then begin with Drucker?

Once Webb launches into an exposition of Polanyi’s thought, the chapter on Polanyi settles into a productive groove. Webb understands Polanyi well and writes with admirable clarity. Webb helps those not knowing Polanyi’s thought avoid seeing him as a subjectivist or irrationalist. “Polanyi was not opposed to objectivity as such, but to what he considered an exaggerated objectivism based on naiveté” (36). His exposition of focal and subsidiary awareness is lucid. In fact, pages 31-46 of *Philosophers of Consciousness* offer as insightful a brief summary of Polanyi’s thought as any I know.

Polanyi is criticized by Webb for his failure to elucidate cognitive processes in any detail (47, see also 76). There is merit in such a comment; Polanyi does little to differentiate the different sorts of tacit knowing or varieties of integration. There is indeed, as Webb puts it, “considerable ambiguity in [some of] his basic concepts” (51). Webb quotes from an article by the analytic philosopher Alan Olding in *Religious Studies* 16 (1980) to extend his criticism. Olding accuses Polanyi of confusing ontological with methodological questions. Olding is basically a materialist. He regards as metaphorical any of Polanyi’s hierarchical language, such as his comment that a machine’s parts are harnessed by its design (49). Here there seems to be an irresolvable clash of basic assumptions: reductionistic-mechanistic versus emergent-hierarchical. I find the Polanyian option far more fruitful – end of discussion.

But to continue this digression on Olding, he also sniffs out traces of vitalism or at least questionable teleology in Polanyi’s explication (PK 37; PK 383-384), and here his criticism is more worthy of note. Polanyi says, “Randomness alone can never produce a significant pattern, for it consists in the absence of any such pattern. . .” (PK 37). I’m not sure what Olding goes on to say about this claim, but Polanyi appears to be on shaky ground insofar as he is speaking of an order of existence and not a mathematical ideal. Polanyi believes randomness exists (PK 38), but can it ever exist alone? The cosmos exhibits a mixture of order and disorder. The disorder or randomness Polanyi refers to is thus never “alone,” but in a context of some order. In relationship to that order, new stabilities could be expected to emerge out of the randomness. For instance, in a physical environment of randomly distributed living things, the features of the environment would be friendly to certain species and thus function as an environmental niche providing ecological order.

Webb suggests Lonergan’s analysis offers Polanyi’s thought some conceptuality that can overcome its ambiguity.

The problem with the language of focal and subsidiary awareness, Lonergan would probably say, is that it connotes an ocular analogy that implies that knowing is a kind of ‘look’ – which from Lonergan’s point of view, of course, would be a fundamental misconception in cognitional theory (77).

Critical analysis is needed before any “look” can claim status as knowledge. The suggested advance in clarity evident in Lonergan’s thought seems, however, either to be merely terminological or to represent a step backwards from Polanyi’s insights. Webb objects to Polanyi calling tacit processes “knowledge” and approves of Lonergan’s designation of that which is tacit or merely apprehended as “experience” in contrast to explicit, critically legitimated “knowledge” (55). But is this not merely to revert to the subjective-objective dichotomy that Polanyi transcended with his notion of personal knowledge?

In the final analysis, despite offering a superb summary of Polanyi's thought and an illuminating discussion of six interesting thinkers, Webb does not get Polanyi quite right in a couple of aspects. Webb writes, "Lonergan shared with Polanyi a conception of consciousness as a dynamic relation between subjective and objective dimensions" (291 – see also 76). But that which is subjective (subsidiary) may be conscious or unconscious, it may be an idea established as "objective" or an embodied skill. That is, the subjective-objective distinction is not entirely isomorphous with Polanyi's subsidiary-focal distinction. Moreover, Webb treats Polanyi as offering an epistemology of the individual much as Lonergan did, and this misses the importance to Polanyi of tradition, of communities of inquiry — their conviviality and their authority structures – and of the role of evolution and emergence in the rise of human cognition. Polanyi is a philosopher of consciousness, but he is far more than that.

No work considered in this essay makes Polanyi's thought more central to its vision than *The Knight's Move: The Relational Logic of the Spirit in Theology and Science* (Colorado Springs: Helmers and Howard, 1992). This challenging work is co-authored by James E. Loder and W. Jim Neidhardt, both now deceased. And in the shadows behind their references to Polanyi one can make out the figure of Thomas Torrance, who is the major contemporary theological influence on this book.

The Knight's Move "is addressed to a wide spectrum of persons with the intention that interrelationships which pertain between theology and science may be brought out of any disciplinary ghetto and put into open dialogue" (xiii). Well, the religion-science dialogue has certainly escaped any ghetto it may have been in, but primary credit must go to Templeton Foundation funding, certainly not to the book at hand. Alas, while the book aspires to great things, its frequently obtuse style and a pervasive lack of clarity about its claims make it a promising but not entirely satisfying work.

The basic aim of the authors is to counter the dualisms of our age with a relational pattern they believe is characteristic both of human-divine and knower-known relations. They term this relationship "the strange loop model of bipolar-relational unity" (56 and elsewhere). Their visual model is the twisted band of the Mobius strip, a figure that has two ends (polar diversity), but only one side and one edge (its unity). Polanyi's notion of personal knowledge is employed to explicate what they mean. "Polanyi views personal knowledge as a differential integration of tacit (informal) knowledge and explicit (formal) knowledge with the latter depending upon, and in turn being molded by, the former; the latter as explicit knowledge controlling what is or is not to be known by others" (41-42). This sentence is typical of the book's syntax and also revelatory of some of its conceptual problems. Is tacit knowledge informal while explicit knowledge is formal? Are the two related by "a differential integration?" Does explicit knowledge control what is to be known by others? Be that as it may, the authors see the asymmetrical relationship between the tacit and the explicit to be an important conceptual alternative to simple dualistic opposition, and in this they have a point, perhaps a very important point.

The Polanyian understanding of knowledge, in which the action of the knower is a necessary concomitant to any object known, informs much of the authors' analysis. Thus Bohr's vision of the universe is seen as superior to Einstein's view because "Einstein did not reason about the universe itself as if the knower *per se* had to be part of the final explanation" (188). Loder and Neidhardt apply the basic Mobius model of reciprocal relationship to Bohr's notion of complementarity, the Kierkegaardian leap of faith, the dialectical exchange between the human spirit and the divine Spirit, Bach's "Musical Offering," indeed to all creative acts of imaginative or intellectual insight. "Our aim cannot be to eliminate how we are implicated in what we know,

but only to make anthropocentrism more inclusive and intelligible and to make knowledge more inclusive of it and its source and ground” (62-63).

Anthropocentrism is made more inclusive and intelligible through the concept of spirit. “[S]pirit refers to a *quality of relationality*, and it is a way to conceptualize the dynamic interactive unity by which two disparate things are held together without loss of their diversity” (10). Is personal knowing then an expression of spirit in this sense? Since one experiencing personal knowledge would be aware, at least in reflection, of both her involvement in the process of knowing and of the object known, it seems that an affirmative answer is called for. The authors phrase it this way: “The generative work of intelligence in such acts of creation and discovery as we have described here provides an analogy for the constructive power of the human spirit in all orders of thought and experience. . .” (230).

There are other indications that *The Knight’s Move* projects a spiritualization of a Polanyian framework of thought. Here is an example: “Wonderful ideas are like the miracles of God in their generative spontaneity. In the seeming empty space between the knower and the known, and without conforming to any natural law, they ‘just happen’” (226). It should be remembered that such talk of the human spirit has a long philosophical history, even though it might strike some contemporary ears as strange.

But Loder and Neidhardt are interested in much more than the human spirit. They believe the role of the Holy Spirit in human existence must be understood if the full possibilities of that existence are to be realized. “The Holy Spirit apart from the human spirit is intrinsically unknowable; the human spirit apart from the Holy Spirit vitalizes and empowers human perversity. In the profound creative interplay between them lies the core of our discussion” (11).

As in *Philosophers of Consciousness*, the thought of Kierkegaard plays a crucial role in *The Knight’s Move*. Seven of the book’s thirteen chapters have Kierkegaard’s name included in their title. This is because Kierkegaard understood the essential role of the individual chooser as empowering the kinetic connection between Christ and culture, Holy Spirit and human spirit, the eternal and the existential.

In the *positive* modality of faith, Religiousness B, *coexhaustiveness* means that the eternal and the existential are united in a bipolar unity which Kierkegaard called *transparency*. The person in whom this is accomplished by faith is one whose despairing self-relatedness is transformed into a relatedness “transparently grounded in the Power that posits it [the self]” (100).

The model of the one who in faith relates the existential and the eternal is the knight of faith set forth in *Fear and Trembling*. And here we come to the figure highlighted in the book’s title.

In a game of chess, the knight’s move is unique because it alone goes around corners. . . . This meaningful combination of continuity and discontinuity in an otherwise linear set of possibilities has led some to refer to the creative act of discovery in any field of research as a ‘knight’s move’ in intelligence” (2).

Even more important than this Polanyian knight of discovery for the authors is Kierkegaard’s knight of faith. This “knight shows how, by existing in faith as a creative act of Christ’s Spirit, human existence comes into its own as an expression of the mind of Christ” (2).

Another work traversing similar territory is Iain Paul's *Knowledge of God: Calvin, Einstein, and Polanyi* (Edinburgh: Scottish Academic Press, 1987). The author of two previous books dealing with Einstein and theology, Paul is a minister in the Reformed tradition who accepts Calvin's thought as the standard by which God may be known. Einstein and Polanyi function primarily as figures whose thought is shown to be analogous to Calvin's thought in some key respects. "Einstein's sympathetic knowledge, Polanyi's personal knowledge, and Calvin's persuasive knowledge share the same formal structure" (143-144). In comparing the thought of these three persons, then, Paul in effect seeks to transfer some of the authority of a great scientist and great philosopher of science to a great theologian of five centuries ago in order to justify continuing reliance on his thought.

A reader can gain the essence of the book's 149 pages by reading the 19 pages of the first chapter. In brief, for Calvin ordinary knowing includes both an activity of the heart, cordial knowing, and an activity of the mind, intellective knowing (6). Neither of these alone is sufficient to connect a person meaningfully to the ultimate mystery that is God. Only when the Holy Spirit underlies cordial and intellective knowing and then seals them in persuasive knowledge is the whole person bound up in an existentially vital relation to God. This relationship is not just a matter of believing God exists, but discerning his will toward each believer. That is, the work of the Holy Spirit comes to a climax in an existential faith.

Paul seeks to show that Einstein and Polanyi argue in parallel ways both that a cordial and an intellectual sort of knowing are required for scientific discovery, and that faith supports the scientific enterprise, bringing the mind and the emotions into harmony. Polanyi claims that critical analysis (intellective knowing) can never lead to comprehensive knowledge (2). It must be supplemented by powers of grasping that which is only vaguely foreknown and brought into increasing clarity by personal judgments (10). In relating cordial knowing to Polanyi's world of thought, Paul does not mention intellectual passions by name, but rather discusses tacit knowing, which, it must be said, involves more than reasons of the heart. Even in discussing tacit knowledge, Paul is not always sure-footed. "According to Polanyi, in tacit knowing we always attend from something in order to attend to something else" (11). That would be a satisfactory description of the from-to structure of consciousness, but would confuse readers seeking to comprehend tacit knowing. In any case, it is true that Polanyi believes that rationality and emotional involvement are required not only for scientific discovery but also for any process of knowing.

Both Einstein and Polanyi, Paul states, are alert to the mysterious dimension of the natural order much as Calvin is to the mysterious nature of God. Einstein is said to have claimed that an intuitive link between his reason and the empirical world "mysteriously schools him in the ways of the universe . . . It is readily appreciated that the reality, the rationality, and the intelligibility of the universe cannot be proved. The modern scientist must believe in them to understand the universe" (5). While acknowledging that Einstein and Polanyi would not approve of calling their intuitive powers the witness of the Holy Spirit, and while stating that Calvin finds no common ground with those who seat the power of discovery solely in the scholar or scientist, still Paul stresses that the way each thinker emphasizes the action of a suprarational power in knowing mysteries demonstrates the continuing relevance of Calvin's approach to gaining knowledge (16, 121-122).

There are surely gaps of reasoning separating Einstein and Polanyi from Calvin that Paul overlooks. Yes, it can be said that the reality, rationality, and intelligibility of the universe cannot be proved, but the sort of faith that affirms their existence is different in kind from faith in God the Creator, the saving existence of the

God-man Jesus Christ, or the authority of the Holy Spirit in authenticating truth. Faith in the reality and rationality of the universe is part of the practical worldview of virtually any sane person, Christian or non-Christian. Faith in the persons of the Trinity requires an extra step beyond faith in the external world, a step many persons believe is unwarranted. In particular, one must question Paul's intimation that the persuasive activity of the Holy Spirit is comparable to conviction resulting from rational inquiry and discovery. That the Holy Spirit is needed to produce meaningful conviction is an over-belief that Paul's book asserts in the name of Calvin without any attempt to persuade the skeptic.

Rather than use theology as the basis for interpreting science as Paul does, Lothar Schäfer takes science to be a source of religious and ethical insight, as the subtitle of his book suggests. *In Search of Divine Reality: Science as a Source of Inspiration* (Fayetteville: University of Arkansas Press, 1997) is well grounded in scientific literature – references to Einstein, Heisenberg, Eccles, Monod, Bell, Planck, and Schrödinger are relatively frequent. On the other hand, references to contemporary ethicists and theologians are virtually non-existent. This is not surprising in a work by a physical chemist. However, the imbalance in the sorts of individuals referred to points to a similar imbalance in the amount of authority evident in the scientific content (insofar as it is presented rather than applied) versus the philosophical-humanistic content of the book.

To his credit, Schäfer's work is clearly written and motivated by highly honorable ideals. Simply put, he argues that the value-denying triumph of the mechanistic sciences destroyed the religious worldview that offered many people their sense of meaning in life, but that scientific advances in the past century provide grounds for affirming that the universe is basically mind-like and a reservoir of life-giving values. Polanyi (who would be surprised to learn that he was a biologist) is first cited in an apparently approving way as having "views close to vitalism in a modern way" (58). His view of emergence is mentioned but never taken up into the argument of the book. That is a shame, because the author relies on some pretty weak bases for what turns out to be an impoverished idealism. His basic claim is that ultimate reality is mind-like and thus a plausible dwelling place for the ethical principles and divine realities that bring meaning to existence.

First Schäfer appeals to the transcendental principles of object permanence, induction, and causality as demonstrating that understanding the universe requires more than empirical evidence shaped by reason (19, 23). He then cites quantum phenomena as evidence of transcendent and non-material foundations of physical reality (chapter 2). That there is a difference between 'transcendental' (what is required to explain a state of affairs) and 'transcendent' (that which exists beyond direct empirical evidence) is not noticed. The author states that such information-driven phenomena as suggested by the electron diffraction experiments, the Pauli principle, and other quantum phenomena "convey the impression that the background of reality has **mind-like qualities**" (86). The upshot of his investigation is that he proposes a new covenant between human minds and the mind-like background of the universe (109), a covenant that affirms the existence of purpose and values and the possibility of divinity.

Ian Barbour is among the many thinkers who dismiss the sort of use Schäfer makes of quantum theory as involving a confused conflation of radically different dimensions of existence (see his *Religion and Science: Historical and Contemporary Issues* [HarperSanFrancisco, 1997, p. 187]). This work by Barbour, who is like Haack a self-professed critical realist, combines revised historical material from his *Issues in Science and Religion*, a widely respected standard work in the field, with material from his first series of Gifford Lectures. Here Barbour displays the same respect for Polanyi's accomplishments that mark his previous books. Polanyi's refusal to bifurcate reason and faith, his emphasis on tacit skills in all sorts of knowing, his holding together of

personal responsibility with communal consensus, his application of gestalt ideas to knowing, his stress on the practice of scientists, and his exposition of the role of boundary conditions – these are among that ideas Barbour incorporates from Polanyi in this seminal work.

Holmes Rolston, III, like Polanyi and Barbour a Gifford lecturer, is another who has appropriated aspects of Polanyi's thought. This reliance is not evident in Rolston's Gifford Lectures themselves (*Genes, Genesis and God*), but Rolston makes some use of Polanyi in his *Science and Religion: A Critical Survey* (New York: Random House, 1987). This thoughtful work analyzes central scientific ideas insofar as they intersect with religious ideas. Rolston offers his reasons for believing that religious faith is compatible with the findings of science. Polanyi's discussion of the need for a higher ordering principle to explain evolution (PK 382-387) is cited approvingly.

Reconstructing Nature: The Engagement of Science and Religion (New York and Oxford: Oxford University Press, 2000 [1998]) is yet another work originally delivered as Gifford Lectures. Its authors, John Brooke and Geoffrey Cantor, take an historical approach to explore crucial encounters between particular expressions of science and religion. An emphasis on particularity marks their approach. Like much postmodernist discourse, their work is skeptical of any master narrative, which they believe says more about the perspective of the author of the narrative than of the events themselves.

Polanyi's thought, taken from PK 133-148, is heavily relied upon in a chapter entitled "From Aesthetics to Theology." The authors use Polanyi's notions of indwelling and aesthetic satisfactions in theory development to explore how the Scientific Revolution, Enlightenment thought, and Darwin's notions were influenced by an honoring of beauty wherever it was found. Throughout their discussions, the authors emphasize that neither science nor religion should be seen as essences inextricable from the historical contexts in which they come to expression.

John Haught has focussed in recent years on considering what theology can learn from Darwinian evolution. His work, *God After Darwin*, was reviewed in *Tradition and Discovery* 28:1 (2001-2002), and his plenary address at the 2001 Polanyi Society conference at Loyola Chicago was published in the same issue. A revised version of that address appears as chapter 8 of Haught's most recent work, *Deeper than Darwin: The Prospect for Religion in the Age of Evolution* (Boulder, CO: Westview Press, 2003). At stake in this chapter is the question as to whether impersonal evolutionary theory can give an adequate explanation of the rise of religion. His use of Polanyi can be summarized in this quotation: "The logic of achievement – implying the possibility of success and failure – as Polanyi has consistently attempted (often without success) to get across, is simply inapplicable to impersonal processes" (116). Personal issues must be addressed in discussing the history and development of religion.

This review of Polanyi's contemporary influence would be incomplete without mentioning that many well-known authors, whose works have not been reviewed in this journal, make at least passing reference to Polanyi's ideas. Authors as wildly diverse as Huston Smith, Fritjof Capra, Parker Palmer, and Charles Taylor are among the many who might be cited in this regard. It would also be misleading to end this article leaving the impression that Polanyi's influence is confined to writers in the fields of philosophy of science or science and religion. So the last book I will cite comes from the field of jurisprudence.

Randy E. Barnett's *The Structure of Liberty: Justice and the Rule of Law* (New York and Oxford:

Oxford University Press, 2000 [1998]) begins by asking how liberty might be structured so that it will not lead to license. Freedom and constraint need to be balanced in law so that the problems of knowledge (who has access to what important information?), interest (how should society's goods be distributed so as to be fair yet retain incentives and be complied with?), and power (how can the law be enforced without abuse?) are adequately dealt with. Barnett's sympathies lie closer to Nozick than to Rawls, and he is leery of schemes of redistributing income. That is, Barnett is a classical liberal, appreciative of John Locke, but a contemporary conservative, influenced by Friedrich Hayek and the lesser-known Lon Fuller. Barnett acknowledges the background influence of Polanyi on his mentors as follows: "Both Hayek and Fuller were heavily influenced by Polanyi's treatment of polycentricity, tacit knowledge, and spontaneous order. . ." (257). It will thus come as no surprise that he appropriates Polanyi's notion of polycentricity, contrasting it with a monocentricity that he thinks almost inevitably leads to an abuse of power.

While the array of authors cited in this review article were selected because they evince knowledge and appreciation of at least some aspects of Polanyi's thought, the scope of the sample makes it reasonable to conclude that Michael Polanyi's thought continues to act as a catalytic force among many contemporary thinkers.

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Annual membership in the Polanyi Society is \$25 (\$10 for students). The membership cycle follows the academic year; subscriptions are due November 1 to Phil Mullins, Missouri Western State College, St. Joseph, MO 64507 (fax: 816-271-5680, e-mail: mullins@mwsc.edu). Please make checks payable to the Polanyi Society. Dues can be paid by credit card by providing the card holder's name as it appears on the card, the card number and expiration date. Changes of address and inquiries should be sent to Mullins. New members should provide the following subscription information: complete mailing address, telephone (work and home), e-mail address and/or fax number. Institutional members should identify a department to contact for billing. The Polanyi Society attempts to maintain a data base identifying persons interested in or working with Polanyi's philosophical writing. New members can contribute to this effort by writing a short description of their particular interests in Polanyi's work and any publications and/or theses/dissertations related to Polanyi's thought. Please provide complete bibliographic information. Those renewing membership are invited to include information on recent work.

Kant's Notion of Judgment from the Perspective of the Theory of Tacit Knowing

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ABSTRACT Key Words: universal-particular distinction, judgment, tacit knowing, Kant, Polanyi
The dominant view of the Western intellectual tradition, or perhaps more accurately, the continental European tradition, emphasizes the primacy of the universal over the particular when it comes to understanding the nature of knowledge. This preoccupation with the universal is undermined by the theory of tacit knowing which underlines the mediation of the universal and the particular with an emphasis on the latter, that is, the particular. An analysis of Kant's notions of determinative and reflective judgment reveals that he grounds each in tacit processes, privileging the role of particular examples or exemplars. Structural similarities between Kant's judgments of taste and Polanyi's notion of personal knowledge illuminates Polanyi's surprising claim that "The very nature of knowledge is in the Third Critique, not in the First Critique."

1. Introduction

Michael Polanyi popularized the notion of tacit knowing and contributes much to its elaboration. In the contemporary discussion, traditions associated with Wittgenstein's thought, phenomenology, and hermeneutics have also contributed to a still loosely-formulated notion of tacit knowing. When the various notions of tacit knowing are examined jointly, they cover such contrasts as the articulated and the unarticulated; the articulatable and the unarticulatable; the focal and the subsidiary; the foreground and the background; the critical, the uncritical and the a-critical; the particular and the universal; the detached and the involved; the representational and the pragmatic, etc. The potential of the notion of tacit knowing will be fully displayed only when some future analysis of these conceptual relations engages all relevant philosophical traditions.

In this article, I will concentrate on the universal-particular relation involved in tacit knowing. Polanyi touches upon this conceptual relation in the following two statements:

An art which cannot be specified in detail cannot be transmitted by prescription, since no prescription for it exists. It can be passed on only by example from master to apprentice (*PK* 53).

What has been said of skills applies equally to connoisseurship. . . Connoisseurship, like skill, can be communicated only by example, not by precept (*PK* 54).

The acquisition or transference of skill and connoisseurship leans on examples rather than rules, prescriptions or precepts. A prescription or a precept is something universal and an example is a particular. According to Polanyi, skill and connoisseurship are two paradigm cases of tacit knowing. Evidently, there is a universal-particular dimension in Polanyi's theory of tacit knowing.

The dominant view in the Western intellectual tradition, or perhaps more accurately, the continental European tradition, emphasizes the learning of rules, precepts, and prescriptions which are universal concepts

embedded in explicit knowing. It claims the primacy of the universal over the particular when it comes to understanding the nature of knowledge. Wittgenstein describes it as “the craving for generality” and “the contemptuous attitude towards the particular case”¹ This preoccupation with the universal in continental European intellectual tradition is one of the targets of attack of the theory of tacit knowledge. With respect to the universal-particular relation, the theory of tacit knowing underlines the mediation of the universal and the particular with an emphasis on the latter.

Polanyi alludes to the universal-particular relation in his theory of tacit knowing; however, the theme is not fully explored in his writings. In this connection, we have a lot to learn from Aristotle’s discussion on *phronesis* and Kant’s analysis of judgment. I have elsewhere examined Aristotle’s notion of *phronesis* from the perspective of the theory of tacit knowing.² The focus of this article is on Kant’s notion of judgment. It is not difficult to see that there is a judgmental component in the exercise of skill and connoisseurship. I will examine Kant’s notion of judgment to see to what degree it will help us understand the role of tacit processes in learning with an emphasis on the universal-particular relation.

The connection between Kant’s conception of judgment and tacit knowing was first pointed out by Michael Polanyi (*KB* 105), and this point was later reinforced by others, for instance, Kjell S. Johannessen, a Norwegian Wittgensteinian.³ However, to my knowledge, a detailed exposition of Kant’s conception of judgment from the perspective of the theory of tacit knowing has not yet been attempted, and this is what I want to pursue in this article.

The term “judgment” usually has two meanings: first, the power or the faculty of judgment, and second, the result of the exercise of this power, that is, the product of various judgments about things we are concerned about. These two meanings are inseparable, but my focus here is on the first.

Theoretically, there can be two ways to achieve the mediation between the universal and the particular. One starts from the universal and the other starts from the particular. Correspondingly, according to Kant, there are two types of judgment, the determinative and the reflective. “Judgment in general is the ability to think the particular as contained under the universal. If the universal (the rule, principle, law) is given, then judgment, which subsumes the particular under it, is determinative. But if only the particular is given and judgment has to find the universal for it, then this power is merely reflective.”⁴ In this paper, I will examine determinative judgment and reflective judgment respectively from the perspective of the theory of tacit knowledge. Then I will respond to two relevant questions involved in such an attempt.

2. Determinative Judgment

According to Kant, judgment is one of man’s higher cognitive powers; the other two are understanding and reason. Kant characterizes understanding as our power of rules, and judgment the power of subsuming particulars under the universal rules. “If understanding in general is to be viewed as the faculty of rules, judgment will be the faculty of subsuming under rules; that is, of distinguishing whether something does or does not stand under a given rule (*casus datae legis*).”⁵ Obviously, the judgmental power Kant talks about here is determinative. “Determinative judgment, [which operates] under universal transcendental laws given by the understanding, is only subsumptive” (*CJ* 19). Given the rules provided by understanding, when confronted with a particular case, it is up to judgment to decide whether or not it can be subsumed under a certain rule.

We have two different ways of describing what happens in a determinative judgment. If we take the direction from the particular case to the given general rule, what we do in a determinative judgment is *subsumption*, but if we take the other way round, that is, move from the given general rule to the particular case, then what we do is *application*. Subsumption and application are two sides of the same coin.

From the perspective of the theory of tacit knowledge, the first point that merits attention in Kant's analysis of determinative judgment is the argument that there is no rule for application or subsumption in determinative judgment.

General logic contains, and can contain, no rules for judgment. . . . If it sought to give general instructions how we are to subsume under these rules, that is, to distinguish whether something does or does not come under them, that could only be by means of another rule. This in turn, for the very reason that it is a rule, again demands guidance from judgment. (*CPR* 177)

If we try to set a rule for subsumption or application as general logic does — since it abstracts from all content of cognition, all it can provide is formal rules — then this new rule has the same subsumption or application problem. In order to solve this problem, general logic will once again resort to a third rule, and thus we end up with a n infinite regress. That is to say, the application of a rule or the subsumption of particular cases under a rule is ruleless. Kant reaches this point in his First *Critique* by appealing to *ad infinitum* arguments. It is not explicitly stated in the above passage, though it is definitely implied in it.

In this connection, it is interesting to note that this *ad infinitum* argument is once again employed by the late Wittgenstein in his discussion of rule-following activity. K. J. Johannessen points out that one of the most significant points of late Wittgenstein is that

a definition or the expression of a rule cannot itself determine how it is to be applied, as it can be interpreted in various ways. From this it follows that there can be no point in formulating a new rule that lays down how the first is to be applied. For then the same problem will arise once more in connection with the expression of the new rule. It, again, can be taken or understood in various ways. And thus it will go on *ad infinitum* if we try to escape from this tangle by this route. This is, in other words, a dead end. At one stage there thus have to be cases of rule-application which are not determined by other rules. *The application of rules is accordingly in principle ruleless.*⁶ (italics mine)

The application of a rule of language is ruleless. It is up to our intransitive understanding and judgmental power to tell us how to apply a rule.

From a different approach, Michael Polanyi arrives at a similar conclusion in his discussion of personal judgment in scientific research. Polanyi holds that there are two kinds of rules, i.e., strict rules and vague rules. Strict rules, like rules of multiplication, are rules which leave no room for interpretation in their application, while vague rules, like rules of art, always leave a considerable margin for personal judgment on the part of those who apply the rules under particular circumstances. Science does involve strict rules, like the manuals on the methods of experiment, measurement, calculation, map-making, etc., but that part only constitutes the routine work of science. For the original part of science, i.e., scientific research (most importantly, discovery and verification or falsification) in the strict sense, there are no manuals. Only vague rules are involved.

“Admittedly, there are rules which give valuable guidance to scientific discovery, but they are merely rules of art” (SFS 14). Then a question arises: how do we apply those vague rules in scientific research?

How can we ever interpret a rule? By another rule? There can be only a finite number of tiers of rules so that such a regression would soon be exhausted. Let us assume then that all existing rules were united into one single code. Such a code of rules could obviously not contain prescriptions for its own reinterpretation (SFS 58).

In scientific research, we cannot interpret a rule in its application by referring to another rule. Interestingly enough, in contrast to Kant and Wittgenstein who appeal to *ad infinitum* arguments, Polanyi reaches the point that the application of rules is ruleless by appealing to the finitude of the existing rules. This is where the personal judgment of the scientist sets in: “The application of rules must always rely ultimately on acts not determined by rule. . . . The rules of scientific enquiry leave their own application wide open, to be decided by the scientist’s judgment” (SFS 14-15).

The point that the application of a rule or the subsumption of particular cases under a rule is ruleless, and thus requires judgment, indicates that the power of judgment is something that is irreducible to a set of formal rules. It is something ultimate in our mind. Kant takes it as a natural gift and holds that the lack of it is stupidity. “It appears that, though understanding is capable of being instructed, and of being equipped with rules, judgment is a peculiar talent which can be practiced only, and cannot be taught. It is the specific quality of so-called mother-wit; and its lack no school can make good” (CPR 177). “Deficiency in judgment is just what is ordinarily called stupidity, for such a failing there is no remedy” (CPR 178). Learning and intelligence are two different things. It is not unusual that a learned man may betray his original deficit in judgment in the application of his scientific knowledge. Kant maintains that a physician, a judge, or a statesman may have a good understanding of the pathological, juridical or political rules *in abstracto*. However, due to the lack of the natural power of judgment, this person can easily blunder in applying them to cases *in concreto*, or in distinguishing whether or not certain particular cases can be subsumed under them.

Polanyi sees in Kant’s analysis of judgment a wonderful illustration of his theory of personal, tacit knowledge. He says that

even a writer like Kant, so powerfully bent on strictly determining the rules of pure reason, occasionally admitted that into all acts of judgment there enters, and must enter, a personal decision which cannot be accounted for by any rules. Kant says that no system of rules can prescribe the procedure by which rules themselves are to be applied. There is an ultimate agency which, unfettered by any explicit rules, decides on the subsumption of a particular instance under any general rule or a general concept. And of this agency Kant says only that it ‘is what constitutes our so-called mother-wit.’ (KB 105)

The ultimate agency involved in exercise of our judgmental power, which Kant calls our mother-wit, is in Polanyi’s terminology, our personal, tacit powers. Also, according to Johannessen, Wittgenstein’s intransitive understanding as a form of tacit knowledge is similar to Kant’s judgment.

This intransitive understanding expressed in the proper performance of the established practices of a language-society might thus, not inappropriately, be looked upon as a sort of

tacit knowledge, . . . In many respects this tacit knowledge element embedded in our conceptual competence is similar to what Kant pointed out and called a talent, the gift of being able to reach a reasonable decision in cases of subsumption. The traditional name for it is, of course, judgment.⁷

Though the lack of judgment cannot be remedied by learning rules, it can be improved with examples. Examples function very differently in their relation to understanding and judgment. While they are normally negative to the former, they are conducive to the latter. There is a logical gap between examples and the rules of understanding. Examples are particulars, while the rules of understanding are strictly universal. As the particular cases of a certain rule, examples can hardly adequately fulfill the conditions of the rule. They often weaken understanding's effort to grasp the rule universally and independently of the particular circumstances of experience. So, if we stick to examples, "the precision and correctness" of the insight of understanding, which aims at strict universality, will inevitably be impaired. To put it in another way, if we want to accomplish strict universality, we must not be example-bound. But the situation is quite different for judgment, which, as "the ability to think the particular" as contained in the universal, in its effort to mediate between the universal and the particular, has to put more emphasis on the particular. That is the reason which lies behind Kant's following remark: "Examples are thus the go-cart of judgment; and those who are lacking in the natural talent can never dispense with them" (*CPR* 178). For those who lack the natural talent of judgment, their power of judgment can be sharpened through examples and actual tasks. Kant considers it the "great benefit" of examples.

3. Reflective Judgment

According to Kant's definition, when we are only confronted with the particular, and have to find the universal for it, the power that we exercise under such circumstances is reflective judgment. Before Kant, Baumgarten touched upon this form of judgment in aesthetics. A judgment of taste is a typical reflective judgment. According to Kant, taste is our ability to judge the beautiful. "In their logical quantity all judgments of taste are singular judgments" (*CJ* 59). A typical judgment of taste is, "The tulip is beautiful." This judgment and the judgment, "The tulip is agreeable (for example, in its smell)," are quite different. "To say, 'This flower is beautiful,' is tantamount to a mere repetition of the flower's own claim to be to everyone's liking. The agreeableness of its smell, on the other hand, gives it no claim whatever: its smell delights one person, it makes another dizzy" (*CJ* 145). A judgment of the agreeable is based upon a private feeling which is only valid for the person who likes the object, while a judgment of taste requires everyone to like the object and lays claim to universal validity. In line with this distinction, Kant distinguishes two kinds of taste, i.e., taste of sense and taste of reflection. "Insofar as judgments about the agreeable are merely private, whereas judgment about the beautiful are put forward as having general validity (as being public), taste regarding the agreeable can be called taste of sense, and taste regarding the beautiful can be called taste of reflection." For the agreeable, we can say that everyone has his own taste (of sense), while for the beautiful, we cannot say so, since universality is definitive of the taste of reflection. When Kant talks about a judgment of taste as a reflective judgment, he means the latter, i.e., taste of reflection. Thus, we can see clearly that a judgment of taste starts from a certain particular, for instance, a singular given rose, but when the judgment is made that this rose is beautiful, a universal claim is included in the judgment. It has the typical structure of a reflective judgment. In contrast, the lack of universal validity makes a judgment of the agreeable only a judgment of sensation, not a judgment of reflection.

The universality of a judgment of taste implies its necessity. The beautiful is not only an object that is liked by everyone, but also something that cannot be not liked. If I declare that "The tulip is beautiful," then

I assume that everyone *ought* to give his assent to my judgment, not just that everybody *will* agree with me. A judgment of taste contains an ought. If somebody judges differently, I will blame him and deny that he has taste. A judgment of taste exhibits necessity. “About any presentation I can say at least that there is a *possibility* for it (as a cognition) to be connected with a pleasure. About that which I call agreeable I say that it *actually* gives rise to pleasure in me. But we think of the beautiful as having a *necessary* reference to liking” (CJ 85). The beautiful is the object of a necessary liking.

The universality and necessity of taste prompts Kant to identify taste as a kind of *sensus communis*. *Sensus communis* has two different meanings. In one sense, it is what we normally call “common sense,” where the term “common” means nothing but “vulgar.” Common sense means something that can be found everywhere and the possession of which deserves no merit or superiority. Of course, this is not what Kant means when he claims that taste is a kind of *sensus communis*. Rather, he takes “*sensus communis* to mean the idea of a sense shared [by all of us], i.e., a power to judge that in reflecting takes account (a priori), in our thought, of everyone else’s way of presenting [something], in order *as it were* to compare our own judgment with human reason in general and thus escape the illusion that arises from the ease of mistaking subjective and private conditions for objective ones, an illusion that would have a prejudicial influence on the judgment” (CJ 160). *Sensus communis* in this sense requires one to transcend the private subjective conditions of his judgment and puts himself into the positions of everyone else, and thus arrives at a universal standpoint to reflect on his own judgment. Kant maintains that taste, as the ability to judge the beautiful with universal validity and necessity, can be legitimately called a *sensus communis*. In this context, Kant defines taste “as the ability to judge something that makes our feelings in a given presentation *universally communicable* without mediation by a concept” (CJ 162).

The expression “without mediation by a concept” in the above definition indicates another important feature of a judgment of taste, that is, it is not based upon concepts. This point can be shown clearly by contrasting the judgment of taste “This tulip is beautiful” with “This tulip is red” and “This tulip is good.” While the judgment of taste is aesthetical, the latter two are cognitive, either theoretically or practically. In the judgment “The tulip is red”, the predicate “red” is a concept which denotes a property of the tulip, by means of which the tulip, as an object of cognition, is determined. In the judgment “The tulip is beautiful,” “beautiful” also sounds like a property of the tulip. But in fact it is not. Beauty is not a property of the tulip, and “apart from a reference to the subject’s feelings, beauty is nothing by itself” (CJ 63). It is not a concept that determines the tulip. The judgment “The tulip is good” is also based upon a determinate concept, though a practical one. “Good is what, by means of reason, we like through its mere concept. . . . In order to consider something good, I must always know what sort of thing the object is [meant] to be, i.e., I must have a [determinate] concept of it” (CJ 48). Good always involves a concept of a purpose of the object, and consequently a relation between reason and volition, which is not the case at all with a judgment of the beautiful. In a word, a judgment of taste, according to Kant, “is not directed to concepts, for a judgment of taste is not a cognitive judgment (whether theoretical or practical) and hence is neither *based* on concepts, nor directed to them as *purposes*” (CJ 51).

A concept is, in essence, a rule. The fact a judgment of taste is not based upon a determinative concept implies that there is no rule for taste. “There can be no objective rule of taste, no rule of taste that determines by concepts what is beautiful. . . . If we search for a principle of taste that states the universal criterion of the beautiful by means of determinate concepts, then we are engaging in a fruitless endeavor, because we search for something that is impossible and intrinsically contradictory” (CJ 79). That’s why no one, by referring to a rule, can compel us to acknowledge something to be beautiful. No one, by means of any bases of proof, can

talk us into a judgment that something is beautiful. It is up to us, in the presentation of the object, to judge, by reflecting on our feelings of pleasure or displeasure, whether it is beautiful or not.

It's interesting to note here the parallel between determinative judgment and reflective judgment. We have seen that determinative judgment, as the power of subsuming the particulars under a universal (a general rule, a concept), or the ability to apply the universal to the particulars, is ruleless. Now we find that a judgment of taste is also ruleless. The difference lies in the fact that, in determinative judgment, we do have concepts, general rules. It is the application of these concepts, general rules, that is ruleless, while in a judgment of taste, we have no determinative concepts, no general rules at all; only the particular is given. In each case, tacit skills must be employed.

As mentioned above, Kant, in his discussion of determinative judgment, emphasizes that judgment is a natural talent and touches briefly on the importance of examples in sharpening our power of judgment. With regard to taste, he also raises the question of whether it is an original and natural ability, or an ability to be acquired and therefore artificial in its origins (*CJ 90*), but he does not tackle the issue head on. However, it is not hard to see that his emphasis is on the latter, where examples play an important role in the improvement of our taste. Kant says,

Among all our abilities and talents, taste is precisely what stands most in need of examples regarding what has enjoyed the longest-lasting approval in the course of cultural progress, in order that it will not become uncouth again and relapse into the crudeness of its first attempts; and taste needs this because its judgment cannot be determined by concepts and precepts (*CJ 147*).

In this quotation, two points merit attention. Firstly, Kant makes it crystal clear that taste is not identical with the crude predisposition given by nature. It should be refined and sharpened by those exemplary products of taste that have been recognized by generations after generations, like the works of the classical authors. "We extol, and rightly so, the works of the ancients as models, and call their authors classical, as if they form a certain noble class among writers which gives laws to people by the precedent it sets" (*CJ 146*).

Secondly, the reason that we have to resort to examples, models, archetypes so as to sharpen our taste is that we have no general rules to follow in judging what is beautiful, because it is not based upon determinant concepts. Kant generalizes this point and holds that it applies to a lesser degree to other areas like religion and mathematics. In religion, "an example of virtue and holiness will always accomplish more than any universal precepts we have received from priests or philosophers" (*CJ 146*). In mathematics, the ancient mathematicians are still regarded as "indispensable models."

The fact that there is no rule based on determinate concepts for a judgment of taste gives its universal validity and necessity a special character. Kant says, "Hence the common sense, of whose judgment I am at this point offering my judgment of taste as an example, attributing to it *exemplary* validity on that account, is a mere ideal standard. With this standard presupposed, we could rightly turn a judgment that agreed with it, as well as the liking that is expressed in it for some object, into a rule for everyone" (*CJ 89*). We have seen that a judgment of taste has a universality that is not based upon concepts. Thus, it is not general rules based upon concepts that are universally valid for all those who make judgment about the beautiful, but a particular judgment of taste which is an example of *sensus communis* that is valid for all the judging subjects, and has the right to demand

universal assent from all the judging subjects. As an example, this judgment of taste is a particular in itself, but it has the universal validity that a general rule normally has. Thus, Kant is well justified to call it “exemplary validity.” Similarly, Kant calls the necessity of a judgment of taste “exemplary necessity”:

As a necessity that is thought in an aesthetic judgment, it can only be called *exemplary*, i.e., a necessity of the assent of everyone to a judgment that is regarded as an example of a universal rule that we are unable to state (*CJ* 85).

The necessity of a judgment of taste cannot be derived from determinate concepts, whether theoretical or practical, therefore, it cannot be apodictic, an attribute that we usually attach to a general rule. It is the necessity of everyone’s assent to a particular judgment of taste taken as an example. In a word, it is the example, the particular, rather than the concept, the general rule, which has universal validity and necessity in a judgment of taste.

The respect for exemplary products of taste does not turn us into passive imitators. Kant claims that taste is something autonomous; it must be the ability one has by oneself. It cannot be acquired by imitating somebody else’s taste. Imitation is basing one’s judgment on other people’s judgments, hence not autonomy but heteronomy. Then what is the right attitude towards the examples, models, archetypes of the classical authors that we admire so much? Kant puts it as follows: “*Following* by reference to a precedent, rather than imitating, is the right term for any influence that products of an exemplary author may have on others; and this means no more than drawing on the same sources from which the predecessor himself drew, and learning from him how to go about doing so” (*CJ* 146-147). That is to say, following rather than passively imitating a precedent of an exemplary author is the way that one develops his taste to the point that he can demonstrate it in his judgment of what is beautiful as well as his predecessor.

The way that people sharpen their taste by following the exemplary products of classical authors is similar in structure to the way geniuses in fine art transmit their ideas and skills to their pupils. Genius is different from taste. Taste is the ability to judge the beautiful; genius is the ability to produce beautiful objects in fine arts. While taste results from practice in following models of classical authors, genius is an innate productive ability of the artist given by nature at birth. “Genius is a *talent* for producing something for which no determinate rule can be given, not a predisposition consisting of a skill for something that can be learned by following some rule or other; hence the foremost property of genius must be *originality*” (*CJ* 75; italics in original). Genius is the talent of producing something original in fine arts that cannot be imitated or learned by rules. Kant says,

Whenever we convey our thoughts, there are two ways of arranging them, one of these is called manner (*modus aetheticus*), the other method (*modus logicus*); the difference between these two is that the first has no standard other than the feeling that there is unity in the exhibition [of the thoughts], whereas the second follows in [all of] this determinate principles; hence only the first applies to fine art (*CJ* 187).

Since in fine art, there is only manner and no method, “the master must show *by his example* what the student is to produce and how” (*CJ* 230; italics mine). It is true that sometimes artists will describe the procedure of fine art under general rules and precepts, but Kant reminds us that they are abstracted from the products of the artist, and “are more likely to be useful to the students as occasional reminders of what the main features of that procedure are, than as prescriptions of these features” (*CJ* 230-231). That is to say, if there are any rules or precepts in fine art, they are parasitic on examples, the particular products of artists. In fine arts, examples are

prior to rules and precepts. The rules and precepts are useful only as ancillaries for pedagogical purposes. It is the examples or models of one genius that arouse another genius's feeling of originality. That's why Kant entitles the originality of genius as "exemplary originality," which means the products of a genius serve as models to be followed by those who are endowed with genius by nature.

4. Concluding Remarks

Having outlined the main features of determinative and reflective judgment from the perspective of the theory of tacit knowing, I will conclude by addressing the following two questions that might naturally arise about such an attempt. 1) How should one assess the epistemological significance of Kant's third *Critique*, especially its analysis of aesthetic judgment? 2) How should one interpret the challenge to the traditional conception of knowledge posed by Kant's notion of judgment?

We can reformulate the first question as follows: Does something like taste in aesthetic experience have universal epistemological significance? Is Kant's analysis of judgments of taste, which are non-cognitive in nature, relevant to empirical cognition?

The theory of tacit knowing would give a positive response to this question. Kant does not explicitly draw such a conclusion; but this is hinted at in his text. As mentioned above, Kant holds that the principle of the primacy of example in the improvement of taste also applies to areas like religion and mathematics. Hannah Arendt is fascinated by Kant's analysis of judgments of taste. She argues that this type of reflective judgment takes seriously particularity as such. She seeks to pursue this mode of thinking in dealing with political and historical issues. As Richard Bernstein puts it,

Whether she turned her attention to the study of totalitarianism, or the Eichmann trial, or even to politics itself, she sought to understand and judge phenomena in their particularity and to resist the temptation to misjudge them by relying on concepts, universals, categories that failed to do justice to their distinctiveness and uniqueness. All of her thinking consists in the exercise of discernment and discrimination that are characteristic of taste and judgment.⁸

Taste is also regarded as an important quality of a scientist. Nobel laureate, Professor Yang Zhenning, once remarked that having taste or lack of taste has a decisive impact on the professional life of a physicist.⁹ Michael Polanyi likes to talk in a more general sense about connoisseurship embodied in various branches of science, technology and different professions (*PK* 54-55). In short, the question of taste is not confined to aesthetics. In all areas ranging from mathematics and natural sciences to politics and religion, we are confronted with the question of taste, connoisseurship and judgment. The theory of tacit knowledge takes seriously these issues and thematizes taste, connoisseurship and judgment as a group of epistemological concepts with universal significance.

We can interpret the epistemological significance of the third *Critique* in another way. Gabriella Ujlaki reports that in one of his letters to Marjorie Grene, Polanyi claims that "the very nature of knowledge is in the Third *Critique* not in the First *Critique*," and that "all comprehension is informal and personal: this is the real theme of the Third *Critique*."¹⁰ How should one give substance to this rather general comment? This is my understanding: the key to this enigmatic comment lies in the structural similarity between Polanyi's concept of personal knowledge and Kant's notion of reflective judgment, even though Polanyi does not mention judgment at all here.

As far as the problem of knowledge is concerned, it is widely held that we should pay more attention to the First *Critique*, where Kant systematically elaborates his theory of knowledge, than the Third *Critique*, which is normally considered as describing his thoughts on aesthetics. Polanyi surprises us and argues for the opposite: if one intends to understand the nature of knowledge, one should consult the Third *Critique* rather than the First *Critique*. Understandably for a philosopher who emphasizes the role played by the personal coefficients and tacit powers in the shaping and holding of knowledge, the First *Critique* which is “bent on strictly determining the rules of pure reason” is off the mark in its investigation of the problem of human knowledge. But what about the Third *Critique*? In what way does the Third *Critique* shed light on the nature of knowledge? Polanyi’s characterization of the theme of the Third *Critique* offers us a clue to the unraveling of the riddle. He sees in the Third *Critique* a preview of his theory of personal knowledge. To Polanyi, the ideal of scientific detachment, which took shape in the scientific revolution in the 17th century, is a delusion. Polanyi’s attacks it ruthlessly all his life. The substitute that he proposes for the false ideal of scientific detachment is personal knowledge with a tacit dimension. In his view, the personal participation of the knower in the shaping and holding of knowledge is neither a mere imperfection that should be eliminated, nor a mere psychological by-product of objective truth, but a logically indispensable element to science. However, acknowledging the indispensability of personal participation in all acts of knowing does not make knowledge subjective. While endorsing the importance of personal involvement, Polanyi draws a clear demarcation between the personal and the subjective. According to Polanyi, what is subjective is defined as being private, whereas personal participation “is a responsible act claiming universal validity” (*PK* [1958 version], vii). Personal knowledge claims not only universal validity, but also necessity in Kant’s sense. The freedom of the subjective person is to do as he pleases, while the freedom of the responsible person is to act as he must (*PK* 309). It is not hard to see that Polanyi’s conception of personal knowledge is analogous to Kant’s judgment of taste. When I claim to know something, my knowledge claim is not subjective, private, and idiosyncratic. As a responsible knower, I claim it with universal intent and cannot do otherwise. Something similar in structure happens when I make a judgment that “The tulip is beautiful,” which means not only I like the tulip, but also that this sort of liking is universally valid and necessary. In Polanyi’s terminology, a judgment of taste can be regarded as a fusion of the personal and the universal, something that is characteristic of personal knowledge. This is how I interpret Polanyi’s statement “all comprehension is informal and personal: this is the real theme of the Third *Critique*.” Of course, it is not difficult to see that there are great differences between personal knowledge and judgments of taste; for instance, personal knowledge is cognitive, while a judgment of taste is aesthetic; personal knowledge involves a concept of reality which is quite different from Kant’s notion of thing-in-itself, etc. To sum up, it might not be fair to say that the nature of knowledge does not lie in the First *Critique*, but it certainly requires flare and insight to see it in the Third *Critique*.

Now let’s turn to the second question. At the outset of this article, I point out that “the craving for generality” and “the contemptuous attitude towards the particular case” have had a great impact on the understanding of knowledge in the continental European tradition. The theory of tacit knowing calls into question this preconceived understanding of knowledge. It emphasizes the mediation between the universal and the particular, with an emphasis on the latter, that is, the particular. In this respect, Aristotle’s discussion of *phronesis* and Kant’s analysis of judgment are two important sources of inspiration for the theory of tacit knowing.

According to Aristotle, theoretical knowledge (*episteme*) aims at universal and necessary truth, while in practical life, humans need not only to know the general principles, rules and norms, but also to know how to apply them in particular situations. *Phronesis* is required in this process. “Nor is practical wisdom concerned with universals only — it must also recognize the particulars, for it is practical, and practice is concerned with particulars. . . . Now practical wisdom is concerned with action; therefore one should have both forms of it, or the latter in preference to the former.”¹¹ This is Aristotle’s characterization of *phronesis* in terms of the relationship between the universal and the particular.

Aristotle points to the mediation of the universal and the particular in practical (i.e., ethical and political) realms. Kant goes a step further in this direction. He makes clear that the mediation might take different forms. Determinative judgment and reflective judgment approach the mediation in different ways, and thus concretize the Aristotelian thesis of mediation. Aristotle holds that, in *phronesis*, the particular is preferred to the universal. Kant’s reflections imply that, negatively speaking, judgments of taste (tacit knowing) cannot be improved by getting familiar with general rules, principles and precepts, etc. In determinative judgment, the general rule is given; however, the application of the general rule or the subsumption of the particular cases under the general rule is ruleless. In merely reflective judgment, like a judgement of taste, no concept, no general rule is given. Taste is the ability of knowing how to judge the beautiful, while genius is the ability of knowing how to create the beautiful. But neither taste nor genius has any general rule to follow. They rely on tacit skills.

Positively speaking, Kant claims that the faculty of judgment can be sharpened with examples. For determinative judgment, examples are its go-cart. In aesthetic experience, taste is to be refined and enhanced by the exemplary products of the classical authors. Likewise, the tacit knowledge of a genius can only be fully displayed by his examples to his followers. In this vein, Kant talks about the exemplary validity and the exemplary necessity of a judgment of taste and the exemplary originality of genius. The word example comes from *eximere*, meaning “to single out some particular.”¹² The emphasis on examples indicates that in its attempt to mediate the universal and the particular, judgment puts its weight on the particular. This is absolutely in the spirit of *phronesis*. In addition, with his distinction between determinative judgment and reflective judgment, and with the distinction between taste and genius, and based upon that, with his discussions of the exemplary validity and exemplary necessity of judgment of taste and the exemplary originality of genius, Kant’s understanding of the thesis of the primacy of examples is more sophisticated than that of Aristotle.

In sum, so far as the goal of challenging “the craving for the general” and “the contemptuous attitude towards the particular cases” of traditional conceptions of knowledge is concerned, the theory of tacit knowing, in my view, can learn something important from Aristotle’s discussion on *phronesis* and Kant’s analysis of judgment. In this orientation, Kant inherits Aristotle’s basic thesis, and no doubt deepens and concretizes it. Moreover, the insights of both Aristotle and Kant help flesh out Polanyi’s notion of tacit knowledge.

Notes

¹ Ludwig Wittgenstein, *The Blue and Brown Books*, 2nd ed. (London: Basil Blackwell, 1969), p. 18.

² YU Zhenhua, “*Phronesis* in the Perspective of the Theory of Tacit Knowledge,” *Academic Monthly* 12, 2003.

³ Cf. Kyell S. Johannessen, “Rule Following, Intransitive Understanding, and Tacit Knowledge – An Investigation of the Wittgensteinian Concept of Practice as Regards Tacit Knowing,” in *Essays in Pragmatic Philosophy II* (Norwegian University Press, 1990).

⁴ Immanuel Kant, *Critique of Judgment*, translated by Werner S. Pluhar (Indianapolis: Hackett, 1987), p. 18. Hereafter cited in the text as *CJ*.

⁵ Immanuel Kant, *Critique of Pure Reason*, translated by Norman Kemp Smith (London: Macmillan, 1929), p. 177. Hereafter cited in the text as *CPR*.

⁶ Johannessen, op cit, 122.

⁷ *Ibid.*, 124-125.

⁸ Richard Bernstein, *Philosophical Profiles – Essays in a Pragmatic Mode* (Philadelphia: University of Pennsylvania Press, 1986), p. 236.

⁹ Yang Zhenning, *Essays by Yang Zhenning* (East China Normal University), pp. 406-409.

¹⁰ Gabriella Ujlaki (“The ‘Tacit’ and the ‘Personal’: An Aesthetical Approach to the Nature of Knowledge,” *Polanyiana* 1-2 (1992), 127) quotes a letter from Polanyi to Marjorie Grene dated October 13, 1959.

¹¹ Aristotle, “Nicomachean Ethics” in *The Basic Works of Aristotle* (New York: Random House, 1941), pp. 1028-1029.

¹² Hannah Arendt, *Lectures on Kant’s Political Philosophy*, ed. by Ronald Beiner (Chicago: University of Chicago Press, 1989), p. 66.

Notes on Contributors

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Emergence, Materialism, and Worldviews: A Review Article

Taede A. Smedes

ABSTRACT Key Words: chaos theory; complexity; emergence; Intelligent Design; materialism; Polanyi, Michael; reductionism; self-organization

This review article deals with four recent books exploring issues of emergence and self-organization. Three of these also deal with issues of materialism and religious worldviews, while one charts the history and philosophical underpinnings of emergentist thought.

Stephen M. Barr, *Modern Physics and Ancient Faith*. Notre Dame, Indiana: University of Notre Dame, 2003. Pp. ix + 312. ISBN 0-268-03471-0. \$30.00, hardcover.

Richard J. Bird, *Chaos and Life: Complexity and Order in Evolution and Thought*. New York: Columbia University Press, 2003. Pp. x + 322. ISBN 0-231-12662-x. £20.50, \$29.50, hardcover.

Kees van Kooten Niekerk and Hans Buhl (eds.), *The Significance of Complexity: Approaching a Complex World Through Science, Theology and the Humanities*. Aldershot: Ashgate, 2004. Pp. xi + 243. ISBN 0-7546-0972-3. £50.00, \$89.95, hardcover.

Achim Stephan, *Emergenz: Von der Unvorhersagbarkeit zur Selbstorganisation*. (Emergence: from unpredictability to self-organization.) Dresden/München: Dresden University Press, 1999. Pp. xiv + 292. ISBN 3-933168-09-0. •44.99, paperback (sold out). *2nd. Ed.*, Paderborn: Mentis Verlag 2004. Pp. xiv + 292. ISBN 3-89785-439-2. •48.

Introduction

Michael Polanyi is generally regarded as having made a significant contribution to the philosophy of science by emphasizing the role of tacit knowledge in scientific practice. However, in more recent years, Polanyi's work has also been mentioned with regard to developments in various sciences regarding so-called 'emergent processes.'¹ In the following, I review four recent books that may be of interest to those interested in chaos theory, self-organization, and emergent processes. And though these books do not directly address Polanyi's ideas, they can be said to be written in his spirit. Andy Sanders characterizes the aim of Polanyi's work as "the restoration of meaning,"² indicating that Polanyi attempted to counter scientific claims while arguing for the meaningfulness of the universe and a re-assessment of humanity's place therein. In other words, Polanyi aimed at a scientific redefinition of our current worldview. All of the following books can be said to be attempts to show how science itself has the potential to change our worldview.

Barr's Modern Physics and Ancient Faith

At least one cause of the recent interest in emergent phenomena is that many people have, and some scientists give the impression, that the sciences of emergent and self-organizing processes are preeminent among the scientific developments giving rise to a new worldview in opposition to the old, Newtonian worldview in which reductionism and materialism ruled supreme. Stephen Barr, a professor of physics at the

Bartol Research Institute, University of Delaware, argues that already the new physics gives reason to question the validity of the old worldview. Barr argues that our knowledge of the lower levels of our reality, those studied by physics, does not warrant the assumptions of reductionism and materialism. Admittedly, Barr's book is not so much about emergence, mostly regarded as a higher-level phenomenon. The emphasis of Barr's book is on materialism, and he argues that materialism "is not science. It is merely a philosophical opinion" (1). Materialism is not based on science but on certain assumptions about science – assumptions which may be questioned. In his book, Barr argues that physical data may very well lead to other conclusions.

In effect, Barr's aim is apologetic. Since materialism is an "anti-religious mythology" (4), debunking materialism may give room for religious reflections. But what is more, Barr argues that "science can by no means explain away the rich design of nature and its laws. Science has only shown that design to be more magnificent than anyone had ever dreamt. Therefore, the Cosmic Design Argument for the existence of God still stands. Indeed, it is stronger than ever before" (108). However, though Barr emphasizes design, he is not an exponent of the Intelligent Design movement, though he shows sympathy towards Intelligent Design by arguing that there is insufficient data "to prove that natural selection by itself is capable of doing the whole job of driving evolution" (110).

Barr thus not only argues that the old reductionist and materialist worldview is superseded by scientific data, leading to a new worldview, but also that religious reflection has a valid place within that worldview and is backed up by data from physics. His argument is divided in five parts. In the first part he describes that antagonistic relationship between religion and materialism. In the second part he describes how the Christian doctrine of creation resonates with the Big Bang theory. The third part deals with the question whether or not the universe is designed. Is everything the result of chance? But then, what about the highly ordered laws of nature? And what about beauty and symmetry in the universe? Design, in Barr's conclusion, is undeniable. The fourth part deals with the place of humanity in the cosmos. Barr explores the anthropic principle and the fine-tuning of the universe, which again is seen to be consonant with a theistic worldview. The fifth part, finally, deals with human nature, exploring questions about free will, the computational mind, and the connection between quantum theory and the mind.

The book is well-written and Barr is able to explain complicated theories in relatively simple terms. It could therefore be useful for introductory courses in religion and science. For most scholars working in the field of science and religion, however, the book does not cover new ground and its conclusions are not new.

Bird's Chaos and Life

Bird's book clearly arose out of dissatisfaction, or at least unease with the current Neo-Darwinian paradigm, which purports to explain the origination and evolution of life, but which is also unable to fulfill its promises – or so Bird claims. What Bird proposes in this book is, in effect, a new paradigm based on the sciences of chaos and complexity (or self-organization) and on the principle of *iteration*. Bird needs quite some pages to explain the principles of deterministic chaos and self-organization. He concludes that in chaotic and self-organizing systems, iteration is the crucial element. Mathematically, iteration entails that the output of a calculation is consistently used as an input for the next calculation. Hence, a feedback cycle occurs. Many chaotic and self-organizing systems are the result of iterative processes. Now, the title indicates that the book is about chaos and life. However, I believe that, apart from being a catchy title, it does not quite fit the bill. Although the book discusses chaos theory, it really is about one aspect of mathematical chaos, i.e., iteration.

Chaos is only used as an illustration to make plausible the idea that iterating a simple calculation may yield complex results.

Iteration clearly is a computational process, and here we encounter one of the consequences of Bird's approach: it might be (and Bird is suggesting that it actually is the case) that organisms are constituted by computational processes. Or, even more radically put, organisms are themselves "living computers" (as the title of the seventh and central chapter of the book indicates). In the cells of living beings, a computational process takes place using DNA (especially the repeat sequences, which in the 'old' paradigm are regarded as 'junk' DNA). Cells are thus something like a Turing machine. However, computational processes are not limited to the cellular level, but also cause emergent properties to come into existence. At those emergent levels, again iterative computations take place, yielding still more complex phenomena to occur. Ultimately, what we have here is a new worldview or metaphysics, the "iterative-sequential view" (258). Bird contrasts his new worldview with the current "random-selection" worldview (259). According to Bird, nothing happens at random, but all events follow a pattern which is based on iterative computational processes and procedures. Because our world is finite, true randomness cannot occur; at most some processes are pseudo-random. Seemingly random events or coincidences, which are inexplicable in the old random-selection paradigm, for the new iteration-sequential worldview are systematic phenomena (260); they are to be expected due to the self-similar structures of our world: "The same things will be expected to happen at the same time in different places; if they did not, the world would not be iterative" (254). Thus, since the current scientific paradigm, based on a combination of randomness (mutation) and selection, no longer suffices to make sense of the world around us, why not see our world as a giant computer? Though Bird cautiously speaks about his iterative-sequential view as a 'model,' he also is quite confident that this model is better able to make sense of our world than is the old, random-selection paradigm.

Bird's position in more than one way has affinities with Intelligent Design. Bird, in a sense, is proposing a Kuhnian paradigm shift which, ultimately, could result in a scientific revolution. In that sense, I found Bird's initial position resembling that of Intelligent Design theorist William Dembski, who aims at a new science without naturalist metaphysics and methodology. Also, as I see it, Bird's model could be made compatible with another idea from Intelligent Design. For, as Bird argues, organisms as living computers are built by nature: "This computer was designed [!] when the nucleic acids and their rules of manipulation evolved" (137). Though Bird casually speaks about 'nature' as having done the designing, theists might argue that it was God who breathed fire in the equations. However, in general, I believe that Bird is more of a naturalist than Intelligent Designers would like.

Bird's position also occasionally reminded me of Stephen Wolfram's bestselling *A New Kind of Science* (Champaign, IL: Wolfram Media Inc. 2002). By referring to cellular automata, Wolfram argued that the universe is a computer. Bird complements Wolfram's position in that he starts where Wolfram left off: with the practical implementation of the computational worldview in scientific research. This at once also indicates the problematic element adhering to both Wolfram's and Bird's position: determinism with reductionist tendencies. According to both Wolfram and Bird, everything in the universe is the result of calculations, and nothing happens that was not somehow in the equations governing the universe. If one would only know all the equations, as well as the initial conditions, one would have a "theory of everything" of the kind Stephen Hawking is looking for. Bird, however, is aware of the finiteness of the human mind, and argues that, though chaotic systems are deterministic, they are and forever will be unpredictable, because we have no complete knowledge of the initial conditions. He thus rightly concludes (on pages 56-58) that the Newtonian worldview,

in which determinism equaled predictability, is *passé*. Ever since Poincaré discovered the insolubility of the “three-body problem” we know that determinism does not entail predictability.

Bird, however, seems to wrestle with the consequence of a deterministic worldview. On the one hand, Bird adopts a metaphysics in which the universe is a “universal Turing machine,” in which true randomness cannot occur. However, on the other hand, Bird still speaks about “mutations” in biological species, for instance the mutations that shape different species (145). In biology, the term “mutation” indicates a random event. However, though Bird seems to adopt the standard-use of the term in contemporary biology, since he argues at points that there is no genuine randomness in our universe, it is not clear in what way the term should be taken in his new “computed morphology hypothesis,” as he occasionally calls his model.

Bird’s book is interesting for its boldness, but that at the same time is its biggest weakness. There have been many books which argue that chaos theory and self-organization will revolutionize science, but what one sees so far is that scientists are perfectly capable of incorporating chaos and complexity within their current paradigm. Moreover, the idea that some structures in the universe may resemble Turing machines may have some scientific value (though this still needs to be proven – Bird’s idea that junk DNA has a definite function in cellular computations still needs to be experimentally tested), but his metaphysical idea that our universe is a Universal Turing machine not only is counter-intuitive but Bird is incapable of presenting any hard scientific evidence to support that idea, besides pointing to dendrite structures that one often encounters in our universe.

Taking even more distance from the book, the implausibility of its thesis may also have something to do with the lack of definite structure, which can be illustrated by describing the different chapters. The first chapter introduces the mathematical concept of iteration. Then Bird goes on to describe how biology is in crisis (chapter 2 and 3). In chapters 4 and 5 all of a sudden we go back to a description of chaos theory and “chaostability.” Chapter 6 describes fractals and the pervasiveness of fractal structure in the universe. Then in chapters 7 and 8 we come back to biology to introduce Bird’s computed morphology hypothesis and its possible role in evolution. In chapter 9 we get a presentation of information theory, entropy and randomness. Chapter 10 is a philosophical discussion about the effectiveness of mathematical procedure in describing and explaining our universe. Chapter 11 is a short chapter about life and conflict, paradox and contradiction (frankly, in my view this chapter adds nothing but confusion and could easily have been left out). In chapter 12, finally, we get to the grand finale; here the metaphysical consequences of Bird’s view are shown (including a discussion of mystical experience and God). In between there are expositions of the role of beauty, time and timelessness, ethics, Leibniz’s monadology (which Bird in altered form adopts), and what have you. I must admit that at the end of most chapters, Bird gives a small summary of the main ideas of the chapter, which aids in retracing one’s steps. Still, I believe the structure of the book is quite confusing and would have benefited from some sturdy editing.

The Significance of Complexity

What are the consequences of complexity science for the humanities? This question is the focal question of the book edited by theologian Kees van Kooten Niekerk and physicist Hans Buhl. The book is the product of a series of lectures organized by the Danish Science-Theology Forum in 1999-2000. In this book, the concept of complexity is approached from three perspectives: the natural sciences, the humanities, and theology. An introduction by the editors provides for the uninitiated a clear and concise introduction to the

concept of complexity, as well as an overview of the various articles.

The scientific part of the book contains articles by Claus Emmeche, Thiemo Krink and a joint article by Hinnerk Boriss and Volker Loeschcke. Emmeche's article stands out in giving an in-depth view of complexity science which in a sense builds further upon the introduction of the editors. Krink describes the valuable role of computer modeling in complexity research, while indicating that computer modeling has its limitations. He warns us especially not to confuse models with reality. Boriss's and Loeschcke's article argues that complexity theory can promote a more holistic understanding of biological systems. This is illustrated by looking at the stress response in vertebrates and invertebrates. Boriss and Loeschcke develop their argument in such technical manner, that it is out of balance with the level of most other papers in the book.

The two articles comprising the humanities section seem promising but are disappointing, as they only encompass aesthetics and philosophy. Bo Kampmann Walther attempts to give us insights into the role of complexity in interactive art, but the terminology which he uses clouds his argument in obscurity. Psychologist and mathematician Hans Siggaard Jensen shows how complexity leads to the acknowledgment that we can only make sense of the world using different descriptions and explanations. The most we can gain is a kaleidoscopic view of the world, and a unifying account seems impossible. Though Jensen's article raises some interesting, though familiar points (some of which were already made by Nicholas Rescher and are also made by Niels Henrik Gregersen in his contribution), I was not sure why the editors put the article in the humanities section, since it is basically a critique on the aims and methodological assumptions of the natural sciences.

I found the third section, dealing with theology and complexity, the most interesting. Niels Henrik Gregersen explores the various ways in which the sciences of complexity are relevant for theological reflection. This exploration proceeds in three stages: first, an exploration of seven different kinds of complexity; secondly, a critique of Wolfram's (and, implicitly, Bird's) notion that the universe is a computer (though Gregersen admits that computers are useful in describing and explaining the workings of the universe); and thirdly, a Trinitarian exploration of complexity regarded as the workings of the activity God. Günter Thomas, in the second paper of the section, uses the sociologist Niklas Luhmann's ideas about complexity, and argues that theology is 'hyper-complex' in the sense that it not only reflects upon the complex world, but also entails a self-reflection. To reduce the complexity, theology focuses on some specific relations, specifically the relation between theology and the Bible. How such a complexity reduction works is then shown by looking at how the biblical notion of new creation can be the focus of the interaction between science and theology. I admit that the point of this article to me was not entirely clear, but that might have something to do with my lack of knowledge of Luhmann's theory (which is extremely complicated). In the final paper of this section, theologian Wentzel van Huyssteen addresses the idea of 'human uniqueness' in science and theology by looking at scientific theories about the emergence of our cognitive capacities. He argues that from a scientific perspective, the split between humanity and the rest of creation is absent. Yet Van Huyssteen believes we are entitled to speak about human uniqueness when looking at the interaction of specialized modules in the human brain that is responsible for the emergence of art, technology, religion, and science and other aspects of human culture.

Overall, this is a valuable book, since it addresses the interaction between concepts from the natural sciences and the humanities. It contains some outstanding papers, notably the Introduction and the papers by Emmeche, Krink, Gregersen, and Van Huyssteen. Nevertheless, I also am critical in that some articles (such as those by Boriss and Loeschcke, and by Walther) should have been thoroughly edited. However, my biggest criticism is methodological: the input from the humanities could (and should) have been bigger. Every article still takes its lead from the natural sciences, thereby implicitly emphasizing the priority of the natural sciences in academia.

Stephan's *Emergenz*

Stephan's book on the historical and philosophical aspects of the concept of emergence is, in my opinion, the most interesting of the four. This book is a revised version of Stephan's *Habilitationsschrift* at the University of Karlsruhe. However, unlike most German *Habilitationsschriften*, Stephan's book is relatively short (less than 300 pages) and is written in a clear, non-technical style.

Stephan begins by tracing the historical context in which reflection about emergence took place early in the twentieth century. This is the debate between mechanist and vitalist worldviews. As a middle way, Samuel Alexander, Conwy Lloyd Morgan, Roy Wood Sellars, and Charles Dunbar Broad came up with the concept of emergence. Stephan identifies nine characteristics of their use of the concept of emergence and systematically analyzes their interrelations. It is quite striking to find out that, unlike many emergentist thinkers nowadays, these early emergentist thinkers were quite drastically committed to a deterministic worldview. The result of Stephan's analysis is a concise and useful 'map' which charts the different theories of emergence and their emphases.

Next, Stephan traces the beginnings of British emergentist thought in J.S. Mill's *A System of Logic*, while also pointing to Continental theories of emergence. He outlines and analyses arguments against emergentist theories and evaluates counter-arguments. Thereafter, he explores the contemporary renaissance or 'second wave' of emergentist thought, in philosophy of mind, the sciences of self-organizing systems, and chaos theory (arguing that, ironically, chaotic behavior may have more emergent characteristics than the self-organizing processes described in many contemporary complexity theories). Stephan predicts that this wave of interest for emergence will remain for a while.

For me this book has become a primer on emergence. A minor flaw may be that the author nowhere specifically characterizes the difference between 'emergence' and 'supervenience,' or that he does not really develop a position of his own with regard to the usefulness of the concept of emergence in scientific literature (which, in personal communication, Stephan argued, was caused by his doubts about the scientific usefulness of the concept of emergence). But these are merely minor points. The book's strength is that it provides a rigorous philosophical analysis of emergentist theories past and present, as well as a critical and systematic apparatus which can be used to evaluate contemporary and future emergentist theories. Unfortunately for many in the English-speaking community, the book is written in German. However, for those interested in acquiring an English version of this book there is also good news, as an English translation is in preparation, probably due for 2006.

Notes

¹ See, for instance, the responses to Philip Clayton's contribution in *Tradition & Discovery* 29 (2002-2003), Andy F. Sanders's 'On Reading Part IV of *Personal Knowledge*: a Finalism or a Simple Vision?' (*Tradition & Discovery* 30 (2003-2004), 24-34), and Phil Mullins, 'Polanyian Footnotes to "From Biology to Consciousness to Morality"' (*Tradition & Discovery* 30 (2003-2004), 22-30).

² Cf. A.F. Sanders, *Michael Polanyi's Post-Critical Epistemology: A Reconstruction of Some Aspects of Tacit Knowing*. Amsterdam: Rodopi 1988, 227-229.

REVIEWS

Langdon Gilkey. *Nature, Reality and the Sacred: the Nexus of Science and Religion*. Minneapolis: Fortress Press, 1993. Pp. xii + 266. ISBN: 0-8006-2754-7. \$18.75, paper.

Langdon Gilkey, emeritus Professor of Theology at the University of Chicago's Divinity School, here develops an understanding of nature, humanity and God that draws from both the sciences and religion. In a book that reads as partly history of western philosophy, partly history of religions, partly treatise on environmental ethics and partly philosophical theology, Gilkey engages many thinkers, most notably Emmanuel Kant, Michael Polanyi, Paul Tillich and Alfred North Whitehead. His most intriguing claim is that we should treat nature as an image of God.

Gilkey arrives at this point in three steps. In the first, Gilkey tackles the issue of epistemology. While not particularly groundbreaking, this part of the book offers a clear and accessible account of the significant issues. Gilkey skillfully and trenchantly attacks two different positivisms. The first is that of creationism, which treats the opening chapters of Genesis as a divinely inspired "report" of events (11). The second, with which he spends the most time, is that of scientism, which believes that scientific inquiry of various sorts tells us "what is there, as it is there . . . [and] *all* that is there" (14, emphasis added). Scientism thus leads to naïve realism, the belief that the only things that are real are the things that the sciences can discover. Although views of both religious and scientific knowing have changed drastically in the aftermath of the Enlightenment (a process he chronicles in Ch. 2), Gilkey demonstrates that this naïve realism continues to be found in the work of most contemporary cosmologists, among them Heinz Pagels, Carl Sagan, Steven Weinberg and Richard Dawkins, as well as the work of John Barrow and Frank Tippler (Ch. 4). From Gilkey's perspective,

there are several serious difficulties with scientism. The first is that it fails to recognize that it cannot account for the existence of the subjects who engage in scientific enquiry (15). A second problem is that it fails to acknowledge that there are many other ways of knowing than scientific, such as artistic, literary, philosophical and religious (2). For Gilkey, these ways of knowing may differ in standards of intelligibility, in types of data or evidence used and in the kinds of explanations offered, but all decisively remain hermeneutical enterprises (75). A third difficulty with scientism is that it fails to acknowledge that scientific inquiry itself is an attempt by an observer/subject to construct knowledge using symbols (31) in response to our awareness of self, communities and the orderliness of life (37).

Human knowing then, on Gilkey's account, is always theory-laden, participatory and historical. Put differently, what we call knowledge is an on-going construction that is responsive to reality (36). Thus Gilkey strongly reaffirms at least one conviction of Kant's, i.e., that we cannot ever know *das Ding an sich*. Gilkey refuses, however, to give in to the temptations associated with this critical realism (i.e., relativism and skepticism). Even though our knowledge of reality is always "obscure at best and quite unknown at worst" (69), he argues, much like Polanyi, that the participatory nature of knowing allows us to have some confidence that what we know is analogous to what is there, even if it is not identical with reality (69-73).

With epistemology addressed, Gilkey devotes Part Two of the book to the question, "What can we then know about nature?" He begins by lamenting the loss of insights into nature held by primal religions, which shaped attitudes that are more respectful of nature than more modern attitudes (79-80). He also recognizes that nature is decidedly ambiguous with

regard to human beings. On the one hand, nature is the source, or ground of our powers. On the other hand, nature is a physical environment that stands over and against us (81-82).

Drawing from both physics and primal religions, Gilkey suggests that insights from each way of knowing help us understand nature in four ways, the first of which is power (Ch. 6). Physics, on Gilkey's read, suggests that nature's "awesome and terrible power, the mysterious union of matter and energy: the power of physical things to hold together, to be one, and so to be and to act" (91) is indeterminate, temporal (i.e., historical), dynamic and directional in the sense that the process "exhibits a steady accumulation of forms of greater and greater complexity of structure and of interaction" (90). In turning to primal religions, Gilkey argues that they understand all aspects of nature to be the vehicle for a larger power that waxes and wanes, creates and destroys (91-94).

Both the sciences and primal religions likewise associate nature with life. In reflecting on the findings of the biological sciences, Gilkey makes four summary points about nature as life (99-102). First, life is the presupposition, not the effect of mutations during the process of natural selection. Secondly, life is historical; human beings arise in the larger story of life (and Gilkey defends the right to talk this way, even if biology *per se* cannot discern any plot to the story). In addition, Gilkey argues that the biological sciences demonstrate that there is a dialectical interplay between life and death in which death leads to new life. Finally, the biological sciences show that life remakes its environment. Looking at nature as life from primal religions, Gilkey reprises Eliade to show how all natural beings can be symbols of life, including moon, water, earth and plants (102-107).

Turning next to the topic of order in nature Gilkey develops an historical account of humanity's attempt to posit an order of some sort (Ch. 8). Gilkey summarizes the various attempts of primal religions, eastern cultures, the ancient Greeks, medieval Christians and moderns to discern order in nature. In this

summary, Gilkey avoids two mistakes that people often make in talking about order in nature. While he emphasizes the persistence or universality of this intuition of order in all human cultures across time, Gilkey carefully avoids claiming that all cultures say the same thing. In addition, Gilkey reminds us that particular accounts of natural order have lent themselves to "demonic and oppressive uses" in human history (130).

In exploring nature as a realm of meaning (Chapter 9), Gilkey highlights themes he has introduced earlier in the text, especially the ambiguity of nature to and for human beings, in order to emphasize the fragility of any meaning we derive from our understandings of nature. Not only are our attempts to find meaning fragile, but we find that nature itself is, too. In the next chapter, Gilkey explores "Nature and the Human Care of Nature." Blaming both positivistic science and western religions for engendering attitudes and actions that are destructive of the natural world, he calls us to recognize that in harming nature we harm ourselves (144-150). In contrast to destructive attitudes toward nature, Gilkey suggests that we begin to think of nature as an image of God, i.e., a creature that has value and integrity of its own and mirrors (indeed is an instrument of) God's own creative work (150-152).

Part III offers a constructive account of the human situation, nature and God in light of previous sections of the book. In his analysis of the human situation (Ch. 11), Gilkey argues that human beings are generated out of nature, as is the history in which we are immersed. As natural-historical creatures, our lives are characterized by both contingency and temporality, a situation we have typically tried to ameliorate, if not escape, through technology. Unfortunately, modern technology threatens to destroy as much as control, and so Gilkey calls for the development of the political will to resist this technological imperative (167-169).

His constructive account of nature returns to and develops the claim that nature is an image of God

it (Ch. 12) by discussing seven signs of the divine that can be found in nature. Nature discloses itself as power in process. This disclosure of nature's power is accompanied, in religious consciousness, by the experience of demand or obligation. Nature exhibits an order, perceived differently in different cultures to be sure, but an order nonetheless. Order in nature is also accompanied by the perception of demand or obligation. The order of nature coexists with contingency. Thus, nature is, in some sense "prepared" for novelty and the unexpected. Finally, nature discloses the unity of life and death, such that new life always requires the death of the old. Gilkey concludes this chapter by suggesting that in nature, we discern that God is the God of power, and thus life and death, but also God of grace, life and eternity.

Gilkey concludes the book with the outline of a philosophically-rooted natural theology. He realizes that such a project "is not the vital center of Christian theology," but defends it because "the deeper understanding of nature's mystery and value in and for itself is very important and because the relation of God to natural processes is an essential part of our understanding, not only of nature, but of God and of ourselves" (195). Gilkey finishes with five brief statements about God (202-204). God is the name for the noncontingent source of contingent power. God is the name for the continuing ground of freedom in nature, human existence and history, God is the name for the source of order within novelty. God is the name for the organizing principle of human existence. Finally, God is redemptive love.

There is much to commend in this book. The themes Gilkey addresses remain important and timely. His work serves as a welcome ally for those who want to argue that there are many legitimate ways of knowing other than the scientific and that such a claim does not lead to a vacuum relativism or lazy skepticism. Gilkey reinforces themes found in the work of his former colleague at the University of Chicago, James M. Gustafson, when he recognizes the plurality of sciences (thus complicating our notions of the relationship between "religion" and "science") and re-

minds us that nature does not necessarily serve the human good. Gilkey articulates in compelling fashion some of the philosophical implications of what the natural sciences discover.

Those who remain dubious about projects such as Gilkey's will find reasons to remain so, however. Gilkey's argument does not escape the usual problems of philosophical theologies. His claims about God remain abstract and therefore leave the reader wondering how they relate to the claims made in concrete religious traditions. Indeed, much of the book is written in generalizations. For example, Gilkey treats all primal or archaic religions as alike and while the generalizations seem fair, more detailed engagement with specific religions would strengthen the argument. Another part of the argument that could use greater development is the connection between the insights of the primal religions and the findings of the science. Most of the time Gilkey simply reports what the sciences say alongside what religions say and implies, rather than explicates, their coherence. Finally, more work needs to be done to develop the implications of this persistent impulse to find order in nature. If this persistent impulse never results in any thick agreement about the details of that order, then one questions whether the impulse is misguided. Despite its gaps, however, *Nature, Reality and the Sacred* offers suggestive ways of responding to the perpetual task of making sense of God, nature and self in relation to one another.

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William Westney, *The Perfect Wrong Note: Learning to Trust Your Musical Self*. Pompton Plains, NJ: Amadeus Press, 2003. Pp. 239. ISBN 1-57467-083-2. \$24.95.

Bringing together between two covers the contents of his lectures and workshops, pianist William Westney shares his philosophy of learning, teaching, and performing. One could wish that a CD or

DVD were included in an envelope on the inside back cover so that the reader could hear/see the embodiment of that philosophy in performance.

No stranger to the thought world of Michael Polanyi, Westney, holder of two endowed faculty positions at Texas Tech University, presented a paper, *Tacit Knowing at the Piano Bench*, at the April 1991 conference at Kent State University, *From Polanyi to the 21st Century: A Centennial Celebration*. He later gave a performance at this conference. The concept of *tacit knowledge* is implicit in the current volume and not explicitly mentioned.

This reviewer, an independent studio teacher of piano and organ, has heard Mr. Westney lecture on *The Perils of Perfectionism*, observed a demonstration of his famous **Un-Master Class**, and heard him perform in recital at a conference of the Montana State Music Teachers Association at the University of Montana.

Westney begins by describing the freedom and vitality of the young child's response to music. This freedom is imperiled by the advent of music lessons, which demand perfection and discourage that childlike sense of adventure, curiosity, intuition, free play, and body movement that Albert Einstein, for instance, described as being integral to his creative thinking.

He then moves to the dynamics of perfectionism in piano practice, the music lesson, and performance and asserts that "mistakes" (the juicier, the better!) are as necessary to learning in the practice room as they are in life. For Westney, practicing is not performing, and "mistakes" become an opportunity for experimentation and problem solving where real learning takes place. Lessons become less of a "perfection" test than a checkpoint in the learning process with the teacher more concerned with encouraging the student's own impulses than controlling the student. The student then trusts herself more, enjoying and respecting what she already has inside.

A performer who has gone through the process summarized above is thus free to focus on communicating with the audience rather than on ego concerns.

Westney includes two chapters with very specific application. Chapter 4 is *Step by Step: A Guide to Healthy Practicing*, and, in Chapter 9, he describes the traditional master class, in which the student "performs" for a master teacher before a larger audience, usually of music teachers, and the master teacher then shows the audience how to "fix" the student's performance. He then contrasts the traditional master class with the product of his experience and experimentation, **The Un-Master Class**, in which a group of performers, through a series of activities involving body movement, respond to music and develop physical communication skills. When members of the group actually perform, the other members of the group give physical and verbal feedback, which focuses on how they respond to the performance rather than on picayune musical matters.

After a chapter on the adult amateur, whose approach to learning most closely resembles that of a young child in its curiosity and sense of adventure, Westney summarizes those avenues of thought that have most influenced him. It is here that he references Polanyi as having gone "beyond the objective scientific method in which he was trained when he said that humans 'know more than we can tell': there are important truths which are personal and irreducible and which can never be analyzed or described" (p. 218). He then quotes from *Knowing and Being* (p. 126) where Polanyi uses the example of piano technique to illustrate the inadequacy of reductionist analysis and to focus on the essence of making music as an "act of integration."

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Randall E. Auxier and Lewis Edwin Hahn, editors, *The Philosophy of Marjorie Grene*. Carbondale: Library of Living Philosophers, Open Court Publishing Company, 2002. Pp. 594. Pb ISBN 0-8126-9527-5, Price \$32.95 paper.

Here is a hefty and solid volume that extols, extends, and critiques the philosophical work of Marjorie Grene. Her appearance in this volume of “the Library of Living Philosophers” (at age 92!) is no small honor because it means a board of highly esteemed American philosophers has deemed her ideas as of the same relative significance as the ideas of past honorees such as Dewey, Whitehead, Russell, Einstein, Buber, Popper, Sartre, Gadamer, and Davidson, to name a few. The volume is divided into three main sections. Part One is Grene’s intellectual autobiography, which is filled with many fascinating accounts of her philosophical peregrinations and interesting disclosures about her struggles as a woman in a discipline dominated by males. She notes that 1950 was “a special year in my vita: the year I met Michael Polanyi...”. Polanyi invited her to assist him in his development of the Gifford Lectures, which more than six years later would be published as *Personal Knowledge*. She concludes this piece commenting that her earlier “guiding lights” were Polanyi, Merleau-Ponty, and Plessner, whose ideas are enriched and solidified when contextualized within Gibson’s ecological realism. For those who have read her *Philosophical Testament*, this will come as no surprise.

Part Two is the largest portion of the volume, 535 pages devoted to descriptive and critical essays by her peers and Grene’s often feisty replies to them. This section divides into essays dealing with “persons and knowledge,” “philosophy of biology,” and “studies in the history of philosophy.” In a small review like this it will not be possible to comment on more than a few of these provocative essays, so I will merely mention most of the essays and what they’re about and discuss only those whose content importunes. The section on “persons and knowledge” begins with a large essay by TAD’s own Phil Mullins on Grene’s work and friendship with Polanyi. Mullins highlights the happy coin-

idence of these two academic mavericks’ first encounter at University of Chicago in 1950. Polanyi was there giving lectures as a Visiting Professor, and Grene, who was “relieved of her duties” as an instructor there several years earlier, managed to attend one of his lectures and speak to him afterwards. The rest is history. Mullins’ essay is a gold mine of interesting details about their work and 26 years of friendship. Mullins makes it clear that Polanyi held Grene’s philosophical prowess in high esteem and that Grene admired the broadness and general trajectory of Polanyi’s post-critical vision, despite her taking issue with Polanyi over, among other things, *Personal Knowledge’s* Christian overtones, and its “treacherous footnotes” betraying a “hopelessly anthropocentric evolutionism.” Mullins concludes the essay with a superb section on Polanyian themes in Grene’s philosophical thought, themes that Grene takes up most explicitly in her own ecological epistemology.

Other essays in this section include Jacquelyn Kegley’s probing of Grene’s contextual philosophical anthropology and its roots in Portmann and Plessner, Helen Longino’s enlightening discussion of Grene’s biologized naturalism and historicized Kantianism as it contrasts with Quine’s scientific program for naturalization, and Richard Schacht’s fascinating essay on Grene’s philosophical anthropology and the future of human nature. Peter Machamer and Lisa Osbeck’s contribution argues that Gibson’s direct realism ought to eschew, not internal representations per se, but internal inferences; the former, they claim doesn’t offend against Gibson’s thesis of perception/conception continuity and is sometimes required to account for certain judgments and problem-solving behaviors. Michael Luntley’s essay explores “the restlessness of agency” and how “a tacit and direct sense of things” is essential to the individuation of the content of our beliefs and desires as well as our self-conception. Anthony N. Perovich Jr.’s paper questions Grene’s down-grading the role of consciousness in her non-dualist yet non-reductionist conception of personhood. And finally, David M. Rosenthal’s essay agrees with Perovich Jr.’s claim that we must understand consciousness if we are to understand personhood, and

seeks to give specific theoretical content to the special, species-demarkating way that persons are conscious of their mental states.

The critical import of the essays in this section focuses on the centrality of the category of person in Grene's anthropology, particularly as it comes to expression in her refusal to partake of the current crazes for consciousness. Perovich Jr. notes that Grene deploys Erwin Straus's "physics refutes physicalism" trope, which is a kind of transcendental argument that physicalism undermines the conditions of the possibility of the science of physics, the very foundation upon which physicalism rests. He suggests, however, that this trope might carry more punch than Grene bargained for, in that Alan Donagan, someone who Grene has the utmost respect for, believes it actually should motivate an embrace of minds dualistically understood. Whether it does or doesn't, Perovich Jr. believes the argument highlights the fact that consciousness, unlike other higher ontological levels of organized complexity, is a level apart in that it cannot be explained in terms of physical structure and function alone. And yet Grene situates the category of the person, the category she puts in place of consciousness, in ontological continuity with them. Perovich Jr. contends that notions integral to Grene's concept of personhood, things such as responsible agency, intentionality, and others depend essentially upon the conceptually prior notion of consciousness, that what makes these capacities of personhood unique to humans is the mental content residing *in* their consciousness. Rosenthal takes this a step further with his theory of consciousness as higher order thoughts about mental states that are not themselves conscious (HOTS) and specifies the mental content which bestows this uniqueness on human personhood. Unlike Perovich Jr.'s, Rosenthal's article is sympathetic with Grene's rejection of Cartesian dualism, but seeks to account for personhood in terms of consciousness which, in turn, is to be accounted for in terms of HOTS. Armed with this understanding of consciousness as reflection on non-conscious mental states, he calls on a functionalist account of mind to explain the basic components of personhood. Grene's response to these essays is

predictable. She finds dualism "inconceivable," abhors "consciousmongers," and does not "remotely have the hots for HOTS!" For Grene, as for Merleau-Ponty, Plessner and Gibson, it is not what's in our minds or consciousness that demarcates us from the rest of the animal world, but what we are in, a lifeworld of affordances that have personified our organism through enculturation.

The second sub-section of part Two addresses Grene's contributions to the philosophy of biology. Phillip R. Sloan's essay examines the "species problem," the problem of defining species in such a way that it accommodates all the data and practical concerns of the various biological theories into which the notion figures centrally. Sloan argues that Grene's skill at bringing together disparate traditions in philosophy, her impressive grasp of the history of philosophy, and her Polanyian-influenced historical realism, give Grene a unique advantage in sorting this issue out without at the same time undermining a host of humanistic concerns. David Hull's piece gives an overview of Grene's contributions to evolutionary theory, e.g., her Aristotelian-influenced views of species, her antireductionism, her critique of the tautological treatments of natural selection, etc., and offers a few criticisms of his own regarding her antagonistic position on population thinking. David Depew's essay investigates Grene's naturalism as it comes to expression in her work on Aristotle and Darwin, and distinguishes it from the Quinian project of naturalization that attempts to extend the empirical sciences' reach directly into philosophical territory. Niles Eldredge's contribution demonstrates that Grene's insight into evolution's dependency on interactions across two kinds of hierarchy have paid rich dividends in evolutionary theory. Richard M. Burian, in his article, does a marvelous job elucidating Grene's commitments to "historical realism" and "contextual objectivity" and how these influenced her analysis of the various gene concepts deployed in the biological sciences. Eugenie Gatens-Robinson's essay explores Grene's project of returning a robust notion of life to the biological sciences, but claims that Grene's refusal to give sufficient place to teleological explanations in the phyloge-

netic context of evolution stymies her project's realization. This essay receives some of the most scathing criticism found in Grene's responses to the volume's contributors. Hans-Jorg Rheinberger provides a piece on the various notions of time that figure into physics, history, biology, and our being-in-the-world, and John Beatty, in his article, discusses the place of contingency in Darwinian science. These are both interesting and illuminating essays, but they shed very little light on Grene's work.

The final section of part Two is devoted to Grene's contributions to studies in the history of philosophy. It kicks off with a long essay by Richard Glauser that probes the late-scholastic roots of Descartes' notions of substance and of the real distinction between mind and body, and suggests that Suarez may figure into things more than Grene recognized. John Cottingham's contribution seeks to mollify some of the contempt typically directed at Descartes' mind-body dualism—something that is palpable in Grene's work. Cottingham argues that Descartes' view of sensation brought him to acknowledge, at least implicitly, a third kind of being, a being that brings mind and body into substantial unity, viz., human being. Taking the union of mind-body as a primitive allows Descartes to ascribe distinctive and irreducible properties to it, says Cottingham. Desmond M. Clarke's article seeks to qualify Grene's negative assessment of Descartes' accomplishments by showing that Descartes' framework of dualism was an honest response to the failures of 17th century science (including his own) to explain human consciousness, a response that highlighted the limitations of science and that refused to present mere re-description of phenomena as a form of final explanation like his Aristotelian contemporaries were wont to do. Kathleen Blamey offers, in her piece, a Cartesian counter-point in Pascal, persuasively arguing that the four errors of Descartes that Grene identified in her *Knower and the Known*, viz., indubitability, self-evidence, unity of science, and dualism, are dealt with by Pascal in a manner that is in keeping with Grene's own views on knowledge and the human person. Helen Hattab's contribution questions Grene's contextualist approach

to the history of philosophy, suggesting that there is an unrelieved tension in Grene's historicism and her attempt to derive normative import for current philosophizing from the philosophy of the past. Charles M. Sherover's article on Grene's presentation of Heidegger in *Dreadful Freedom* (1948) and *Heidegger* (1957) takes her to task on, among other things, pitching existentialism as fundamentally an atheistic philosophy, failing to adequately appreciate both how far apart philosophically Heidegger and Sartre are, and misunderstanding the reasons underlying Heidegger's obscure language. The final essay is David Detmer's. He applauds Grene for her fair-minded criticism of Sartre, which helped to establish Sartre's reputation as a genuine philosopher in the Anglophone world—even while she had little sympathy for his views. However, Detmer challenges Grene to recognize the ethical possibilities that lie largely latent in Sartre's writings.

Part Three, the final section of this book, contains a bibliography of Grene's writings. All told (thus far): thirteen books, ten edited books, one hundred and thirty seven articles and reviews, and five translations!

This book is a wonderful example of the breadth and depth of Grene's thought and its influences in the world of philosophy. Despite the fact that a few of the essays may have been better left out of the volume, this does not detract from the overall wealth of insight the volume brings to our understanding of Grene and the fertility of her philosophical meanderings.

I have largely passed over in silence Grene's responses to these provocative essays. The pleasure of their spice, humor, vitriol, and deep wisdom must await your reading.

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Upcoming Changes in Polanyi Society Electronic Discussion List

For several years, the Polanyi Society has sponsored an electronic discussion list. Like most electronic lists, discussion has waxed and waned. Sometimes there were introductory questions about Polanyi's thought. The list served an important educational function. Sometimes the list was used to help someone track down some of Polanyi's writings, some historical fact about Polanyi or his compatriots, or a term, concept, or quotation of interest. At other times, there were intricate questions of interpretation debated by those who have worked on Polanyi for many years. The first list was located at St. Bonaventure University and was moderated by John Apczynski. For the last few years, Struan Jacobs has moderated and his school, Deakin University, served as host. Thanks are due to both Apczynski and Jacobs for their service in sponsoring the Polanyi list. Recently, some technical problems have emerged that are going to require that the list be moved from the Deakin host computer. The Society is currently looking for a new moderator and a new host computer. Some possibilities have already come forth (and are being explored) but if you are willing to take on this role and have a server that can handle a moderated list, please send an e-mail to Marty Moleski (moleski@canisus.edu) and Phil Mullins (mullins@mWSC.edu).

At least for the short run, the Polanyi Society list will probably be moved to a Yahoo site. Some members of the list at Deakin were notified and have already signed up for the Polanyi list at the Yahoo address. Given our current technical difficulties, it seems likely that many people formerly on the discussion list have not been notified about the move. If you were on the former list at Deakin, you may soon receive an individual e-mail invitation to join (or have your name added) to the new list at Yahoo. If you are interested in joining, whether or not you were on the former list, you can send requests to Mullins and Moleski.

Polanyi Society Summer Program Survey

Polanyi Society member Dale Cannon has been working in the past year to see if the Society can put together some sort of summer Polanyi program. In the past, the Society has sponsored some small conferences and working group meetings in the summer. Cannon constructed a survey to try to solicit information about the level and kinds of interest that Society members (or others) might have in a summer event. The article above describes technical difficulties that disrupted the operation of the Polanyi Society discussion list. Unfortunately, these problems commenced at about the time the survey about summer program options was e-mailed to subscribers of the Polanyi list. There were a few people who received the survey and responded. But it seems likely that many did not receive the survey. Whether you subscribe to the Polanyi electronic discussion list or not, the survey may be of interest. Below are described the ways you can get a copy of the survey.

You can download the survey in pdf format by going to the Polanyi Society web site (<http://www.mWSC.edu/orgs/polanyi/>). Simply scroll down until you see the link for Summer Polanyi Program Survey. After completing the survey, mail it back to Dale Cannon, Philosophy and Religious Studies, Western Oregon University, Monmouth, OR 97361 USA. You can fax the survey to Cannon at 503-838-8056. If you prefer to write Cannon e-mail (cannodw@wou.edu), he can send you the survey as an attachment that you can complete and return by e-mail. When the Polanyi Society discussion list is again operating, the survey may be circulated there for a second time.

WWW Polanyi Resources

The Polanyi Society has a World Wide Web site at <http://www.mwsc.edu/orgs/polanyi/>. In addition to information about Polanyi Society membership and meetings, the site contains the following: (1) the history of Polanyi Society publications, including a listing of issues by date and volume with a table of contents for recent issues of *Tradition and Discovery*; (2) a comprehensive listing of *Tradition and Discovery* authors, reviews and reviewers; (3) information on locating early publications; (4) information on *Appraisal* and *Polanyiana*, two sister journals with special interest in Polanyi's thought; (5) the "Guide to the Papers of Michael Polanyi" which provides an orientation to archival material housed in the Department of Special Collections of the University of Chicago Library; (6) photographs of Polanyi; (7) five essays by Polanyi.

