Tradition & Discovery

The Polanyi Society Periodical

Volume XXXVIII **Number 1** **2011--2012**

ISSN 1057-1027 (print)
ISSN 2154-1566 (online)

Preface

TAD 38:1 is an issue with many elements that should be of interest. Stephen Henry, a physician, and Charles Lowney, a philosopher, provide careful analysis and discussion of Harry Collins' new book *Tacit and Explicit Knowledge*, a book that has been discussed by Polanyians since it recently came out. Collins, a sociologist, graciously agreed to respond to the comments in these review articles. In a follow-up to an article last year, Kyle Takaki shows how Polanyi and Merleau-Ponty, although they have generally compatible orientations, have projects that differ at key junctures. Takaki argues that Polanyi's "enactive realism" delineates the hierarchical, stratified nature of comprehensive entities as brought forth by the structure of tacit knowing. There are five shorter book reviews in this issue and the books range from philosophy of mind to religion and science to a study of innovation to the project of improving higher education.

Please pay close attention to the abundant informational material included at the beginning of this *TAD*. The program for the November 19 Polanyi Society annual meeting in San Francisco is on page 8. There is an update (p. 9) on the program for the Polanyi Society's June 8-10, 2012 conference in Chicago. The first deadline for the call for papers for the conference (pp. 11-12) is fast approaching. Those planning this conference strongly encourage you early to make known your intention to participate. Society President David Rutledge's open letter (p. 10) is a forthright appeal for dollars to support the Loyola conference and the Society's new endowment. In News and Notes (pp. 3-7) there is an extended list of recent publications of possible interest; most come from the recently published *Bulletin of Science, Technology and Society* issue focusing on Polanyi's thought.

This October issue initiates the annual membership cycle; a membership renewal form and a self-addressed return envelope are enclosed. Some changes are in the offing so please read the Note on Dues Payment at the top of the opposite page.

Phil Mullins

Tradition & Discovery is indexed selectively in *The Philosopher's Index* and *Religious and Theological Abstracts* and is included in the EBSCO online database of academic and research journals.

NEWS AND NOTES

A Note on Dues Payment

As is the case with every fall issue of *TAD*, this issue includes a return envelope to be used to pay 2011-2012 academic year membership dues. Both the October and February issues of *TAD* have enclosed a return envelope and a membership flyer. US postage regulations require that **EVERY** copy of *TAD* mailed in the postage class used must weigh exactly the same. Thus, even if you promptly pay your dues with this October issue's return envelope, the February TAD will also include an envelope. Dues remain $35 ($25 for libraries and $15 students), which is a great bargain in the academic journal world. Except for those residing outside the US, members should pay dues with a check. **The Society can no longer easily and inexpensively process credit cards.** We may eventually be able to set up a Pay Pal web payment option that will simplify payment. As in past years, this October 2011 return envelope will be returned to Phil Mullins, the *TAD* Editor. However, after the October billing cycle, dues and donations will be handled directly by the Polanyi Society Treasurer, Charles Lowney. Phil Mullins can be contacted for address changes or other near term membership business (see his address on the opposite page).

Recent Publications

Walter Mead was guest editor for a special issue of *Bulletin of Science, Technology & Society* (2011, no. 31) which focused on Michael Polanyi's thought. This issue came out in the late spring of 2011. Below are titles and abstracts for the 10 essays included in this issue.

Walter B. Mead, "A Symposium on the Relevance of Michael Polanyi's Insights to a Reformulated Understanding of Science, Technology, and Society," 155-159**. wbmead@ilstu.edu**

Abstract: This is intended as an introductory statement to the explorations undertaken in the essays that follow. The authors of these essays attempt to introduce the reader to some of the insights of Michael Polanyi and their implications for the reader who wishes to come to a greater understanding of modern technological society, which — for better or worse — has come to define his very existence. Arguably, no twentieth-century thinker has probed more deeply than Polanyi into the dynamics of scientific discovery or demonstrated more courage in his willingness to think outside the box of ruling orthodoxies and, consequently, come up with more profound insights and radically new ways of understanding the processes of scientific inquiry, their technological implications, and the sometimes fateful, but potentially fruitful, relationships that exist among science, technology, and society. Each of the following nine authors, grounded in different fields of study and research, but also in a common appreciation of Polanyi's contributions, offers valuable insights into this multi-faceted subject.

Murray Jardine, "Sight, Sound, and Knowledge: Michael Polanyi's Epistemology as an Attempt to Redress the Sensory Imbalance in Modern Western Thought," 160-171. **jardimu@auburn.edu**

Abstract: The author argues that Michael Polanyi's philosophy of science can be understood as an (unconscious) attempt to recapture elements of experience largely forgotten or repressed in modernity. Specifically, the author argues that Polanyi's epistemology appears to draw on elements of oral–aural experience that have been relatively ignored by the heavily visual sensory orientation typical of modern Western societies. The author does this by first deriving the primary features of the modern objectivist conception of knowledge from Polanyi's critique of objectivism and then using the anthropological literature on the differences between oral and literate cultures to demonstrate that these same aspects of the objectivist paradigm correspond closely

to typical features of literate, visual consciousness while Polanyi's alternative formulations correspond to a more oral–aural orientation.

Struan Jacobs, "C. P. Snow's The Two Cultures: Michael Polanyi's Response and Context," 172-178. **swjacobs@deakin.edu.au**

Abstract: C. P. Snow's "The Two Cultures" controversially contrasted science and literature, suggesting that neither scientists nor literary intellectuals have much in common with, and seldom bother speaking to, the other. Responding to Snow, Michael Polanyi argued that specialization has made modern culture, not twofold but manifold. In his major work, *Personal Knowledge*, Polanyi explained that branches of modern culture have *personal* knowing and knowledge *in common*, and there is extensive cross-pollination of ideas. He also, in this book, saw the branches of culture as disparate intellectual frameworks that are *divorced* from one another.

Charles Lowney, "Rethinking the Machine Metaphor Since Descartes: On the Irreducibility of Bodies, Minds, and Meanings," 179-192. **lowneyc@wlu.edu.**

Abstract: Michael Polanyi's conceptions of tacit knowing and emergent being are used to correct a reductionism that developed from, or reacted against, the excesses of several Cartesian assumptions: (a) the method of universal doubt; (b) the emphasis on reductive analysis to unshakeable foundations, via connections between clear and distinct ideas; (c) the notion that what is real are the basic atomic substances out of which all else is composed; (d) a sharp body-mind substance dualism; and (e) the notion that the seat of consciousness can be traced to a point in the human body. The reductivist project in biology began with the emphasis Descartes put on the body as a machine. Polanyi reappropriates the machine metaphor to demonstrate how mechanistic explanations are not fully reductive. He shows how an eliminative materialism that would reduce mind to brain is unwarranted if either an interlevel mechanistic reduction or an intralevel successional reduction is posited.

Terence Kennedy, "From Paradigms to Paideia: Thomas S. Kuhn and Michael Polanyi in Conversation," 193-199. **tkennedy@alfonsiana.edu**

Abstract: There are three approaches to the Kuhn-Polanyi relationship: their ideas are the same, can be reconciled, or profoundly diverge. This article seeks to show that both share a tradition of *paideia*. Kuhn espouses scientific revolutions while Polanyi stresses reform and continuity within a Platonic worldview.

Richard Henry Schmitt, "Models, Their Application, and Scientific Anticipation: Ludwig Boltzmann's Work as Tacit Knowing," 200-205. **rschmitt@uchicago.edu**

Abstract: Ludwig Boltzmann's work in theoretical physics exhibits an approach to the construction of theory that he transmitted to the succeeding generation by example. It involved the construction of clear models, allowed more than one, and was not based solely on the existing facts, with the intent of examining and criticizing the assumptions that made each model work. This tacit program influenced physicists like Ehrenfest and Einstein and the philosopher Wittgenstein, suggesting ways that they used to make further advances.

Mark T. Mitchell, "Polanyi and the Role of Tradition in Scientific Inquiry," 206-211. **mtmitchell@phc.edu**

Abstract: A characteristic of the modern mind is a disdain for tradition. Polanyi argues that neglecting the role of tradition leads to philosophical incoherence as well as moral and political chaos. Polanyi's postcritical philosophy represents an attempt to show how tradition plays a vital role in the process of discovery. Ultimately, a coherent account of the sciences, as well as the humanities, is only possible when tradition is acknowledged as indispensable.

Maben Walter Poirier, "Michael Polanyi and the Social Sciences," 212-224. **poirmw@alcor.concordia.ca**

Abstract: In this article, the author attempts three things: (a) to describe the main beliefs of the "continental empiricist" epistemology that dominated the study of the social sciences in North America since the mid 1930s; (b) to speak of the influence of this epistemology on the dominant or mainstream school in the study of politics; and (c) to propose a new-old approach to the study of politics, based on the thinking of Michael Polanyi (1891-1976).

Robert Doede, "Technologies and Species Transitions: Polanyi, on a Path to Posthumanity?" 225-235. **bobd@twu.ca**

Abstract: Polanyi and Transhumanism both place technologies in pivotal roles in bringing about *Homo sapiens*' species transitions. The question is asked whether Polanyi's emphasis on the role of technology in *Homo sapiens*' rise out of mute beasthood indicates that he might have been inclined to embrace the Transhumanist vision of *Homo sapiens*' technological evolution into a postbiological, techno-cyber species. To answer this question, some of the core commitments of both Transhumanism and Polanyi's postcritical philosophy are examined, especially as they bear on *Homo sapiens*' species transitions. The conclusion reached is that rather than being the next step dictated by the inner logic of Polanyi's thought, Transhumanism is actually the final conclusion of epistemological ideals he spent most of his career denouncing.

James Clement van Pelt, "Toward a Polanyian Critique of Technology: Attending From the Indwelling of Tools to the Course of Technological Civilization," 236-246. **james.vanpelt@yale.edu**

Abstract: As a scientist, Michael Polanyi made significant advances in chemistry and economics. From that deep hands-on experience, he derived a powerful critique of prevailing ideas of knowledge and the proper role of science. He demonstrated that disregarding or eliminating the personal embodiment of knowing in the tacit dimension in pursuit of purely explicit and impersonal knowledge results in knowing that is misleadingly incomplete—"absurd." If technology is the practical application of science, then it should be useful to extend his critique of science to technology. The pursuit of impersonal knowledge parallels the quest for efficiency through the standardizing and programming of technique while devaluing personal knowing in the form of embodied skills, institutional memory, and a "feel" for possibilities that leads to insightful breakthroughs. As technological development continues to accelerate and proliferate unsustainably, the idolizing of efficiency operates to subsume other values that would tend to constrain such development, raising concerns about the future of discovery, of the economic and social order, and of the human soul.

***

Stefania Jha's review of *Knowing And Being: Perspectives On The Philosophy of Michael Polanyi* edited by Tihamér Margitay (Newcastle upon Tyne: Cambridge Scholars Publishing, 2010) is forthcoming in *Journal of Value Inquiry* and became available online on July 16, 2011 (DOI 10.1007/s10790-011-9278-9). This new collection of essays on Polanyi's thought was also reviewed by **John Apczynski** in *TAD* (37:1 [2010-11]: 55-59) and by **Péter Hartl** in the forthcoming English issue of *Polanyiana* (Vol. 19:1-2 [2010]).

Stefania Jha, "Wigner's "Polanyian" Epistemology and the Measurement Problem: The Wigner–Polanyi Dialog on Tacit Knowledge," *Physics in Perspective* 13:3 (2011): 329-358. DOI: 10.1007/s00016-010-0050-5.

Abstract: I analyze the long dialog that Eugene Wigner (1902-1995) and Michael Polanyi (1891–1976) carried out on Polanyi's concept of tacit knowledge and its meaning for the measurement problem in quantum physics, focusing in particular on their ten-year correspondence between 1961 and 1971 on these subjects and the related mind-body problem. They differed in their interpretations**,** epistemologies, and ontologies, and consequently never resolved their differences on the measurement and mind-body problems. Nonetheless, their long dialog is significant and opens up avenues for exploring these problems further.

Struan Jacobs and **Phil Mullins**, "Relations Between Karl Popper and Michael Polanyi," *Studies in the History and Philosophy of Science* 42 (2011) 426–435. DOI:10.1016/j.shpsa.2010.09.001.

Abstract: Karl Popper and Michael Polanyi grew up in central Europe and, having escaped from Nazism, went on to pursue academic careers in Britain where they wrote prolifically on science and politics. Popper and Polanyi corresponded with each other, and met for discussions in the late 1940s and early 50s, but they seldom referred to each other in their publications. This article examines their correspondence so as to produce a picture of their intellectual relations. The most important of the letters was one that Popper wrote in 1952, which we reproduce in its entirety, indicating his dissatisfaction with ideas that Polanyi had expressed in a paper of that year, 'The Stability of Beliefs'. In this paper, Polanyi used the example of the framework of Zande witchcraft to shed analogical light on science and other systems of belief, arguing that 'frameworks of belief' equip their adherents with intellectual powers whose use reinforces commitment to the framework, inoculating adherents against criticism. Polanyi's 1952 paper and his 1951 and 1952 Gifford Lectures (to which that paper is intimately tied) are the first articulation of Polanyi's sharp rejection of the modern critical philosophical tradition that by implication included Popper's philosophical ideas. The 1952 paper is also part of Polanyi's constructive philosophical effort to set forth a fiduciary philosophy emphasizing commitment. Popper regarded Polanyi's position as implying cognitive relativism and irrationalism, and from the time of Polanyi's 1952 paper their personal relationship became strained. Discord between them became publicly manifest when Polanyi subtitled his book *Personal Knowledge* (1958), *Towards A Post-Critical Philosophy*, and Popper lambasted the idea of a 'post-critical' philosophy in his Preface in *The Logic of Scientific Discovery* (1959).

Milton Scarborough's book, *Comparative Theories of Nonduality: The Search for a Middle Way* (London, New York: Continuum, 2009), which was discussed by **Walter Gulick** and **Milton Scarborough** in a recent *TAD* (37:1 [2010-11]: 39-50), is now available in a more reasonably priced paperback edition.

Travel Assistance Available For November Meeting

For students and other young scholars planning to attend the Society's Annual Meeting in San Francisco on November 19, 2011, limited travel funding is available. Society members are urged to inform worthy candidates about this assistance Those interested in this funding, as well as those who know of potential candidates, should contact Walter Mead (**wbmead@ilstu.edu**). Contributions to the travel fund are always welcome; those interested in contributing should e-mail Walter Mead. Related information about the travel fund can also be found on the Polanyi Society web site.

Student applicants are expected first to inquire if their school's academic department or student affairs office can provide assistance. Applications to the Polanyi Society (via Walter Mead) should include the e-mail and postal address at which they can be contacted before November 18, information regarding the applicant's academic background and accomplishments, as well as a brief comment describing his/her interest in and study of Polanyi's thought. The applicant should identify and provide an e-mail address for someone (preferably a professor under whom he/she has studied) who has agreed promptly to supply a letter of reference by e-mail to Walter Mead. Also, the applicant should indicate estimated travel expenses and cost of lodging for the night preceding (November 18) and the night following (November 19) the two sessions of the Polanyi Society meeting—that is, the portion of these expenses requiring assistance. Applicants are encouraged to share travel, if by car, and lodging with others, wherever possible, in order to minimize costs. (Walter Mead can assist applicants by providing names of persons traveling from nearby locations and names of those seeking roommates.)

Fall 2011 awards will be made no later than mid October 2011 so applications need to be submitted no later than early October.

Some travel assistance should also be available for students and/or younger scholars with limited resources who have had a paper proposal accepted for presentation at the June 8-10 Polanyi Society Conference at Loyola University, Chicago. Those interested in assistance should contact Walter Mead soon after receiving notification that a paper proposal has been accepted.

Polanyi Society Speakers Bureau

The Polanyi Society's Speakers Bureau helps organize talks to groups by Polanyi scholars. Marty Moleski, S. J. and Richard Gelwick gave talks in 2010 at universities; Richard Moodey and Phil Mullins gave talks in summer of 2011 at a meeting in Gummersbach, Germany. If you know anyone who might be interested in a speaker, send the name and e-mail address to Phil Mullins (**mullins@missouriwestern.edu**). There is now a link on the Polanyi Society web page with general information about the Speakers Bureau. You will find there a précis of the talks given by Moleski and Gelwick. Several Society members have indicated interest in speaking on different aspects of Polanyi's thought. It is likely that the Society can arrange for someone nearby to provide a talk on a topic of interest.

Electronic Discussion List

The Polanyi Society supports an electronic discussion group that explores implications of the thought of Michael Polanyi. Anyone interested can join. To join yourself, go to the following address: http://groups.yahoo.com/group/polanyi_list/join. If you have difficulty, send an e-mail to Doug Masini (**Douglas.Masini@armstrong.edu**) and someone will see that you are added to the list.

New Polanyi Society Web Addresses

The address for the Polanyi Society web site has long been http://www.missouriwestern.edu/orgs/polanyi/. This address still works but (with the help of some web saavy members) the Society now has acquired rights to two other web addresses that are much easier to remember and don't require the http and the www: polanyisociety.org/ and polanyi-society.com/.

WWW Polanyi Resources

The Polanyi Society has a World Wide Web site at http://www.missouriwestern.edu/orgs/polanyi (or polanyisociety.org). In addition to information about Polanyi Society membership and meetings, the site contains the following: (1) digital archives containing all issues of *Tradition and Discovery* and its predecessor publications of the Polanyi Society going back to 1972; (2) indices listing *Tradition and Discovery* authors, reviews and reviewers; (3) the history of Polanyi Society publications; (4) information on *Appraisal* and *Polanyiana*, two sister journals with special interest in Michael Polanyi's thought; (5) a link to the "Guide to th e Papers of Michael Polanyi," which provides an orientation to archival material housed in the Special Collections Research Center of the University of Chicago Library, Chicago, IL 60637; (6) photographs of Polanyi; (7) links to a number of Polanyi essays (available on the Polanyi Society web site and other sites), Polanyi's Duke Lectures (1964), as well as audio files for Polanyi's McEnerney Lectures (1962), and Polanyi's conversation with Carl Rogers (1966).

2011 Polanyi Society Annual Meeting

Saturday, 19 November

The annual meeting for the Polanyi Society will be held in conjunction with the American Academy of Religion annual meeting in San Francisco.The overall theme for the meeting is "Persons in Society." Information about the meeting sessions (including papers) will also be posted on the Polanyi Society website.

9:00-11:30 am Taylor Room at the Hilton Hotel, Union Square, San Francisco

Convener: Charles Lowney, Washington and Lee University

"The Moral Person: Psychology, Neuroscience and Polanyi"
Darcia Narvaez, University of Notre Dame.

Respondent: Paul Lewis, Mercer University

Respondent: Gus Breytspraak, Ottawa University

Business Meeting
Presiding: David Rutledge, Furman University

The Online Program Book is available at http://www.aarweb.org/Meetings/Annual_Meeting/Curent_Meeting/Program_Book/addmtg.asp. Locate the listing by searching for session number P19-106.

7:00-9:30 pm Taylor Room at the Hilton Hotel, Union Square, San Francisco

Convener: Esther Meek, Geneva College

"The 'Hard Problem'—From Polanyi to Chalmers:
Nonreductive Explanations for the Mind-Body Connection"
Stefania Jha, Independent Scholar

Respondent: David Nikkel, University of North Carolina, Pembroke

"The Participatory Turn"
Jacob Sherman, California Institute of Integral Studies

Respondent: Dale Cannon, Western Oregon University

The Online Program Book is available at http://www.aarweb.org/Meetings/Annual_Meeting/Current_Meeting/Program_Book/addmtg.asp. Locate the listing by searching for session number P19-492.

Update on Polanyi Society Loyola Conference

The Polanyi Society conference that is scheduled for June 8-10, 2012 at Loyola University, Chicago, is beginning to take shape. The conference will be held at the downtown Loyola conference center which is easily accessible by public transportation. This site is much like the Loyola conference center at which the 2008 Polanyi Society conference was held. During the fall of 2011, details about food, housing, registration and other matters will be posted on the Polanyi Society web site (http://www.missouriwestern.edu/orgs/polanyi/ or simply polanyisociety.org/). A notice indicating that details are posted will be circulated on the Polanyi Society electronic discussion list and such information will be included in the February 2012 issue of *Tradition and Discovery: The Polanyi Society Periodical*. The conference planning committee presently anticipates that some travel assistance/conference registration scholarships will be available for students and/or younger scholars. See the note in this issue of *TAD* about travel assistance as well as Polanyi Society President David Rutledge's open letter which seeks to stimulate the Society's fund raising efforts.

The conference planning committee is pleased to announce that some of the plenary sessions for the Loyola conference are now in place and others are slowly taking shape. Mary Jo Nye, Horning Professor in the Humanities and Professor of History Emeritus at Oregon State University, will give a talk on Friday evening June 8. Nye is a historian of chemistry with long-standing interest in (and many publications about) Michael Polanyi. Professor Nye received the History of Science Society's Sarton Medal for Lifetime Scholarly Achievement in 2006. Her new book, *Michael Polanyi and His Generation: Origins of the Social Construction of Science* is scheduled for publication by the University of Chicago Press in fall 2011. Walter Gulick, Professor Emeritus from Montana State University, Billings, will give an address at the Saturday, June 9 evening banquet. Gulick had a long career at MSU, Billings, working not only as a professor teaching a wide array of material in philosophy, religious studies and interdisciplinary humanities, but also as a department chair, founding honors director and academic vice president. He was twice a Fulbright Scholar (once in Budapest where he worked on the then new journal of the MPLPA, *Polanyiana*) and has also taught in several other programs in Europe and was a member of the Montana Humanities Council and President of the Montana Association of Churches. Gulick joined the Polanyi Society in 1972 at its inception and has been an important leader, serving as Society President, Board member and *TAD* review editor for many years. Over those years, Gulick has published more than thirty essays, review articles, and book reviews in *TAD* as well as many essays and reviews in other Polanyi journals like *Appraisal* and *Polanyiana* and journals like *Zygon*. On Saturday afternoon, a third plenary session will be a panel discussion focusing on issues in political philosophy. Presently, we are still working on assembling the panel of scholars whose writings about political theory/political philosophy makes use of Polanyi's work. Two earlier Loyola conferences featured a plenary session with a skilled practitioner (a musician and a magician in 2001 and 2008); suggestions are invited.

The 2012 Loyola conference, like the earlier conferences, will also include a number of concurrent sessions at which conference participants can give papers. Insofar as possible, papers will be grouped thematically. Sessions will be scheduled with ample time for discussion. The conference planning committee hopes for proposals covering a wide range of topics to which Polanyi's ideas can be related. See the call for papers elsewhere in this issue of *TAD*. This conference, like earlier Loyola conferences, will build in time for informal discussions among participants.

An Open Letter Soliciting Financial Support For The Polanyi Society

Dear *TAD* Reader,

Even a quick reading of the plans for the June 8-10, 2012 Polanyi Conference at Loyola University, Chicago outlined in this issue reveals the opportunities for scholarly enrichment this conference presents. Anyone who has attended these Loyola gatherings in the past knows how much more enjoyable they are than more typical, large academic meetings where you have to fight to access elevators or restaurants!

But the Chicago conference offers another, less visible, opportunity—a chance to support the Society's work tangibly by making a special gift to the Loyola effort. Many Society members contribute more than dues to the Society each year, and that faithfulness, as well as an extremely Spartan operation with minimal overhead, has enabled The Polanyi Society to be one of the more active scholarly groups around. Publishing this journal, maintaining a web site (with many scholarly resources) and an electronic discussion list, sponsoring annual meetings (with peer-reviewed papers and/or invited distinguished speakers) in conjunction with the American Academy of Religion and occasional meetings with the American Philosophical Society, supporting important publications (e.g., the Polanyi biography and the re-issue of *The Tacit Dimension*), establishing the William Poteat archive at Yale, setting up a travel fund to help young scholars attend Polanyi-related meetings—all of these efforts have depended upon the energy and financial support of a relatively small society.

The Loyola conference entails certain unavoidable expenses (e.g., renting meeting rooms), as well as costs that enhance the event: (covering expenses for some plenary speakers, registration and travel support for some younger scholars, organizing a trip to the Polanyi archives). As in the past, contributions to offset special conference expenses are something we must solicit and count on. Please send a check to the Treasurer, Dr. Charles Lowney, Dept. of Philosophy, Washington and Lee University, Lexington, VA 24450 (e-mail: **lowneyc@wlu.edu**).

As other earlier announcements in *TAD* indicated, another giving opportunity exists is the new Polanyi Society Endowment Fund, which aims to establish more stable, long-term funding for the Society's activities. The endowment contains about $10,000 at present, and we hope to double that amount in this next year. If you wish to know more about supporting the endowment (and that includes making a bequest), please contact me, since as the current Society president I chair the Endowment Committee (**david.rutledge@furman.edu**). Like last year, we have a challenge open until January 1, 2012 from endowment donors willing to match up to the first $1000 received. Send endowment donations (clearly marked as such) directly to Charles Lowney at the address above. Since the Polanyi Society is an IRS 501C3 organization, donations to the Loyola Conference and/or the endowment above the $35 annual Society membership dues are tax deductible.

David Rutledge
President, Polanyi Society

2012 Polanyi Society Conference

Connections/Disconnections: Polanyi and Contemporary Concerns and Domains of Inquiry

Call For Papers

The Polanyi Society will sponsor a three-day conference June 8-10, 2012. Conference participants will have the opportunity to spend a morning (June 8) at the Regenstein Library of the University of Chicago reviewing the archival Polanyi materials held there. The conference will include several plenary speakers or panels as well as parallel sessions in which conference participants present and discuss papers with others interested in the session's particular topic. Like the Polanyi Society sponsored conferences in 2001 and 2008, this will be a conference that builds in many opportunities for discussion and is open to persons using Polanyi-related ideas in a number of fields.

Proposals are invited for papers that examine the themes of post-critical thought in the context of the new century. The following are some suggested general categories within which specific papers might be grouped. [Please do not think of these categories as a limit for submissions but as a springboard for your own reflections. The final program will reflect groupings adjusted in light of proposals submitted.]

· Polanyi As Public Intellectual: Cultural Criticism and Reorientation in the New Global Order
· Redeeming Reason: Does "Personal Knowledge" Have a Future in a Partisan World?
· Polanyi in the Light of Developments in Psychology (and vice versa)
· Polanyi's Work in Relation to Current Accounts of Organizations, Institutions and Authority
· Doubt and Commitment in the Postmodern Environment
· Religion and Science: Polanyi and Current Discussions
· History and Philosophy of Science: Polanyi and Current Discussions
· Contemporary Politics and Economics in Polanyian Perspective (and vice versa)
· Polanyi and the Rediscovery of Embodiment
· Language, Learning and Logic—Polanyi and Current Discussions
· Trust, Truth and Conscience: Polanyian Communal Values and Contemporary Culture
· The Good Society: Polanyi and Current Challenges
· Pluralism: Does Polanyi Help Us Address Current Interest in and Problems Associated with Diversity?
· Can Polanyi Speak to a Digital Age?
· Resources in Polanyi for Theological Reconstruction in the Face of Fanaticism and Secularism
· Skills, Practice and Virtue—Polanyian Links
· Polanyi on the Importance of the Beautiful
· Polanyi's Antireductionism and the Logic of Emergence
· Proposals for panel presentations are invited

Proposals should be 250-300 words and will be reviewed by a panel of jurors. Send an electronic copy of the proposal without your name on it as an attachment to Phil Mullins at **mullins@missouriwestern.** edu. In the body of the e-mail, provide a preferred mailing address (or fax number) as well a phone number of the author.The initial deadline for receipt of proposals is October 1, 2011 (however, if delivery of the October issue of *TAD* is slow, proposals received in early October will be reviewed in the first round) . If there is space on the program, those who do not submit for the October initial review can submit proposals before the final deadline of March 30, 2012. Priority consideration will be given to proposals considered in the October review. If the proposal is for a panel, the full panel needs to be identified and one member designated as the primary contact. The panel proposal should outline why a discussion of this topic is important. Future issues of *TAD* and a posting on the Polanyi Society web site (http://www.missouriwestern.edu/orgs/polanyi/ or polanyisociety/org) will include additional conference information.

Notes on Contributors

Harry Collins (**CollinsHM@cardiff.ac.uk**) is Distinguished Research Professor of Sociology and Director of the Centre for the Study of Knowledge, Expertise and Science (KES) at Cardiff University and is a past President of the Society for Social Studies of Science. Prizes include the 1997 Bernal prize for social studies of science and the 1995 ASA Merton book prize. He has published sixteen books, and more than 150 papers. The topics are sociology of scientific knowledge, artificial intelligence and, more recently, expertise and tacit knowledge, work now supported by a major European Research Council Advanced Grant.

Stephen G. Henry (**henrstep@umich.edu**) is a primary care physician and research fellow in the Robert Wood Johnson Clinical Scholars program at the University of Michigan. He has published several articles exploring the role of Polanyi's thought and tacit knowing in clinical judgment and medical decision making. His current research focuses on face-to-face communication in medicine, with a particular interest in communication about pain during primary care office visits.

Charles Lowney (**lowneyc@wlu.edu**) received his doctorate from Boston University and is currently at Washington and Lee University in Virginia where his teaching focuses on Wittgenstein and applied ethics. He is primarily interested in the limits of understanding and expression in the analytic tradition and in moral epistemology. Lowney's recent writings on Polanyi include "Re-Thinking the Machine Metaphor since Descartes: The Irreducibility of Bodies, Minds and Meanings" (*Bulletin of Science, Technology and Society*, 31:3, Spring 2011, 179-192) and a series of three papers in *TAD* generally titled "From Science to Spirituality" (36:1, Fall 2009: 42-54; 36:3, Summer 2010: 52-65; 37:1, Fall 2010: 19-38). Lowney is a member of the Polanyi Society Speakers Bureau and is willing to speak at colleges and universities on these and other Polanyi-related topics.

Kyle Takaki (**ktakaki@hawaii.edu**) is a lecturer at Kapiolani Community College and the University of Hawaii at Manoa. He is interested in emergence and complexity across a wide range of disciplines. He completed his Ph.D. at Manoa, working with two faculty who are Deweyans and Polanyians, Ron Bontekoe and Jim Tiles. An earlier essay, "Embodied Knowing: The Tacit Dimension in Johnson and Lakoff, and Merleau-Ponty," appeared in *TAD* 36:2 (2009-2010): 26-39.

A Clinical Perspective on Tacit Knowledge and Its Varieties

Stephen G. Henry

ABSTRACT Key Words: tacit knowing, tacit knowledge, explicit knowledge, Michael Polanyi, Harry Collins *Harry Collins' book* Tacit and Explicit Knowledge *seeks to clarify the concept of tacit knowledge made famous by Michael Polanyi. Collins' tripartite taxonomy of tacit knowledge is explained using illustrative examples from clinical medicine. Collins focuses on distinguishing the kinds of tacit knowledge that can (in principle) be made wholly explicit from the kinds of tacit knowledge that are inescapably tacit. Polanyi's writings, on the other hand, emphasize the process of tacit knowing. Collins' investigation of tacit knowledge makes an important scholarly contribution that is distinct from and complementary to investigations that focus on tacit knowing.*

The term *tacit knowledge* has been used in many scholarly disciplines, but its definition varies widely between (and sometimes within) disciplines.[1] The term *tacit knowledge* itself contributes to this confusion. Polanyi rarely used the phrase *tacit knowledge* in his own writings. He wrote instead about tacit awareness, the tacit dimension, and tacit knowing.[2] So discussion of Polanyi's central intellectual contribution – the tacit dimension – is typically conducted using a term – tacit knowledge – that does not emphasize his focus on the process of knowing. In particular, the term *tacit knowledge*, though it is grammatically less awkward than *tacit knowing*, tends to reinforce the misconception that Polanyi was endorsing some kind of mystical, special knowledge in opposition to explicit knowledge.

This often-ignored distinction between tacit knowing and tacit knowledge is important for understanding Harry Collins' excellent new book, *Tacit and Explicit Knowledge*, in which he tries to clarify confusion about Polanyi's thought and modern debates about tacit knowledge and tacit knowing. Collins (who uses the term *tacit knowledge* throughout his book) has produced an original and important contribution to scholarship on the tacit dimension that should be of great interest to all readers of *Tradition and Discovery*. This book provides a fresh perspective in part because it tackles the subject of tacit knowledge without using Polanyi's own writings as the starting point for discussion. In this review, I shall frequently rely on illustrative examples of tacit knowing and tacit knowledge taken from my own discipline, clinical medicine.

Collins' book is built around three provocative claims. First, he declares that Polanyi himself is partially to blame for the confusion around tacit knowledge. Polanyi's discussion of the tacit dimension in *Personal Knowledge* is not always clear or consistent, and often seems to suggest that the tacit dimension is a mystical or special concept, rather than an unremarkable aspect of everyday human knowing and doing. Second, he argues that tacit knowledge seems problematic or unusual only because of our modern focus on explicit knowledge. Humans know and do countless things every day without worrying about exactly how they know or do them. This fact seems odd only because our society takes for granted that true, scientific knowledge must be wholly explicit. As a result, scholars often misinterpret the existence of tacit knowledge as a residual nuisance rather than an indispensible component of human knowledge. Finally, Collins claims that scholarship on tacit knowledge has been hindered by the mistaken assumption that "understanding human experience is the route to understanding knowledge" (6). The resulting focus on human perception and embodiment obscures important features of tacit knowledge. In other words, Collins argues that we should focus more on tacit *knowledge* and less on tacit *knowing*.

Collins devotes the first half of his book to the concept of strings. A string is any physical object with some kind of pattern inscribed on it, such as a photograph (patterns of ink on paper) or spoken words (patterns of compressed air). Strings transmit information through physical contact, through which patterns are transformed from one medium to another (e.g, transformation of electrical currents into patterns of pixels on a computer screen). Collins takes pains to distinguish string transformation from language translation, which always requires human interpretation (and so by extension access to tacit knowledge). Collins also distinguishes digital strings from analog strings. The information in digital strings can (at least theoretically) be broken down into a set of explicit steps or patterns without any loss of information. In contrast, transmission and interpretation of analog strings depends partly on their physical properties. The patterns in analog strings always require some social knowledge or understanding that "affords" their interpretation in one way rather than another. Knowledge can be made wholly explicit only if it can be transmitted as a digital string.

Collins' detailed, painstaking definitions (e.g., eight different meanings of *cannot*) pay off in the second part of the book, where he proposes a taxonomy of tacit knowledge. He divides tacit knowledge into three distinct categories.

(1) Relational tacit knowledge comprises knowledge that is tacit only because of contingent features relating to interpersonal interaction or attention. A doctor seeing a patient for a rash may not explicitly recognize that his patient is annoyed, because he is behind schedule and is focused on getting to his next patient. This knowledge could have been made explicit if the doctor had merely more paid attention to the patient's emotional state or if the patient had voiced her annoyance at being kept waiting past her scheduled appointment time.

(2) Somatic tacit knowledge comprises knowledge that is tacit because of the human body's physical properties or limitations. Suppose that the presence or absence of this patient's rash depends on two factors: subtle changes in body temperature and small fluctuations in serum antibody concentrations. The patient will be unable to tell the doctor exactly when her rash started or how it has changed over time. This is because a) human memory is fallible, b) humans have a limited ability to perceive subtle changes in their peripheral body temperature, and c) humans have no ability to perceive changes in their serum antibody concentrations. Doctors might, however, construct a sophisticated machine to continuously measure antibody concentrations, body temperature, and the presence or absence of skin rashes. Such a machine could make explicit the knowledge of how the patient's rash changes over time and perhaps even lead to a mathematical equation that predicts her rash based on body temperature and antibody concentrations. Somatic tacit knowledge, like relational tacit knowledge, is not mystical and can be made explicit in principle (e.g., through the construction of a temperature-and-antibody-measuring machine).

(3) Finally, collective tacit knowledge comprises knowledge that is tacit because it depends on social and cultural judgments that depend on context and so cannot be generalized in explicit terms (i.e., transformed into digital strings). A decision algorithm for diagnosing a rash, for example, always presupposes a wealth of collective tacit knowledge that cannot be made explicit. The diagnostic algorithm takes for granted that the rash is troublesome enough for the patient to seek formal medical advice (a threshold that varies across cultures), that the doctor is able to distinguish among rashes, bruises, and burns and so consult the proper diagnostic algorithm, that the doctor has training that allows him to interpret the algorithm, and so on. Collins convincingly argues that collective tacit knowledge can never be made wholly explicit, even with the help of massive supercomputers or armies of researchers. Collective tacit knowledge is typically required for processes (such as bicycles or temperature-and-antibody-measuring machines) to operate successfully within

human society. For example, our hypothetical temperature-and-antibody-measuring machine could only work reliably for a rash that always had the same color and appeared at the same anatomical location. Few rashes are so predictable in the real world. Even with sophisticated optical technology, it is probably not possible to construct a machine that could reliably identify a rash that appeared and disappeared in different shapes and on different parts of the body. Nor could a machine reliably identify the rash when the patient was sunburned, or if the rash periodically changed colors. A human with access to collective tacit knowledge would probably need to tell the machine when the rash appeared and disappeared in order for it to work properly. Collective tacit knowledge, however, is just another kind of everyday human knowledge. Humans can typically identify a rash on their skin without a second thought. Rash identification only seems difficult when one tries to build a machine that can do the job as well as humans can.

I know of only one other published attempt to develop a taxonomy of tacit knowledge,[3] so Collins' tripartite classification of tacit knowledge is an important and welcome contribution to Polanyi scholarship. I agree with Collins that Polanyi's own descriptions of tacit knowing are not always entirely clear. For example, in *Personal Knowledge* Polanyi contrasts tacit vs. explicit awareness, focal vs. subsidiary attention, and articulable vs. inarticulable knowledge, but he never explains exactly how these different pairings relate to one another. Polanyi's later writings did clarify some of the ambiguities in *Personal Knowledge,* and his thinking did evolve over the course of his career. Nevertheless, ambiguity remained, as evidenced by important disagreements about Polanyi's philosophy among many of his closest collaborators.[4, 5]

A major goal of the tripartite taxonomy of tacit knowledge set out in *Tacit and Explicit Knowledge* is to distinguish the kinds of knowledge that can (at least theoretically) be made explicit from the kinds of knowledge that cannot. Most of Collins' arguments are oriented to the artificial intelligence community and to debates about the degree to which computers can approximate human cognitive processes and expertise. He draws a line between relational and somatic tacit knowledge on one side, which can always be made explicit (at least theoretically), and collective tacit knowledge on the other, which cannot.

One practical test of Collins' taxonomy is whether scholars in different fields find it a useful framework for working out the implications of tacit knowledge to their own disciplines. For example, doctors and patients typically reach decisions about diagnosis and treatment during face-to-face interactions. When reaching these decisions, both parties depend on explicit and tacit knowledge to reach optimal decisions. Identifying circumstances during which reliance on tacit knowledge leads to better or worse medical decisions might eventually be used to improve medical care.[6] As a modest first step, I recently attempted to make explicit some aspects of tacit knowing in clinical medicine. In this study, doctors and patients were video-recorded during routine office visits and were subsequently interviewed about their thoughts and actions using the video-recording as an elicitation device. My colleagues and I analyzed these interviews for evidence that study participants relied on tacit knowing when reaching medical decisions.[7]

I found that Collins' taxonomy was a useful way to think about the study's findings, though the study was mostly finished before I read his book. The majority of patients' and doctors' comments involved relational tacit knowledge; that is, knowledge that patients and doctors merely failed to notice during the visit. Several patients, for example, explicitly recognized aspects of their own communication styles for the first time. Other comments might relate to somatic tacit knowledge. A few doctors mentioned that they adjusted their tone of voice to fit the topic of discussion and patients' needs. Although ratings of doctors' tone of voice have been associated with patient satisfaction in other studies, patients in our study rarely mentioned the doctor's

tone of voice. Collins might consider tone of voice an example of somatic tacit knowledge. Humans have difficulty focusing on multiple cognitive tasks at once, so during clinic visits, patients may not be able to notice changes in voice tone at the same time that they are talking to the doctor and remembering details of their physical symptoms. Finally, some comments from the study participants seemed to indicate collective tacit knowledge. One patient related that she was satisfied with her doctor because he was much kinder than her previous doctor. This kind of judgment requires sophisticated collective tacit knowledge about what counts as kind behavior for doctors. Study participants did, therefore, seem able to recognize explicitly some judgments that required access to collective tacit knowledge. Collins' taxonomy does make it clear, however, that it would be impossible to derive a universal, explicit rule for judgments that require collective tacit knowledge (e.g., a formula for predicting patients' satisfaction with their doctors). Readers of *Tradition and Discovery* will not need Collins' book to convince them of this conclusion. Many otherwise intelligent people who work in health care, however, still seem to act as if medical technology could (and should) one day replace (rather than merely complement) the human practice of clinical judgment. For these people, Collins' book provides an argument that is helpful for distinguishing realistic applications of technology from science fiction.

I have few complaints about *Tacit and Explicit Knowledge*. I do wish that Collins had given the reader more context for his argument in the first half of the book. In particular, his discussion about strings and string transformation relies almost entirely on his own previous work and gives the impression that he developed the concept single-handedly. His discussion of strings would have been stronger if he had discussed how his definition related to or built upon the concept of strings used in computer science. In addition, I was curious as to whether Collins' definition of strings has been taken up by other scholars in the fields of artificial intelligence and information science.

Finally, while Collins does show the importance of distinguishing between the content of knowledge and the process of knowing, he seems to dismiss the focus on knowing as misguided or unhelpful. However, these two perspectives are complementary and both are important for answering different questions. Whether knowledge is tacit or explicit ultimately depends not on its content, but on how it functions for the people who interpret and rely on it.[8] Polanyi's central motivation was to explain the processes of problem solving and scientific discovery, which is why he typically wrote about *tacit knowing* and the *tacit dimension* rather than *tacit knowledge*. In contrast, Collins is tackling a question that was secondary to Polanyi's intellectual program: which aspects of the tacit dimension can be made explicit under the right circumstances, and which cannot? This question requires a focus on knowledge rather than knowing and is central to problems about artificial intelligence. It is a much less important question, however, when trying to understand how doctors and patients make use of knowledge to reach medical decisions. Collins himself notes that the doctor evaluating the rash cannot distinguish between relational, somatic, and collective tacit knowledge, because he experiences all three categories of tacit knowledge in the same way.

Overall, however, these are minor criticisms of an important book. Collins has provided a fresh and practical perspective on tacit knowledge that has the potential to help scholars in other disciplines (such as clinical medicine) think more carefully and clearly about the nature of human knowledge. Collins leaves the door open for others to build on or even improve his taxonomy. He notes that many problems relating to tacit knowing and knowledge remain unsolved, and that the boundaries between relational, somatic, and collective tacit knowledge are not always clear or fixed. These categories can still, however, do much to clear away the thicket of misunderstanding that has grown up around tacit knowledge and tacit knowing. Polanyi was

undisputedly a brilliant and original thinker, but his own writings do not always provide clear or definitive answers to the many questions and problems he tackled during his life. Collins' book builds on and extends aspects of Polanyi's intellectual program by focusing on questions about knowledge to which Polanyi gave relatively less attention. As a result, I expect that *Tacit and Explicit Knowledge* will have a significant impact on future debates about the tacit dimension for years to come.

Endnotes

[1]Véronique Ambrosini and Cliff Bowman, "Tacit Knowledge: Some Suggestions for Operationalization," *Journal of Management Studies* 38:6 (2001): 811-829.

[2]Stephen Gourlay, "Knowing as Semiosis: Steps towards a Reconceptualization of 'Tacit Knowledge'" in Tsoukas H. and N. Mylonopoulos, editors, *Organizations as Knowledge Systems: Knowledge, Learning and Dynamic Capabilities* (New York: Palgrave MacMillan, 2004), 86-105.

[3]Carl Bereiter and Marlene Scardamalia, *Surpassing Ourselves: An Inquiry into the Nature and Implications of Expertise* (Chicago: Open Court, 1993).

[4]Marjorie Grene, "Tacit Knowing: Grounds for a Revolution in Philosophy," *Journal of the British Society for Phenomenology* 8 (1977):164-71.

[5]Phil Mullins and Marty Moleski, "Harry Prosch: A Memorial Re-appraisal of the *Meaning* Controversy," *Tradition and Discovery* 32:2 (2005-2006): 8-23.

[6]Stephen G. Henry, "Polanyi's Tacit Knowing and the Relevance of Epistemology to Clinical Medicine," *Journal of Evaluation in Clinical Practice*, 16:1 (2010): 292-7.

[7]Stephen G. Henry, Jane H. Forman, and Michael D. Fetters, "'How Do You Know What Aunt Martha Looks Like?' A Video Elicitation Study Exploring Tacit Clues in Doctor-Patient Interactions," *Journal of Evaluation in Clinical Practice*, 2011 [in press].

[8]Grene, *op. cit.*

Ineffable, Tacit, Explicable and Explicit: Qualifying Knowledge in the Age of "Intelligent" Machines

Charles Lowney

ABSTRACT Key Words: tacit knowledge, tacit knowing, Polanyi, Collins, string transformation, semantics, artificial intelligence, emergence, dualism, *phronesis*

Harry Collins' Tacit and Explicit Knowledge *is engaged to clarify and expand the notions of* tacit *and* explicit*. A broader continuum for tacit knowledge and its indirectly or only partially explicable components is provided by complementing Collins' exposition of* tacit knowledge *with a discussion of formal systems and Polanyi's exposition of* tacit knowing*. Support is provided for Collins' distinction between strings and language, mechanical modeling as a form of explication, and the notion that machines lack tacit knowledge and language. While Collins emphasizes the inexplicability of cultural fluency as tacit knowledge, Polanyi emphasizes the functional dimension of skillful performances. The conceptual strengths and weaknesses of Collins' and Polanyi's approaches are examined. Collins' emphasis on string transformation and his division of tacit knowing into Relational (RTK), Somatic (STK), and Collective (CTK) are helpful tools, but should not flatten Polanyi's multiple levels of knowing and being into a dualism that may encourage reductionism.*

Since Michael Polanyi coined the term, "tacit knowledge" has been understood and applied in many different ways. As a trained sociologist and seasoned explorer of the tacit dimension, Harry Collins, in *Tacit and Explicit Knowledge*, takes on the difficult task of more clearly defining and better understanding tacit knowledge.[1] He attempts to correct uses of the term that might misdirect us and attempts to show us the heart of the truly tacit by emphasizing its presence in cultural knowledge and linguistic fluency.

In crafting his distinctions, Collins takes inspiration from both Polanyi and the later Wittgenstein. Collins' approach reduces the mystery involved in bodily performances and the mastering of a craft, but he also increases the mystery involved in how innovative social adaptations take place. In contrast, Polanyi's approach would keep some of the mystery all the way through and Wittgenstein would like to see all the mystery dissolve.

In providing his new map of the conceptual territory, Collins shows us a different perspective that highlights some important features of the landscape, but other important features become shadowed. Collins crafts a sharper distinction between the domain of mechanical causation and meaningful interpretation than Polanyi does, but Collins may make too sharp a distinction between the sort of tacit knowledge that a boxer or a master craftsman might use and the linguistic fluency that allows us to adjust to new social situations.

Collins' approach to tacit knowledge is especially helpful in adding clarity to the discussion about how we should think about computers and artificial intelligence; he shows what humans can do and what computers and most animals cannot. He also provides magnificent examples, such as driving in China, that show how more than one sort of tacit knowledge is typically involved in any tacit-dependent activity. But Collins' analysis of the tacit is also incomplete in what might be a dangerous way for some of his own conclusions.

Collins makes advances on Polanyi in understanding certain aspects of tacit knowledge, rekindling Aristotle's own approach to practical wisdom in the process, but he should perhaps be more Polanyian in developing

a general conception of the tacit. A study of tacit *knowledge* is incomplete without proper attention to the process of tacit *knowing* that Polanyi emphasizes. Attention to those processes more clearly opens an area for the tacit that lies in between the ineffable and the explicit, and shows how knowledge must be personal in Polanyi's sense of the term.

Problems with "Tacit Knowledge"

There are several different sorts of activities that involve what we, as intelligent members of our language community, would normally be inclined to call "tacit." Riding a bike, for instance, is something many of us can do, but we cannot say *how*. Mastering an art or craft is also said to involve tacit knowledge; to learn what the expert knows and develop a similar level of skill one typically needs more than an instruction manual. Even the ability to understand a joke requires tacit knowledge, so unless we have a similar set of background experiences we might not get the punch line or might not be in a position to judge if the joke is funny. Having the right sort of experience or background knowledge to perform these skills or to have the right understanding is the sort of thing we'd identify as having tacit knowledge.

Collins quotes Polanyi, who famously said "we can know more than we can tell" (TEK, 4; TD, 4), and who also made the stronger claim that "all knowledge is *either tacit* or *rooted in tacit knowledge*" (TEK, 6; KB, 195). The experience of tacit knowledge is now so commonly recognized that Collins believes there are people who would deny the existence of explicit knowledge. Collins says, and Polanyi would agree, that the explicit does not get entirely swallowed up by the tacit. "Polanyi's very formulation shows that a distinction between tacit and explicit has to be preserved, though it doesn't show us exactly where the distinction lies or how it works" (TEK, 6). Collins does an excellent job helping us to see where an important distinction lies, but Polanyi is still better about showing how it works.

There would appear to be problems with any formulation of tacit knowledge, be it Collins' or Polanyi's. First of all, to a critical reader, the term itself can appear to be an oxymoron. Isn't all *knowledge* necessarily explicit? If something is not explicit but somehow veiled in silence, can it properly be called "tacit *knowledge*"? There is a second problem as well. If tacit knowledge, somehow operative in the background, can be made explicit, can it then properly be called "*tacit* knowledge"? Isn't the term merely a placeholder for something unknown that, we hope, will someday become known? Putting both these problems together, "tacit knowledge" seems to present a dilemma: either it is tacit or it is knowledge, but not both.

Though neither Collins nor Polanyi formulate the problem in quite this manner, we can see that Collins' way of moving past this dilemma involves separating knowledge from our contingent experience of coming to know and restricting what we should properly call tacit. Polanyi gets past this dilemma by emphasizing intentional awareness and the functional nature of what he called "tacit inference."[2] I'll explain what I mean by that later, since I think it shows an important part of the landscape that Collins colors over, but first l will look more closely at how Collins approaches these problems and the insights he draws.

Collins begins mainly by addressing the second horn of the dilemma. He agrees with Polanyi that "tacit knowledge" is not merely a way station on the road to explicit knowledge.[3] For Collins, the *proper* use of the word tacit, directly *opposes* the explicit—it is that which *cannot* in a strong sense become explicit.[4] Background knowledge and bodily skills that can become explicit are "explicable" and therefore are not properly called "tacit" for Collins. So riding a bike or mastering a craft are not, in the end, proper examples of tacit knowledge, although the experience we have when we ride a bike, drive a car, or learn how to make a good pair of shoes can fool us into thinking those tasks are inexplicable.

In crafting this hard line, Collins is by no means indiscriminant. When he says the tacit "cannot" be "explicable," he will provide eight different grades of "cannot" ranging from inconvenient to impossible (TEK, 89) and he will give four different ways that something unknown or unrecognized might become "explicated" (TEK, 81).[5] Yet in spite of the variation in scales, Collins still wants to keep this hard line between (1) the tacit as inexplicable, and (2) the explicit, which includes the explicated and, ultimately, the explicable.

The danger here is that Collins may lose any firm footholds on the ground in between the inexplicable and the explicit. Without a robust conception of this in-between ground, the tacit runs the risk of collapsing into the ineffable, i.e., that which cannot, in the strongest sense, be put into words or modeled. This is ultimately the mistake I see Wittgenstein making: he pushes the tacit into the ineffable, and then the ineffable drops out as a supplementary nothing or nonsense. When Wittgenstein asks, "what does imponderable evidence *accomplish*?",[6] we can read "imponderable evidence" as "tacit knowledge," and his implicit answer is "nothing," it is an idle wheel.[7]

Pushing the "properly" tacit too much together with the ineffable, can lead to the results I called "dangerous." If the ineffable comes to look like nonsense, the safer bet is that all knowledge is explicable, though some sorts are more complex to untangle than others. Inexplicable social meaning drops out as ineffable nonsense and we are left with a reduction to causal and mechanical transformations in the physical world.[8] Thus by aligning the tacit with the ineffable, the very things that define us as human for Collins are at risk. In contrast, I see a need to distinguish between (1) **the ineffable**, i.e., the tacit which cannot be made explicit; (2) **the tacit**, which can be made (a) indirectly explicit or (b) inexhaustibly explicit; (3) **the explicable**, i.e., the tacit that can be made completely explicit; and (4) **the explicit**.[9] Polanyi's exposition of tacit knowing also provides this same spectrum and secures the ground between ineffable and explicit knowledge, as I'll show later.

Although it is in tension with the strong distinction carved out in part one, Collins will allow for the use of the word "tacit" to modify that which is explicable, if it has not yet become explicit. Ordinary language use seems to force his hand here. But, in another way, Collins welcomes this use, since this concession also allows him to build his "three phase model." He separates Relational Tacit Knowledge (RTK), e.g., learning the skill of a master craftsman; Somatic Tacit Knowledge (STK), e.g., riding a bike; and Collective Tacit Knowledge (CTK), e.g., knowing when it is appropriate to laugh at a joke. Collins rank-orders these phases on a scale ranging from easiest to explicate (RTK), to more difficult (STK) or impossible to explicate (CTK). But ultimately, for Collins, both STK and RTK are, in principle, explicable, so without a use for "tacit" as that which may *become* explicit, there would be no relational or somatic tacit knowledge *per se*. Only collective tacit knowledge would remain. Collins thus widens his use of "tacit" to include the explic*able*, but he will occasionally remind us that the proper understanding of tacit comes from its contrast with the paradigmatically explicit.

Making It Explicit

And what is the paradigmatically explicit? According to Collins, the notion that most knowledge is explicit or explicable only came into prominence in the mid-20th century. Collins says that "the enthusiasm for science and computing typical of the 1940s and 50s made the explication of everything seem easy" (TEK, 7). Before then, Collins notes, it was taken for granted that most people could not explain very well how they knew things. Collins here is indirectly describing the movement in thought that flowered in analytic philosophy and gave it its dominance in the philosophy of science. This, indeed, is the right place to look for paradigmatic

efforts at making knowledge fully explicit, but fleshing out the history here will show where Collins may be a bit unsteady in recognizing the implications of the hard-line distinction he forges.

In Collins' insightful conceptual analysis of explicit knowledge, the key distinction is between *strings* and *language*. Strings are "bits of stuff inscribed with patterns" (TEK, 9) such as the dark spots on this page we call letters. They are metaphysically continuous with physical causes and effects (TEK, 10, 50). Language, in contrast, takes place with the interpretation of those marks.

Strings can undergo physical transformations. If you read this sentence aloud, someone in the room might hear the vibrations in the air, i.e., the string is transformed from dark marks on a white background to a pattern of vibrations. But in order to understand that spoken sentence the person also must have language, i.e., the ability to interpret the string into meanings.

Strings of signs must be interpreted in order to be language. As Collins notes, "This book in itself contains strings, not language; therefore it does not in itself contain knowledge" (TEK, 45). The conditions that help allow strings to communicate meanings can include the length of the string (e.g., more words might be required for a fuller explanation), the affordances of the medium (e.g., intonations are possible with spoken words that are not easily achieved in a printed medium), and certain transformations in the receiver (one might transform one's own "string" or affordances, e.g., brain structure, to become capable of interpreting different configurations or sorts of strings).[10] String transformations allow for the explicit communication of knowledge where it is not at first present.

Collins' four senses of explication thus center around what we can do with strings. Knowledge can be made explicit 1) by "elaboration," i.e., providing a longer string; 2) by "transformation," e.g., translating a secret code (one string) into English words (another string); 3) by "mechanization," e.g., modeling human activities (one string) with a machine (another string); and 4) by "explanation," i.e., transforming "mechanical causes and effects" into "strings called scientific explanations" (TEK, 81).

Explicit knowledge according to Collins should be defined as "knowledge that can, to some extent, be transferred by the use of strings in the right circumstances" (TEK, 80) and the right circumstances are outlined by his five enabling conditions (TEK, 31).[11] Given the way knowledge is communicated by strings, explicable knowledge becomes, for Collins, unknown or unrecognized knowledge in one string or sequence of causal chains that can be transformed into a string that we can interpret. (And here, of course, there is an assumption that there is a continuity in how the original string *should be* interpreted and how the resulting transformed and possibly expanded string is interpreted.) Tacit knowledge, according to Collins, is thus knowledge that cannot be transformed into an interpretable string.

In short, according to Collins, if we can represent knowledge, or a *knowing how*, in a string, e.g., if we can write it down, then it is explicit, and if we cannot then it is tacit. And there are "three main kinds of reason for not being able to write things down" corresponding to RTK, STK and CTK (TEK, 80). But we must continue to keep in mind that without an interpreter, such transformations bear no meanings and convey no knowledge; they are strictly in the domain of material cause and effect.

When Collins looks to computer programming for the distinction between string transformations and translations, or interpretations, he is on the mark (TEK, 16). We can see this clearly, and perhaps further sharpen the notion of a string and explicit knowledge, by looking at the history of analytic philosophy. The distinction Collins charts between strings and language can be found in mathematical logic as the difference between "syntax," i.e., the concatenation of signs and the rules for transforming them, and "semantics," i.e., how those signs may be interpreted. Work in mathematical logic eventually led to the Turing machine and

to the invention of the computer, so we see Collins is on tack. Early on in the history of logic, with Gottlob Frege in the 1890s, syntax was seen as setting up basic conditions for meaningfulness, but by the 1930s syntax became completely divorced from meaning and takes on the character of Collins' strings. Syntax no longer described the role of concepts and objects (e.g., subjects, verbs, adjectives, etc.) but simply the material signs and their transformations.[12]

The mathematical-logical tradition, reaching back to Frege and passing through Wittgenstein, emphasized the idea that knowledge becomes fully explicit when we can translate ordinary sentences, or sentences from various scientific fields, into a formal language or system. Transformed into that language, those sentences were now seen as unambiguously distinct propositions that are capable of being judged true or false, but they were also knowledge, rather than merely meaningful statements, if proofs leading to them could be derived from basic, true assumptions. In the analytic tradition, presenting a full analysis, or proof, in a formal system is the paradigm case of making knowledge fully explicit.

In this model of explanation, there are two notions of making *explicit* at work that should be distinguished, and a third fundamental underlying notion that is necessarily involved in making either of those two phases explicit *knowledge*.

First, there is making explicit via (1) a transformation or translation into a formal system, i.e., the transformation of one string into another string that can be further transformed or manipulated mechanically by explicit rules. This first transformation qualifies as a translation because the new string/series of signs affords an *interpretation*. And, second, there is making explicit via (2) the production of a proof inside that formal system, i.e., the manipulation of the signs by explicit rules, which can show the reduction of postulates to basic axioms, or more generally, show the analysis of knowledge to simpler parts and rules that fully account for them. It is important to note that strings embed this reduction of meaningful wholes to basic parts, so the reduction or analysis that constitutes the proof takes place on the same metaphysical plane as strings and things. The translation is fixed in the system, so the primary task of making knowledge explicit in sense two here is no longer to provide a translation into a formal language but to provide a reduction or proof within that language.

So tacit knowledge, in contrast to explicit knowledge, might be (in sense 1) identified with an inability to transform knowledge into an interpretable string (this comes to be Collins' explicit definition of tacit knowledge) or it might be (in sense 2) identified with an inability to analyze some piece of knowledge, or whole, to its parts (and this is the sense Collins comes to use in distinguishing between RTK and STK on one side and CTK on the other). Both (1) transformation into a formal system of signs,[13] e.g., putting something into words and (2) manipulations of signs into a proof, e.g., providing an explanation, are involved in making knowledge *fully* explicit, but only (3) the contrast between strings and language, is required for a basic sense of tacit, and neither (1) the explicit transformation into a string nor (2) the explicit proof, can be *knowledge* without (3) an interpretation. Thus in the analytic tradition there is a strong distinction between proof, as a syntactic notion (characterized by strings and their transformations), and truth, as a semantic notion (characterized by interpretations). And the fundamental notion of the tacit one should garner from the strings *v*. language distinction derives from sense three (3), *how background information is used by a person to give the signs-strings their explicit or focal meaning*. As Polanyi says,

> . . . nothing that is said, written, or printed, can ever mean anything in itself: for it is only a *person* who utters something—or who listens to it or reads it—who can mean something *by* it. All these semantic functions are the tacit operations of a person (SM, 22).

Collins worries, with good reason, that the distinction between strings and language is too often confounded (TEK, 27). And when it is, we mistake animal behavior and artificial intelligence for meaningful

behavior and human knowledge. Failure to recognize the distinction can make it seem as though causal processes are inherently meaning-laden and detracts from the importance of the distinction between the strings as material and language as social. Polanyi will also stress disjunctive space between the physical or physiological and the social, but his approach, as we'll see, allows for senses in which some mechanistic processes do possess meaning.[14]

But because we so automatically interpret strings, it is also very easy to let the meaning-making and meaning-identifying process submerge into the tacit background and then to see the tacit *v.* explicit solely in terms of (1) whether or not a transformation of one type of string into another is possible or (2) whether or not the presentation of a formal proof or a reduction to constituent parts—at the level of signs, strings and things—is possible. And this tendency seems to be what pushes human productive skills closer to STK for Collins, when by virtue of a stronger share in artifactual and linguistic meanings, they may be closer to CTK.

Because of this emphasis on string transformation, Collins will sometimes inadvertently make a necessary condition for explicit knowledge, i.e., transformation into a string, into a sufficient condition.[15] So whereas the force of the string-transformation *v*. meaning-interpretation distinction should inspire Collins to agree with Polanyi's contention that "wholly explicit knowledge is unthinkable" (KB, 144), Collins dissents, suggesting instead that fully explicit knowledge without a tacit underpinning is a matter of course. He will identify "explicit knowledge without tacit knowledge" with "string transformation" (TEK, 70). Collins thus feels the need to "fix" Polanyi's formulation by saying "strings must be interpreted before they are meaningful" (TEK, 70). True enough, but strings also must be interpreted before they are *knowledge*; there is no truth without semantics. String transformation alone does not make for explicit knowledge, just as the strings of signs in his book would not become knowledge if they were merely read aloud.

Focusing on (3) strings *v.* language shows us that there is always an element of the tacit in any meaning construction or meaning interpretation; the explicit signs are not knowledge without it. But the impetus of the second sense (fully analyzable in a proof *v.* irreducible) is what pushes Collins to sometimes suggest that the properly tacit is present only in creative adaptations marked by fluency rather than in *any* meaning event. The true home of the tacit is in how explicit meanings are produced and identified. This sense underpins the mundane use of language in at least RTK and CTK; innovating with language in CTK is a further sort of activity that also relies on tacit knowing.

Collins' emphasis on making something explicit by transforming one string into another is a result of his insight that an ability to model an animal process of "knowing how" (one string) into a mechanical model (another string) is a form of explication (i.e., his third sense, "mechanization"). But insofar as Collins is right not to call unknown or unrecognized mechanical processes "tacit knowledge" but instead "the way the world unfolds" (TEK, 80), so it is wrong to call any purely mechanical processes, i.e., mere string transformations, "explicit knowledge." That, too, is just the way the world unfolds, unless meanings are involved.

How mechanical modeling can make somatic functions explicit, and what makes us distinctively human, are the topics of the next section.

What Computers (and Most Animals) Can't Do *or* Why Data Can't Dance

Collins draws important lessons from this sharp divide between strings and things on one side, and interpretations and meanings on the other. He makes it clear why computers and more complex AI machines

cannot understand in terms of meanings the way that humans do. The answer is basically that humans can operate with tacit knowledge (CTK) and most animals (if not all, for Collins) and all machines (made to date) cannot operate with tacit knowledge (TEK, 116). As Collins says, "The computer does not really 'read' anything except in a metaphorical sense; what it does is string transformation" (TEK, 54). Likewise, unconscious performances, i.e., the "knowing how" common to humans and most animals, are seen by Collins as mechanical and, in contrast to the properly tacit, explicable.

The complaint Collins lodges against those who see calculators and computers as performing acts of intelligence is apt and important. I see it as a re-incarnation and expansion of the complaint that Frege lodged against the mathematical formalists in the 19th century. Frege claimed that without the mathematical meanings of the signs, i.e., the semantics, symbol manipulation is just a hollow game of transformation, and it may run off in directions that do not increase our understanding of the meaningful content we are interested in. In effect, Frege argued that syntax should be tethered to semantics. To use Collins' language, Frege saw that these formalists were unwittingly engaged in "social prosthesis" when they saw the mechanical game of transforming signs as mathematics proper. Without the interpretation, there is no intelligent understanding and no knowledge; without the interpreter—and this must be a human interpreter or a very similar sort of animal for Collins—there are only physical transformations.

Although we can train bodies to accomplish tasks without conscious thought, Somatic Tacit Knowledge can in principle be mechanically modeled. Just as we can build a machine that can simulate riding a bike, we might even build a machine that could play soccer (TEK, 112). Performing such skills is explicable for Collins, not only because we can describe how they are done abstractly in scientific terms (i.e., his sense four explication)[16] but also because we can build a machine that can perform the same tasks (i.e., his sense three explication).

This keen insight regarding mechanical modeling is substantiated by the development of the notion of a formal system in mathematical logic. We saw that presenting an analysis, or proof, in a formal system is the paradigm case of making knowledge fully explicit. Proofs in a system are seen as a series of transformations from one set of sentences (premises) to another (conclusion).[17] Also, around the 1930s with Gödel's famous proofs on completeness, proof came to be more sharply identified with mere *mechanical* transformation. Syntactically, signs came to be seen as mere marks, and transformation rules tell us how to manipulate these marks mechanically. This sense of proof lends force to Collins' notion that if one can model a so-called tacit process, e.g., an animal hunting or a person riding a bike, mechanically, then one has made that process fully explicit. By modeling the process mechanically, one is (1) transforming the string into a formal language of sorts and (2) obtaining the right conclusion, e.g., the machine catches the prey, balances the bike, or plays soccer.

We have the sense, Collins says, that once a process has been mimicked by a machine it has been explicated and made explicit (TEK, 51). This sense comes not only from the idea that "mechanical causes and effects are made of the same metaphysical substance as string transformations" as Collins states (TEK, 51). Mechanical modeling in a machine is an explication both because strings and machines are of the same basic stuff *and* because we have explicated the process in a way analogical (or stronger) to the way we might explicate a causal process in a scientific theory. This is explication because we interpret that mechanical model as a formal language in which the process has been successfully embedded, and the working mechanical model acts as a syntactic proof.

Our ability to use tacit knowledge is often seen as something we share in common with animals, Polanyi, too, stresses the tacit powers of animals and infants (PK, 132). But for Collins this is a common misunderstanding; tacit knowledge is what makes us distinctively human. For Collins, human and animal

bodies are basically machines and their tacit performances can in principle become fully explicit. He sees it as misleading to focus on somatic processes as good examples of tacit knowledge because then we confound mere strings together with human meanings. Cutting the other way, this can also make human meanings come to look like mere strings. Focus on the somatic as properly tacit leads us to push humans and animals together too closely and also leads us to push humans and computers together too closely. Protecting what is distinctly human is the impetus of what Collins calls his "main project… to demote the body and promote society in the understanding of the nature of knowledge" (TEK, 8).

The difference between an animal body, a human body, and a machine for Collins lies mainly in the affordances of the medium. The body and brain are flesh and cells; a computer can be metal and silicone, but although the affordances of one are different than another, both are, or can be translated into, an interpretable string. Just as an analogue string can in principle be transformed into a digital string (TEK, 49), so the functions of the brain can be reduced to a digital computer. So while Hubert Dreyfus emphasizes the affordances of the human body as that which makes us distinct from the computers and AI machines we can build (TEK, 107, 167), Collins sees this as a mere logistic or practical problem rather than a principled difference (TEK, 50). The strings that human affordances can accommodate are in principle capable of being accommodated in a different medium, though logistically another medium might requires strings so very long that it would be impractical to construct such a machine.

Collins puts the notion that a computer, or a body, is merely a string transformer and not a string interpreter at the forefront of any discussion about the differences between mind and machine, or between humans and animals. Even "neural nets," machines that are programmed to learn, do so in a fashion that is mechanical in the same way that operant conditioning is mechanical (TEK, 74-75).

In contrast, understanding meanings requires tacit knowledge because there is no sufficient mechanical procedure for successfully interpreting meanings. A lookup table mechanically tells how one string should be transformed into another by, for example, equating a series of written marks with a series of vibrations in the air, thus transforming a written word/string into a spoken word/string. But as Collins says, "though strings are sometimes used to represent meanings, their relationship to meanings cannot be stabilized with lookup tables in the way that the relationship between one string and another can be stabilized" (TEK, 44).

The distinction between mechanical transformation and meaningful interpretation also leads Collins to a criterion, adopted from John Searle's Chinese Room scenario (TEK, 129-130), for when an artificial intelligence, or an animal, might legitimately be said to employ tacit knowledge: when it can fluently respond to the right *language* input with the right *language* output.[18] When it employs a skill that goes beyond what using a look up table or following some mechanical algorithm can provide, it will be more than a machine.[19] To extend Collins' example from *Star Trek: The Next Generation*, a machine will have real intelligence and use tacit knowledge when Data can dance; until there is fluency and innovation, we must assume that what we witness is string transformation and mechanical manipulation rather than interpretation.

The distinction between strings and their interpretations distinguishes between machines and most animals on one side, and humans as language speakers on the other. We have the ability to understand signs as meaningful and to artfully interpret a string beyond what a machine or a body can do via something like a look up table, operant conditioning, or other rules of transformation. The construction and interpretation of meaning is thus the true mark of the tacit for Collins as well as Polanyi. Interpretation takes place in language, and language is indeed social not only in genesis but in significance. Collins is thus on tack with an emphasis on the string *v.* language distinction and with an emphasis on collective tacit knowledge as special and distinct from somatic and relational knowledge, but some aspects of the tacit get obscured in his approach.

Relational and Somatic *v.* Collective Tacit Knowledge

Collins is sensitive to many of Wittgenstein's insights including the role of social practices in language, the idea that there can be no private language, and the realization that a word may be used in multiple ways via different language games. He also sees how Wittgenstein's discussion about rule following can exemplify the sort of knowing that cannot be made explicit (TEK, 46 fn #15; Lowney, 2009, 43). Formulating a general conception of the tacit, however, is a very un-Wittgensteinian task. Wittgenstein might say there is a family resemblance between the many uses of "tacit knowledge" and leave it at that. To attempt a rigorous definition and come to a general understanding will inevitably invite some relatives to the party and disown others.

Wittgenstein's main technique in the *Philosophical Investigations* is to juxtapose different examples of how we use, or might use, a word. In providing his examples, however, Wittgenstein has a very different purpose in mind than either Polanyi or Collins. As we start to think about different uses of words in different language games, we see different similarities and dissimilarities, and we start to break free from the conceptions that bind us. This is a therapy for Wittgenstein because attention to different language games ideally undermines mystery. Philosophical puzzlement tends to arise from the false expectations that come from pushing together language-games that do not belong together.[20]

Grouping different uses for a term will provide certain insights, but it will also cloud over others. Polanyi and Collins select and organize their examples of tacit knowing differently. Both groupings lead to insights we might not normally see, but both views can also obscure.

Collins' choice of examples draws body-knowing together with purely mechanical processes; it also draws the knowing of a master craftsman into that same circle of skillful processes. Although this reduction flies in the face of conventional understanding and trends in philosophy, evident in the work of Polanyi, Merleau-Ponty and Heidegger (via Hubert Dreyfus in Collins' book), it is perfectly consistent with an emphasis on the distinction between strings and meanings and the way Collins want to use the phrase "tacit knowledge."

Collins groups activities such as an animal hunting with activities such as riding a bicycle and using a probe, and he runs these together with the way a computer works. Just as we come to see an animal hunting as something that is not driven by conscious intentional activity but as behavior programmed by evolution and operant conditioning, we come to see unconscious human activities in a similar way.

The inclusion of a sieve in this group of examples is particularly striking (TEK, 76-78). An inanimate object with no moving parts is shown to perform the function of sorting stones in a skillful way. There is indeed complexity involved in making the right size stones fall through a sieve, and surely there is a similarity in that identifiable physical processes are involved in all these examples, but thinking about a sieve also directs us away from any intentionality involved in hunting, or biking or finding your way through a dark cave with a stick.

The examples Collins groups also push together somatic productive activities with other skillful human productive activities. Relational Tacit Knowledge surrounds the transmission of knowledge in specialized fields and in crafts. The masterfully skillful productions, which many see as harboring great funds of tacit knowledge, are explicable and capable of transmission via an instruction manual or mechanical modeling according to Collins.

While Dreyfus shows how driving a car skillfully in traffic goes through five identifiable stages, similar to those that the apprentice goes through in order to be a master craftsman (TEK, 102), Collins emphasizes that all these skillful doings are still based on identifiable strings, and the knowledge is difficult to convey for

merely contingent reasons. In fact, they are the easy cases. Whereas we may have to build a complex machine or make a scientific advance in knowledge to understand a somatic process, in most cases all we need to do to explicate RTK is ask the right question. Then a "longer string" is made by adding that verbal or written explanation to what we already know (i.e., Collins' first sense of explication, "elaboration"), and we might successfully mimic the process with an additional step. Again, for Collins, the affordances of the medium (human or machine) can make the production more or less difficult to achieve, but productive processes are eminently explicable for Collins.

Surely, more often than not, further explication can help communicate knowledge. Asking the master can even get the master to start thinking about exactly what it is she does, and then that activity might be put into words. But we normally conceive of a master craftsman or a virtuoso as someone who can also creatively adapt in the production of her work; we see "the resourcefulness with which the master handles every new and unprecedented situation" (KB, 129). We also see the master as producing a unique artistic product each time. By pushing craft skills together with a skill in copy typing, Collins undermines not only intentionality but any creativity that our bodies and particular practices contribute to somatic and craft skills.

Generally a craftsman is looking for a consistent quality of product, producing the same again. But the juxtaposition of sieve, copy-typist and master craftsman also seems unfair. In copy typing—stealthily brought in under the guise of expanding rather than contracting the different types of skills represented (TEK, 102-103)—the very goal is a transformation, i.e., a transcription from one medium to another, and its inclusion pushes the other crafts towards the goal of mimeomorphis.

To the extent that we are performing a bodily skill or producing a product, for Collins, "We are just like complicated cats, dogs, trees, and sieves" (TEK, 104). While performing these "mimeomorhic" actions "we are just complicated sets of mechanisms … It is all just a matter of one kind of mechanism versus another" (TEK, 104-105).

"Polimorphic" actions, those that display linguistic fluency, go beyond what machines can do (TEK, 55). But we so typically interpret the end product of a string or causal chain into our social meanings that we do not see clearly the line between polimorphic and mimeomorphic activities. We engage in what Collins calls "social prosthesis" or "repair"; we weave things and strings into our own network of meanings.

When Collins puts the expert driver or master craftsman in the same category as a sieve and copy typist, it both instructs and obscures. As the sieve example benefits our understanding by emphasizing the mechanical nature and explicability of somatic processes, the example of a copy typist benefits by emphasizing how craft knowledge can, after the fact, be flattened into the mechanical transformation of strings; it shows us that any one of the master craftsman's end products can be more fully explained and mechanically replicated. But as the sieve de-emphasizes intentionality, which is important for tacit knowing, the copy-typist de-emphasizes how the practices of the craft might creatively contribute to the production and determination of a *good* end product.

Collins wants to separate the final product from craftsman's judgment. Polanyi, in contrast, would affirm that the uses of the body and a discipline's special practices have a role in these judgments. Choices and repairs are made at every level in the development of the skill. Because, in the end, we might flatten out the production into a series of instructions, doesn't take away from the *use* of tacit knowledge in making creative judgments all along the way, nor does it take away from the special use of that knowledge by a master in adapting to new situations. Polanyi says that "any rules laid down for carrying out empirical inferences must be highly ambiguous" (PK, 370). Being involved in the practices is what reduces the ambiguity and brings one towards understanding what is true and good in a craft or field of knowledge.[21]

For Collins, the craftsman's knowledge can become explicit in an instruction manual (his second sense of explication, "transformation"), and—in the same way the somatic skill of riding a bike can be modeled in a machine—we can build a factory to do the craftsman's job. Any creativity or artistry in determining the final product is drained from its connection with hands-on practice and is relegated to social sources. In the factory, "social prosthesis" and "repair" weave the mechanical back into the social fabric.

If we begin with the examples of a sieve or a copy typist, we might be inclined to agree with Collins' division between STK and RTK on one side and CTK on the other. But, the division would be less clear if Collins chose different examples. For instance, STK looks different if one takes examples from fighting arts, where, yes, the goal is to defeat your opponent, but one's body might respond to a strike not encountered before in a creative, adaptive and *right* manner. Different emphases would also arise if Collins chose examples of tacit knowing from other arts, like playing improvisational jazz. Is it the body or culture that is determining the *right* next chord? Is the mechanical practicing of different songs integral to the production of the new improvised piece, or is social fluency the critical factor in deciding what is right about the new music? Can the two be cleanly divided? Perhaps when the water settles the fluid pond can be distinguished from the stringing shore, but muddy water is primordial and precedes the conceptual tools used to analyze it.[22]

The examples Collins groups together ultimately will also push somatic skills and productive crafts together with artistic activities. Collins pays little attention to the arts, but why take what are, from his perspective, the hard cases first? In Collins' approach, the artistic activities would involve *more* social tacit decisions than the crafts, but the body is not seen as possessing its own intentionality and creativity, as it would from Polanyi's approach.

In the next section I will briefly look at Polanyi's structure of tacit knowing. A different association and ordering of the phases of tacit knowledge will emerge from his examples, and we will come to see how the basis for linguistic meaning is set in somatic processes.

Tacit Knowing and Meaning in Nature

Unconscious body skills and craft skills are explicable. What gets in the way and produces the mystery, according to Collins, is the subjective psychological feeling we have when we humans perform tasks unconsciously or have a talent; we come to believe we have a special sort of knowledge that cannot be explicated. Collins is thus at pains to separate the psychological affects surrounding knowing from knowledge proper. This is the right thing to do when it comes to contingent subjective feelings and arbitrary assessments, but it can obscure the intentional structure of knowing and the personal nature of judgments. Our judgments about facts, while rooted in culture and language, are also rooted in the body, practices and personal experience.

In developing STK and RTK, Collins closely aligns productive activities that do not appear to involve goal-oriented intentionality and creativity with those that do in order to emphasize the difference between the mechanical and the social. Polanyi will group his examples in a way that brings out the intentional and creative aspects of the body, and brings out the meaning intrinsic to machines.

Polanyi groups activities such as using a probe, seeing in three dimensions, riding a bike, and playing the piano (i.e., activities Collins can see as mere string transformations), together with mastering an art, understanding meaning in language, and making a scientific discovery (i.e., activities that would go beyond mere string transformation). From all these activities Polanyi distills the essence of tacit knowing.

The general structure of tacit knowing (or tacit inference) is the movement from *subsidiary* clues to a *focal* joint comprehension. In tacit knowing, "clues" are gathered together into a joint comprehension, and, for Polanyi, that joint comprehension is a gestalt, which is not fully analyzable into the simple sum of its parts and rules.[23] Even in purely physiological processes there is this intentional "from-to" structure, in which tacit subsidiary knowledge functions to provide explicit focal knowledge.

"Tacit knowledge" can describe both this *from-to* structure itself or the knowledge is that is *attended from* when we *attend to* some explicit piece of knowledge or thing. Tacit knowledge thus comes to be identified not with "inexplicable knowledge" or an inexplicable *know how*, but it is seen in the light of the function of tacit knowing. Contrary to the impression Collin's gives, Polanyi affirms that much tacit knowledge can be made explicit (e.g., KB, 124-125, 194), but even after we explicate a tacit process by analyzing and making explicit important clues involved, this knowledge can still sink into subsidiary awareness and *function* tacitly. Knowledge functioning tacitly is thus still properly called "tacit knowledge" from Polanyi's perspective.

For Polanyi there is much in the process of tacit knowing that we can make explicit, but there is always a tacit residue (KB, 124), which protects the ground between the ineffable and the explicit. First of all, we cannot look directly *at* the *from-to* process itself, since when we objectify it as a "to" or "at" we miss what we were after.[24] Secondly, and similarly, there is a sense in which we can't make any of the tacit clues or knowledge explicit, since they will be functioning differently when we *attend to* them in isolation than they do when we *attend from* them. Here we *indirectly* make the tacit explicit, since to focus on a tacit clue or part misrepresents it and flattens its functional role.[25] Thirdly, while we can indeed analyze and specify many clues indirectly, and thus bring tacit knowledge into the explicit, we will inevitably miss many clues.

Here on this third point, what I called the *inexhaustibility* of tacit knowledge, Collins and Polanyi overlap in agreement. Some of this tacit knowledge, as Collins points out in discussing RTK, is not specifiable for contingent reasons, i.e., we cannot explicate all the clues at once due to the contingency of our missing something or needing to discover more. He says, "while there is no principled reason that any particular piece of unrecognized knowledge could become recognized, one cannot imagine *every* piece becoming recognized. There will always be a frontier with things just beyond it waiting to be discovered" (TEK, 98). For Polanyi, we will miss clues for these contingent reasons, but we will also miss clues for principled reasons. So whereas the inexhaustibility of the tacit here can collapse into the explicable for Collins, for Polanyi it retains the sort of inexhaustibility that Collins might connect with CTK. Even in craft knowing, we miss clues because we do not know what to look for. Clues, in isolation from their joint meaning, "get lost among the irrelevant details of their surroundings" (KB, 135). It's not just human error or the inexhaustibility of scientific discovery that foils our current endeavors to specify the tacit, we miss clues because we are inextricably dealing with the analysis of meanings. That is, we miss the tacit because of the sort of inexhaustibility and indeterminacy we find in Wittgenstein's rule-following discussion, rather than merely the sort of inexhaustibility we find in the progress of scientific discovery. While Collins sees this indeterminacy only in CTK, for Polanyi it runs deeper.

The general structure of tacit knowing is *from* subsidiary clues *to* a focal joint comprehension. Joint comprehensions are also called "meanings" for Polanyi (KB, 128). This makes sense in examples that involve acts of understanding, where we see *from* discrete parts *to* meaningful wholes, but it does seem forced in cases of somatic tacit knowing, and Polanyi applies the term even to acts of visual perception (KB, 161). When we see a three-dimensional object, we *see from* tacit bodily clues and *see to* a focal image, and that image is a *meaning* for Polanyi.

This is indeed pushing together several sorts of different language games. Perhaps a class of joint comprehensions that are pre-linguistic "proto-meanings" would help reduce the forcing together we feel here.

But while pushing together these examples distorts, it is also reveals. It brings out analogical processes at work both in perception and understanding, and it brings out how meaning is involved in our focal identification of even the most basic *things*. The sharp line between our knowing processes and the ontological structure of the world, meanings and things, disintegrates at a certain point of analysis for Polanyi. Whereas from a traditional analytic perspective the psychological/epistemological is thought to always be cleanly divisible from the real/ontological, and the genetic sources of knowledge are thought to be cleanly divisible from the justificatory standards of knowledge, Polanyi, like the pragmatists, is, at a certain level, breaking these distinctions and providing a new approach. Polanyi shows how strings and meanings weave together so that our meanings can catch real things.

Polanyi's functional approach shows more easily how there can be hierarchies of from-to knowing processes woven together. We can attend from physical strings, but we also attend from meanings. In interpreting language we attend from both. For example, the letters are attended *from* in attending *to* the meaning of a word, the words are attended *from* in attending *to* the meaning of a sentence. The sentences can be attended *from* in attending *to* the meaning of a story.[26]

Similarly, there is a hierarchy of ontological levels in the world that we might discover. There are emergent realities that cannot be completely analyzed into their parts. To use Collins' example, "gratin dauphinois" is more than just the aggregate of "a pound of potatoes, some milk, cream, and flavorings" (TEK, 36). According to Polanyi these emergent realities include living organisms, artifacts and machines. While most physical and natural wholes are fully explicable and reducible to physical and chemical parts and their laws, these are not.

To identify something as a machine is already, according to Polanyi, to see more than a physical string in the same order as the physical and chemical properties that govern its parts. Something is ontologically as well as epistemologically a machine by being what Polanyi calls a "dual control" system (KB, 154). Higher organizational principles are involved, and these ultimately challenge any hard boundary between the physical and physiological world, on one side, and human language/meanings, on the other.

According to Polanyi, organisms, machines and other human artifacts require higher-level explanations that defy a physicalist's attempt to explain all in terms of the general laws of physics. While this may seem inconsistent with the notion of explanation I brought to light in discussing formal systems and proofs above (i.e., knowledge is fully explicit if analyzable in terms of premises and rules), it is inconsistent only if one insists that the basic premises must be the basic elements of physics and their properties and if one assumes that reductive explanations cannot be complemented by holistic explanations.[27]

Collins is right to show a sharp difference between mechanical processes and human social meanings. The danger that Collins may be encouraging, however, is that focusing on our ability to translate all such hierarchies into interpretable strings can *mask the differences in ontic levels and the correlative explanatory levels*, which leads us to mistakenly think that one flat explanatory level can fully account for all material phenomena. Collins is right, we can provide explanations for somatic and machine-like processes, but these do not fully reduce to the most primitive "atoms" and are not without tacit residue.

This flattening of hierarchical levels is evident in how Collins orders his three phases. Collins orders varying examples by how difficult a case of knowing might be for us to explicate: from RTK (in craft and special field knowing) to STK (in body knowing) and on to CTK (in social knowing). The jump to CTK is indeed a difference in type for Collins, but in his approach it is one without precedent. Also his ordering and focus on strings make it seem that the inexplicability of CTK is a matter of complexity. Collins offers his division as a "hostage to fortune—a falsifiable claim" (TEK, 144), but is betting that CTK will not reduce to the same

order he allots to RTK and STK. Collins presumably envisions either no explication for CTK or a new type of explication that we will master once we have solved the "socialization problem" (TEK, 171). Starting as he does, however, with no conception of emergent meaning or being, the reduction of CTK into a string on the same uniform ontic level as all other phenomena comes to seem an inevitable result of the progress of science.

Polanyi would see a more natural ordering of "phases" as one that follows the developing levels of emergent activities: from STK (as biological, behavioral, and individual achievement) to CTK (as social, linguistic and collective) and then perhaps to RTK (as special knowledge in particular fields, crafts or arts).[28] This alternate ordering would be appropriate if CTK provides a general sort of fluency that comes from speaking the language, and if RTK reflects a specific expertise. But Collins talks of CTK as being more than just the ability to interpret and understand a language. Perhaps "LTK" should be added, i.e., Linguistic Tacit Knowledge. Then the hierarchical order that follows the phases of emergence might move from STK at the bottom, to LTK next, to RTK and then CTK at the top. This would be a more natural hierarchy if CTK is reserved to describe instances of practical wisdom in league with Aristotle's more special sense of that term.

Practical Wisdom and CTK

The way Collins orders his phases (RTK, STK, CTK) is misleading, but it is also revealing. Removing RTK from proximity with CTK seems wrong because we tend to see productive crafts as good examples of the use of *practical wisdom*. We see a master as one capable of employing practical wisdom, and if this is what is relayed in the relation between apprentice and master, then it seems the very essence of the fluency that Collins points us toward in CTK. But there is ambiguity in use of "practical wisdom" and Collins' exposition can help to clarify it.

Practical wisdom is the sort of from-the ground-up wisdom that cannot be reduced to rules. According to Aristotle, practical wisdom, i.e., *phronesis*, is the ability to figure out which general rule to apply to a particular situation. It is also the power that allows us to formulate a new general rule from particular instances.[29] While we tend to see the master craftsman's skill and judgment as a good example of the use of *phronesis*, Collins' way of dividing the mechanical from linguistic fluency reminds us of the proper and more specialized use of *phronesis*. For Aristotle, *phronesis* is *the* master virtue and here, as Collins' division emphasizes, there is a strong distinction between the productive arts and the human virtues. To have expert courage or expert moderation means that one also has *phronesis*, and vice versa. But a master craftsman, or fighter or fisher does not necessarily have this form of expertise; the virtuous person does, and the virtuous person is not an expert at all crafts.

So, in Collins' terminology, the "contributory expertise" of a craftsman can be discriminated from "interactional expertise" of the social and rational animal. Collins associates this interactional expertise with CTK. But is CTK equivalent to *phronesis*?

Interactional expertise is something we gain by "mastering the language," and, according to Collins, you cannot master the language without understanding the people. "Mastering the language *means* understanding the people" (TEK, 135). The mastery of the language and culture, what Polanyi would call "indwelling" in the culture, is indeed necessary for *phronesis*.[30] One important thing Collins reveals by dividing interactional expertise and CTK from contributory expertise and RTK is that one can master a language, and understand a people, and have insight into their practices without engaging in *all* their practices.

Collins emphasizes that no particular type of human body and no particular practices seem required to gain interactional expertise.[31] Collins says, "It seems that the body is necessary to the acquisition of even collective tacit knowledge" but he opts for the "minimal embodiment thesis" rather than a full-fledged "social embodiment thesis," which would put too much weight on how concepts and language directly relate to the body and practices. He notes how the blind can speak well about color and says "not every individual needs the typical body in order to draw on collective tacit knowledge. This is because collective tacit knowledge is, to a large extent, located in the language of the collectivity rather than in its practices" (TEK, 135).

For Collins, "interactional expertise" can give one the ability to understand some important aspects of a craft, but it doesn't require being immersed in the practices of that craft (TEK, 136-137). Similarly, for Aristotle, the virtuous person, the *phronimos*, need not understand each craft from the ground up to inform her judgments. Although there is an internal logic and development within a craft, the goals of each craft were subordinated to social goals. The craft of saddle-making, is subordinated to the goals of horsemanship, which is subordinated to the role a horse has in cavalry, and so on. All productive processes are ultimately subordinated to the goals of politics, for Aristotle. The good statesman must have some knowledge of the subsidiary crafts, but not all can be ground-up knowledge. What the good statesman should have, according to Aristotle, is *phronesis*. This social and moral expertise seems similar to Collins' interactional expertise, but is also both more comprehensive and more specialized. Collins says we gain the capacity for interactional expertise by mastering the language. While this is undoubtedly true, there seems a stronger sense of "mastering" the language or ethos at work in the creativity and knowledge Collins allies with CTK, and there is an even stronger sense of linguistic mastery in *phronesis* than in interactional expertise or CTK.

While anyone who speaks a language well might have interactional expertise, and contributory expertise is more specific to a craft, *phronesis* is both more general and more specific; to have it one must master the entire language *and* have the knowledge of the right thing to do, at the right time, for the right reasons in any particular situation. *Phronesis* is not a virtue we all possess by virtue of having language or culture, but a master of the culture could have it and then would be capable of knowing the right thing to do in any social situation.

For Aristotle, the judgment of the virtuous person, using *phronesis*, is not reducible to a rule or algorithm; the judgment of the virtuous person is itself the rule. While the same might be said of the master craftsman with regard to his expertise, Collins' distinction between RTK and CTK leads us to a more general (than crafts or arts) and yet more specialized (than language at large) conception of practical wisdom, and shows how it may be teased apart from the sort of skill and knowledge that the craftsman possesses.

In developing the notion of CTK, Collins may be seeing what Polanyi would call an "emergent, joint comprehension" in the collective; as such it can be dwelled in, and be seen *from* or *through,* when we look back *to* particular clues to understand their meaning.[32] CTK presents a new level of meaning and perhaps even a new ontic level, which necessarily involves some of the bodies and practices of individuals but is not sufficiently explained by them.[33]

When Collins says, "At least one major component of the self (and it may be the entirety of the self), is society" (TEK, 116), he is recognizing how the emergent culture or language can express itself in the individual. Polanyi allows for a "higher level of individuality" such as the human mind, to exercise marginal control over the "lower centres of individuality, such as the muscles and organs that comprise it (KB, 135-136). To extend Polanyi's notion of the human mind as an active center, Collins' collective might be a higher center that can, to some extent, organize its parts—us—in terms of its own emergent goals. But though Collins

seems to lean in this direction, he is also happy talking about an individual's ability to *draw on* collective tacit knowledge (TEK, 137), thus putting our minds as active centers in the driver's seat.

Polanyi agrees on the importance of the social in constructing the individual. He says, "to ask how I would think if I were brought up outside any particular society, is as meaningless as to ask how I would think if I were born in no particular body, relying on no particular sensory and nervous organs"(PK, 323).

But Polanyi sees both the emergence of the social, and the emergence of the individual, to be rooted in a process of tacit inference and emergence that can be traced even to the mechanical way in which our bodies produce a three dimensional picture from the two dimensional images given by each eye.

Collins wants to look at what knowledge is apart from what it is for human knowers (TEK, 6), and he believes that Polanyi made the mistake of making knowledge too personal. But although knowledge may be held collectively in language, it is developed and affirmed personally and there is no knowledge without an interpreter. Knowledge, though objective, is intrinsically dependent on meanings and personal judgments. Polanyi thus sees the "personal" as a category that transcends the subjective even as it subsumes the social.

> I think we may distinguish between the personal in us, which actively enters into our commitments, and our subjective states, in which we merely endure our feelings. This distinction establishes the conception of the *personal*, which is neither subjective nor objective. In so far as the personal submits to requirements acknowledged by itself as independent of itself, it is not subjective; but in so far as it is an action guided by individual passions, it is not objective either. It transcends the disjunction between subjective and objective (PK, 300).

Our judgments can be objectively true and reflect reality, according to Polanyi and still remain *personal* in this sense. Collins tends to follow critics like Alan Musgrave and Karl Popper, in that Collins too condemns Polanyi as being too subjective about knowledge (TEK, 149).[34] The ambiguity of terms like "personal," "judgment" and "intuition," which can retain psychological associations, can lead to this interpretation of Polanyi. But while Polanyi believed our passions do play a role in the pursuit, discovery and recognition of knowledge, he also distinguished between validation and verification (PK, 202).

Collins also worries that Polanyi makes tacit knowing seem too mysterious. While Polanyi's use of terms such as "ineffable" (in contrast to my own use) to describe "the domain of skillful knowing" (PK, 90 on TEK, 76) can indeed make tacit knowing seem mysterious and completely inaccessible, Polanyi also indicates how the tacit dimension may be indirectly or inexhaustibly approached and explicated.

Polanyi was bucking against trends in the analytic tradition that promoted what he saw as a false and destructive ideal of objectivity in knowledge, but he was still committed to the objectivity of reality, even to the point of being a Platonist.[35]

Conclusion: A Richer Picture

As Collins says, "the simplest things are the hardest to see if one starts from the wrong position" (TEK, xi). Neither Collins nor Polanyi begin their search for tacit knowledge from the wrong position, but both starting points have their advantages and their dangers. In the end, I believe that both views can complement and enrich each other. Polanyi's approach tends to collapse different sorts of tacit inferences, especially those in bodily achievements with those in interpretive understanding, but it reminds us that there is an intentionality, a creativity, and a gestalt at each level and in each family type of tacit knowing.

Collins' approach tends to flatten out hierarchical ontic and explanatory structures. This makes it appear that there is just one important division, but it reminds us that there is something remarkable about human social meanings and that they are different in kind from the "meanings" or proto-meaning found at lower levels of emergence. While Polanyi emphasizes the structures that we have in common with an animal's skillful practices and a machines' dual control, Collins sees the danger in making us look too much like other animals and machines. For instance, his main complaint against the Dreyfus model is that "it entirely ignores the most fundamental subdivision of human expertise; that between expertise of the sensory motor kind and expertise of the social kind" (TEK, 124).

In order to stress that important division, Collins emphasizes our ability to embed somatic, productive and mechanical processes in strings. Our distinction as the creators and interpreters of meaning proper is thus given its due, but this approach also flattens out other tacit processes and emergent structures makes it seem that we are distinct from everything else in the universe in an inexplicable way. This flattening can thus lead to Descartes' matter-spirit dualism or Collins' "Social Cartesianism" (TEK, 125-126). In contrast, Polanyi's dualities of (1) attending from *v*. attending to and (2) dual control systems show us that we are different from everything else in the universe because we are a new emergent creature with new capacities and meanings.[36] By looking at Polanyi's conceptions of tacit knowing and emergence we see continuity and development in the evolution of life and consciousness—but that does not make the differences between hierarchical levels less disjunctive and less real.

Collins' work shows us both the promise of mechanization and the limits of artificial intelligence as he helps us see what distinguishes us as human beings. We humans have language and use collective tacit knowledge, but there is no such tacit (or explicit) *knowledge* involved in what computers and complex artificial intelligence machines do, in what animals do by instinct, and in what humans learn to do automatically. These are proto-meanings at best, in the same way that the altruistic behavior of chimpanzees is proto-moral rather than moral in the fully human sense.

Examples that show the body adapting creatively and that show how practices inform the assessment of the product may break Collins' isolation of the tacit to language, more generally, or to social fluency, more particularly—or, if we choose, we can keep Collins' distinctions and then talk about the artistic and creative aspects of these activities as being linguistic or social, i.e., CTK mixed in with STK and RTK.

Whereas at first the distinction between STK, RTK and CTK grated on my sensibilities—because tacit knowledge was not seen as genuine or proper in STK and RTK—once tacit knowledge is seen more fully in the light of tacit knowing and not strictly in terms of inexplicability, the terms grow useful and lend order (and perhaps better order with the addition of LTK). Attention to tacit knowing adds legitimacy to explicable background knowledge as tacit knowledge, and it shows that there is something like the tacit inference of CTK in both STK and RTK though each represents a distinct level of analysis.

Collins successfully separates out what Polanyi has pushed together in an instructive way. And so long as we do not lose Polanyi's insights regarding tacit knowing, or flatten hierarchies that display real differences in type, Collins' analysis complements and expands on Polanyi's work.

Endnotes

[1]TEK will refer to Collins' book, *Tacit and Explicit Knowledge* (Chicago: University of Chicago Press, 2010).

[2]Another way to get by this problem is to expand knowledge to include "know how", i.e., the ability to perform a task, but Collins will ultimately identify *know how* with string transformation rather than with properly tacit activity.

[3]Collins believes that Polanyi also wanted to preserve tacit knowledge as that which *cannot* be made explicit. As explained below, I don't think that's entirely true in the end, but to the extent that it is true I believe Polanyi came to see "tacit" as most properly modifying the word "knowing."

[4]Here "cannot" is in the sense of logistic practice, technological impossibility, or higher (TEK, 89, 138).

[5]I also set out four different sorts of knowledge which might be explicable to certain extents, ranging from fully to not at all [Lowney, *The Tacit and the Ineffable: Frege and Wittgenstein on the Distinction between Language as a Calculus and Language as the Universal Medium* (Boston: Boston University, 2005), 412]. My focus, however, was on the expressibility of logical and linguistic notions in the early work of Wittgenstein. While all my sorts focus on semantics, Collins' four sorts of explication deal mainly with strings (TEK, 81), i.e., the "syntax" in its mathematical-logical sense that supports the semantics.

[6]Ludwig Wittgenstein, *Philosophical Investigations*, trans. G.E.M. Anscombe (Oxford: Blackwell, 1953), henceforth "PI", page 228.

[7]On how Wittgenstein collapses the tacit into the ineffable, and how that is a natural progression of ideas in the universalist tradition within analytic philosophy, beginning with Frege and culminating in W.V.O. Quine, see my *The Tacit and the Ineffable* (2005). Wittgenstein achieves this collapses mainly by undermining Frege's insights into the tacit realm. For a summary of five ways in which Frege foreshadows distinctions that Polanyi makes explicit, see my "The Tacit in Frege" (*Polanyiana*, 17:1-2, 2008, 19-37). For differences between Wittgenstein and Polanyi's conceptions of the tacit dimension and the costs each view faces, see my "Seeing, Saying and Being the Gestalt" (*Appraisal,* 7:1, 2008, 21-38).

[8]The way Wittgenstein undermines metaphysics and the tacit dimension can lead directly into the flat-footed physicalism of Quine [See Burton Dreben's, "Quine and Wittgenstein: The Odd Couple" in Robert L. Arrington and Hans-Johann Glock, eds., *Wittgenstein and Quine* (London and New York: Routledge, 1996, 39-61)]. Collins might believe he can welcome this, since he believes materialists could welcome his understanding of knowledge as being held collectively (TEK, 131, 132), but he cannot without giving up on the existence of his firm divide between string transformations and language.

[9] In *The Tacit and the Ineffable* (2005), I determined there were various types and levels of expressibility by studying what was sayable and unsayable for "universalist" thinkers, such as Wittgenstein and Frege, in contrast to "calculist" thinkers, such as Ernst Schröder and David Hilbert, all in the analytic tradition. My understanding of Polanyi was tacitly in the background here. I see the differences between the universalists and calculists as a debate about how much of the tacit conditions for knowledge can be made explicit. It is interesting to note that Martin Kusch, who co-wrote *The Shape of Actions: What Humans and Machines Can Do* (Cambridge, MA: MIT Press, 1998) with Collins, also worked extensively on the universalist v. calculist distinction, applying it to the continental tradition in philosophy. See his *Language as the Universal Medium vs. Language as a Calculus: A Study of Husserl, Heidegger and Gadame*r (Dordrecht: Kluwer Academic, 1989). For more on this distinction as Jaakko Hintikka originally developed it, see Hintikka, *Lingua Universalis vs. Calculus Ratiocinator, Selected Papers*, vol. 2 (Dordrecht: Kluwer Academic, 1997).

[10]See Collins' "five conditions of communication" on page 31 and his "four meanings of 'explicable'" on page 81.

[11]Collins seems to be hedging his bets a bit too much with "to some extent." The work of that phrase seems to be in measuring human and computational limitations, and this seems mostly covered already by "in the right circumstances" though those circumstances may never present themselves. To tighten the definition in line with Collins' intent, we might then say: "Explicit knowledge is knowledge that can, in principle, be transferred by the use of strings in the right circumstances."

[12]Perhaps Collins is wise to keep away from the terms "syntax" and "semantics" since, in contrast to their special logical use, both these expressions are colloquially identified as meaningful parts of a language. For Collins, only the syntax in this special use as a string, together with the semantic would qualify as language. See Lowney (2005) page 342 for more on the semantics of "syntax."

[13]Here "formal system" is less ambiguous than "formal language." In a "formal language," often "language" merely means a system of signs and mechanical rules for their concatenation, whereas a "language" is necessarily an interpreted string in Collins' use of the term.

[14]See Lowney, "Re-Thinking the Machine Metaphor since Descartes: On the Irreducibility of Bodies, Minds, and Meanings" (*Bulletin of Science, Technology and Society*, 31:3, 2011, 179–192).

[15]The slippage here might be rooted in too strong a connection between "knowledge" and "information." Collins must agree that there is no knowledge in the string itself, but he also wants to say there can be information in the string itself (TEK, 16, 25, 87). There are indeed differences and patterns in a string that can make a causal difference, also information can be transferred without conscious awareness and then it can act tacitly, but we must be careful not to equate information outside of tacit knowing with knowledge.

[16]Collins will acknowledge that scientific explanation, usually cannot be directly used to help the prospective bike rider or soccer player develop their skills (TEK, 61).

[17]Proofs were initially modeled on axiomatization in geometry. This aspect of explication goes back to Euclid but had its renaissance in Descartes' analytic geometry, which provided a reductionist paradigm for scientific knowledge that heavily influenced the 19th and 20th centuries' conceptions of explanation [see Lowney, "Re-Thinking the Machine" (2011)]. In math-logic, proofs can now be seen in a less grandiose manner, as transformations executed by mechanical procedures.

[18]Here language is comprised of signs/strings and meanings together. The idea that one response is right rather than just what happens seems important here for Collins to maintain the distinctiveness of CTK as more than just a random selection.

[19]Of course, determining *when* it has actually done this will always be a matter of what Polanyi calls personal knowledge or judgment, since there can be no mechanical procedure to tell us.

[20]For instance, because one can legitimately state in some contexts "You cannot feel my pain," one starts to think that pain is a uniquely private sensation. Sentences such as "I have a pain in my arm" gets confused with the way we use sentences such as "My arm is *mine* and not yours."

[21]See Lowney, "From Science to Morality: A Polanyian Perspective on the Letter and Spirit of the Law" (*Tradition and Discovery*, 36:1 [2009-2010], 42-54) for more on how the practices in a craft or a science lead one to transcend the explicit rules and, similarly, how social practices such as obedience to the laws can lead one to transcend the explicit laws in a creative and moral understanding of how to go on.

[22]I expand here on Collins' excellent analogy.

[23]A criticism of this notion of joint comprehension might be developed from Collins' arguments that analogue strings can be transformed into digital strings. The joint comprehension would thus not be an irreducible gestalt but would be fully analyzable in terms of parts and rules. Such a criticism, if legitimate, would also affect Collins' understanding of the inexplicability of CTK.

[24]This aspect of the knowing process is something Polanyi does not emphasize, but early thinkers in the universalist tradition stress that we cannot know our *knowing processes* in the same way that we know *objects*.

[25]The tacit can also be made indirectly explicit in the way balancing a bike can be made explicit through a scientific formula. Polanyi does not see any contradiction in discussing balancing a bike as an example of the tacit and, several pages later, providing a scientific formula that provides the parameters for how that is done (KB 141-142, 144). Collins, in contrast, sees irony if not contradiction here (TEK, 100-101), because he sees scientific explanation (i.e., his fourth sense of explication) as a full and direct way to make explicit subsidiary tacit knowledge.

[26]On page 115, Collins provides a nice example of how this movement to focal meaning is automatic, and how good we are at moving from clues to meanings. When the letters in a word are scrambled with first and last remaining in their proper position, we can still understanding the words holistically (with the clues provided from both the letters and the projected joint meaning of a sentence).

[27]See Lowney, "Re-Thinking the Machine" (2011) for more on how good explanations need not be fully reductive. Also see William Wimsatt, "Reductionism and Its Heuristic: Making Methodological Reductionism Honest" (*Synthese*, 151, 2006, 445-475).

[28]This order seems appropriate if "Relational Tacit Knowledge" is fixed to designate what is acquired in the progression from apprentice to master craftsman. Since there are many aspects of the transfer of knowledge that are contingent, just as Collins describes, we may want to use another name for the tacit knowledge transmitted in crafts or arts and keep RTK to designate only contingently unknown or unrecognized knowledge in body-knowing, skillful production knowing, and more advanced social forms of knowing.

[29]This is properly a form of abduction rather than induction—there is no set algorithm for good abduction, whereas induction, like operant conditioning, generalizes a series. For Aristotle's use of *phronesis* see primarily book six of his *Nichomachean Ethics*.

[30]Indwelling allows us to see new meanings (KB, 160).

[31]Here Collins is diverging from a standard interpretation of Wittgenstein's famous aphorism "If a lion could talk, we couldn't understand him" (PI, 223; TEK, 135). It is not just because we do not have the body and share the practices of the lion that we cannot understand it, as Dreyfus or Wittgenstein might contend. Having the affordances of a particular sort of body would indeed make some practices easier than others. What is wrong about the analogy for Collins is that a lion could never master our language and have access to CTK; a lion could not creatively adapt to new social circumstances in the way that we can.

[32]See Lowney, "The Tacit in Frege" (2008), especially page 28, on how concepts collect together particulars and then operate as tacit lenses for the understanding.

[33]See Lowney, "From Morality to Spirituality: Society, Religion and Transformation" (*Tradition and Discovery*, 37:1 [2010-2011], 19-38) for a view of this sort of emergence in cultures and religions.

[34]For these criticisms of Polanyi and defenses against them, see Andy Sanders, *Michael Polanyi's Post-Critical Epistemology* (Amsterdam: Rodopi, 1988) and Lowney, "The Tacit in Frege" (2008).

[35]It might be interesting to note here, in the context of strings and interpretations, that Gödel was also Platonist.

[36]See Lowney "Re-Thinking the Machine" (2011) on how Cartesian dualism is undermined from a Polanyian perspective.

Analysing Tacit Knowledge: Response to Henry and Lowney

Harry Collins

ABSTRACT Key Words: tacit knowledge, explicit knowledge, machines, artificial intelligence
I respond to the reviews by Henry and Lowney of my book Tacit and Explicit Knowledge*. I stress the need to understand explicit knowledge if tacit knowledge is to be understood. Tacit knowledge must be divided into three kinds: relational, somatic and collective. The idea of relational tacit knowledge is keyto pulling the three kinds apart.*

I would like to thank my reviewers for spending so much time and thoughtful effort on reviewing my book. I am going to start my response with a bit of autobiography, as it may explain some of what is going on.

The first paper I ever published (in 1974) was about how scientists learned to build a new kind of laser called a 'TEA-laser'. In the first incarnation of the work, written as a Master's dissertation in 1971, I described the process as like learning a new language rather than gathering discrete bits of information. My inspiration for this was Kuhn's 'paradigms', which I took to be science's version of Wittgenstein's 'forms of life', which I knew about having been led there by Peter Winch's brilliant little book *The Idea of a Social Science*. I had never heard of Polanyi or tacit knowledge until one of the referees of my tardily submitted paper told me that was what I was writing about. So I changed the sub-title of the paper to 'Tacit Knowledge and Scientific Networks' and acknowledged Polanyi. This was good because it helped people locate my paper but bad because there is a lot more to Polanyi than I wanted to talk about. In particular, I am a sociologist and my interest lies in the knowledge of groups, how knowledge spreads, how we can acquire different ways of seeing the world, and so on. I have no interest in individual creativity or insight except to say that without the *idea* of individual pioneers we could not have the form of life of science.[1] Mostly, however, Polanyi's stress on personal knowledge has tended to mislead people about what I was up to when they found the term 'tacit knowledge' in my writings.

By default, then, some of what I am doing in the book is continuing a near 40-year process of untangling. What interests me about creativity is how one idea gets picked up and becomes a discovery while another doesn't; this is a sociological process. How those acts of creativity get done is of no interest to me (my own creativity aside—we all find our own creativity fascinating). Thus my book is not about personal knowledge, it is about the nature and transmission of knowledge—a 'substance' which gets passed around. Furthermore, the notion of knowledge which informs the book is based on the Wittgensteinian 'ask for the use not the meaning'. This means, I believe, that I have no need to get caught up with the much discussed philosophical puzzle about whether something that is tacit can be knowledge (Lowney, 19). If I can ride a bike I *know* how to ride a bike whether or not I know *how* I do it.[2] Of course, animals and machines can also do things but I argue that, nevertheless, we should not speak of them as having knowledge. This, however, has to do with the fact that they do not share our social and intentional life and has nothing to do with self-consciousness in the use of knowledge. Another element of this is that when I say that something has *meaning* I intend to say that it is interpretable in a *usable* way.

Stephen Henry's review makes me very happy because he explains how he can *use* the ideas in the book to enhance understanding of a doctor's relationship with patients, and perhaps improve it; this means that the work has not been in vain. If the book has a use, it has meaning. It is also enormously flattering to be told by Charles Lowney that the book complements and expands on Polanyi's work; it is not an easy thing to add something to the work of an original thinker. Given this, it seems graceless to take issue with some of the reviewers' remarks, but that is the nature of the job when one is given the opportunity to respond.

Before I get to that, for readers of this journal who have not read the book, let me say a little more about it. As a result of writing some much-cited and reprinted articles about tacit knowledge, and having used the idea throughout my various books on scientific practice and on artificial intelligence, I thought I knew all about it; when I started, I told people that the first draft of the book would take about four weeks to write. It wound up taking two agonising years; I worked on it every day and produced dozens of drafts and mostly it felt like ploughing a swamp. Clarity didn't begin to arrive until I realised two things as a consequence of the recalcitrance of the printed page. First, to understand tacit knowledge, I had to understand explicit knowledge and, as far as I can see (though I am a poor scholar), no-one has ever tried to work out what explicit knowledge is. For example, there is no book with that title on Amazon.com, there is no entry in the *Stanford Encyclopedia of Philosophy* (though, oddly, there is no 'tacit knowledge' either—someone should fix that) and there does not seem to be much beyond dictionary definitions on Google. So the first three main chapters of my book are about explicit knowledge.

To me, these three chapters do not comprise a finished work. I think they contain some insights about the meanings of explicit which are good enough to support the second half of the book—which maps out tacit knowledge and divides it into three types. But I think someone who is better equipped than me ought to write a proper book about the explicit. I am just relieved that I seem to have 'got away with' writing these three chapters, out of something close to thin air, as it were and, so far, no one has pointed to any gross stupidity (and a heartfelt thanks to Lowney, who brings a lot more to the table in the way of history of philosophy than I can, for saying it is 'insightful'). Those chapters do, however, rely on the concept of affordance which, as I point out in the book, I use as a 'conceptual bandage'; fortunately, it seems to work for the purpose at hand. Furthermore, my table of four meanings of explicit, which also seems to work pretty well, has been put together with a lot of sweat and a pick and shovel—I would be happier if there was some simple theory underlying it. I think that theory would probably come up with the same categories but it would be nice if it made it obvious why there were four categories rather than three, or five. (I like Lowney's pointing out that building a machine is just another string transformation—that seems to point in the right direction. What he misses because I neglected to say it, is that no one would build a machine unless they could use/interpret it and that is why building a machine is a way of rendering something explicit—it is not *just* string transformation; if there is ever a second edition of the book, that will be in it.)

On the other hand, I'm really happy with the second three main chapters and I will nail my colours to the mast of my three-way classification of tacit knowledge and am ready to go down with the ship. The three-way classification is `Relational Tacit Knowledge' (RTK); 'Somatic Tacit Knowledge' (STK); and 'Collective Tacit Knowledge' (CTK). I am also pleased that these second three main chapters are much less complicated and convoluted than the first three. The second thing I realised, as the drafts unfolded, was that to understand the notion of tacit knowledge the new but extremely simple concept of Relational Tacit Knowledge was essential. I now realise that all my previous writings on tacit knowledge have the three types confounded but to untangle them RTK had to be pulled out first. The simplest things can be the hardest to see and Polanyi's

tendency to mystify does not help. RTK is just knowledge that is tacit for no deep reason—for example, it might be that secrets are being kept, or maybe someone doesn't realise what you need to know so it doesn't occur to them to tell you—what I call 'mismatched saliences'. RTK can easily be rendered explicit (at least a bit at a time) and there is little in the way of 'cannot' about it. Even so, as long as RTK is not rendered explicit it looks and feels just like the other kinds of tacit knowledge: to 'get it' you need social interaction with the knower (as with the TEA-laser builders, a lot of whose tacit knowledge was RTK). It is probably because all the classes of tacit knowledge look and feel the same way to someone experiencing them, and because they mostly occur together, that they have not been pulled apart before.

Now I move on to the reviews. Let me add that, for me, there is no real philosophical puzzle about the fact that some piece of knowledge that is tacit at one moment can be explicit at another. It is still tacit when it is tacit—with all that this implies about how it can be transmitted—and explicit when it is explicit (cf. Lowney, 19). I believe all these philosophical 'puzzles' can be dissolved if one simply talks about tacit knowledge that can be explicated in principle (which I claim comprise RTK and STK) and knowledge that cannot be explicated as far as we can foresee (CTK).

Note the qualification 'as far as we can foresee'—that means we won't get there by incremental steps from what we know now. There is no prophecy in the book—tomorrow some genius may come up with a scientific explanation of the social and CTK may become explicable too. That is why the ineffable isn't nonsense (Lowney, 20) so long as it has consequences. And CTK has very evident consequences which are discussed at length in the book. CTK, or, more properly, the idea of the social that underpins it, is like Newton's idea of gravity—you can't see it, touch it or smell it and it is a kind of mysterious action at a distance, but it still has consequences. Maybe we now understand gravity as curved space-time (or maybe we don't) and maybe one day we will understand the social. Not being a genius, I still treat the social as an *explanans* not *explanandum*.[3]

Henry says that I should have done more in the way of linking my concept of strings, which underlies my attempt to analyse the explicit, to the notion of string as found in computing. I think that is wrong but the fault is mine. When I came up with 'string' I was looking for a word that was so general that it meant almost nothing; 'thing', or 'grom' might have been better choices. In my usage, every physical object is a string unless it is completely featureless or completely random—so almost everything is a string. It just happens that most of the things we are interested in when it comes to this subject are of a certain type—such as letters in a book or chunks of air with moving waves—but the idea of the string as I use it much more general: it is anything that has an order that is, or could be, used or construed as information and has the potential to be interpreted. Only at the moment of the final 'heat death of the universe' will there be no strings. The point about strings, as I use the term, is to get away from terms like 'symbol' and 'icon'. Those terms already have the ghost of meaning within them so to try to explain their use in making knowledge explicit is to risk circularity. To avoid circularity, one needs to start with things with all meaning removed. That is the only quasi-negative thing I need to say about Henry's review—as I read it, I simply thought `that's my book … that's my book … that's my book'.

Lowney's review is full of insights, particularly as he relates the first part of the book to the history of philosophy. Nevertheless, as has already begun to be indicated, there was more that I did not recognise and there were places where I thought he might have been a bit more charitable in the interpretation of its strings. For example, on page 23 he says:

> So whereas the force of the string-transformation *v*. meaning-interpretation distinction should inspire Collins to agree with Polanyi's contention that "wholly explicit knowledge is unthinkable" (KB, 144), Collins dissents, suggesting instead that fully explicit knowledge without a tacit underpinning is a matter of course. He will identify "explicit knowledge without tacit knowledge" with "string transformation" (TEK, 70).

Could I really have said that? Note that, as Lowney points out, a few lines later I deny it!

> Collins thus feels the need to "fix" Polanyi's formulation by saying "strings must be interpreted before they are meaningful" (TEK, 70).

I rushed to TEK, opened it at page 70, and there *is* something that looks like what Lowney accuses me of:

> Polanyi's claim that "a wholly explicit knowledge is unthinkable" bears on the matter. The claim as stated is evidently wrong because explicit knowledge without tacit knowledge—string transformation—is exactly what we are thinking about right now.

But read a little more charitably and I am making a (perhaps ill-advised) joke at Polanyi's expense. I am saying 'here I am thinking about it' in the sense that 'the job of a philosopher is to think three impossible things before breakfast' so it can't be literally 'unthinkable'. I go on to say:

> If we replace Polanyi's claim with "strings must be interpreted before they are meaningful" and we forget about the word "unthinkable," a level of mystery disappears: we have strings and we have interpreted strings.

I'm not saying that string transformation is explicit knowledge—I couldn't be saying that—I'm saying it's a pity that Polanyi always has to mystify things when he could use simpler words.

I think Lowney also makes a more serious and systematic mistake in interpreting the book. I was taken aback when he gave as an example of RTK 'e.g., learning the skill of a master craftsman' (Lowney, 20). The mistake is exemplified once more in the following sentences: 'STK looks different if one takes examples from fighting arts, where, yes, the goal is to defeat your opponent, but one's body might respond to a strike not encountered before in a creative, adaptive and *right* manner' (Lowney, 28). In both cases Lowney is taking it that my view is that a certain kind of tacit knowledge can be exemplified in the activity of a certain kind of craftsman, artist, or other actor. But this is quite wrong. As I stress throughout the book, all the three kinds of tacit knowledge are usually found together and Lowney's criticism of my supposed analysis of the master craftsman or the martial arts exponent is misplaced. He is pointing to the fact that in both cases some CTK is involved—of course it is. The point is made crystal clear if it wasn't already in Appendix 1 of the book where the work of the master baker is analysed. We see that though a great deal of the master-baker's activities can be mechanised, judgement of the acceptable level of tolerance of the finished product cannot—it is CTK. I believe this example maps nicely onto the examples that puzzle Lowney and there are many others throughout the book. Let us take the martial artist: one way to win would be to smash the opponent's head with a baseball bat, but that would not be a *right* move, the criteria are collective (one should extend the argument to less crude examples).

Lowney's penultimate sections refer back again to 'personal knowledge' and I have already tried to explain why that is not a focus of my work. I keep saying that it is a mistake to try to understand knowledge by focussing on human experience because human experience is a contingency of the nature of our bodies. That seems to me undeniable as the example of cycling on the Moon shows. But then I say that we should be analysing knowledge as 'stuff', not human experience, but I also say that the only knowers are human. There is something not quite squared-away there – my instinct tells me it is right but I don't think I have yet found the way to say it quite right. So I am not in a good position to demolish my critics. It's nice that academic life is open-ended.

Though I have been critical of some of its aspects, I enjoyed Lowney's review and gained much from it, both in terms of substance and reassurance. That Henry, the clinical practitioner, can use the ideas is an absolute delight to discover. I also enjoyed writing my response and hope my reviewers will agree that we have seen an excellent example of productive academic interchange—not so easy to find in the competitive atmosphere of contemporary academe.

Endnotes

[1]There may not be much in the way of individual pioneering in science as it is practised given that what is vital is how new ideas are accepted or rejected – and the vast majority are rejected — but *the idea* of the individual hero is still a vital element in science's form-of-life.

[2]I think it is time that philosophical puzzle was put to bed. It arises because many philosophers start with an unhelpful definition of what it is to know something that has its roots in the explicit. If they began with the idea that to *know* something is to *know how to do something*, the puzzle could be forgotten about.

[3]An approach that, in my view, ought to be the quintessence of sociological thinking but mostly isn't.

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 is 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 an electronic copy as an e-mail attachment.

Phil Mullins
mullins@missouriwestern.edu
MWSU
St. Joseph, MO 64507
Ph: (816) 244-2612 Fax (816) 271-5680

Walter Gulick
WGulick@msubillings.edu
MSU, Billings
Billings, MT 59101
Ph: (406) 259-3622 Fax (406) 657-2187

Enactive Realism

Kyle Takaki

ABSTRACT Key Words: boundary, duality, emergence, expression, form, levels/hierarchies.
Polanyi and Merleau-Ponty are often viewed as arguing for philosophical positions that are generally non-Cartesian. Despite their broadly compatible orientations, their overall projects differ at key junctures. What I have called Polanyi's "enactive realism" is an attempt to clarify what is unique about Polanyi's epistemology. It is specifically Polanyi's delineation of the hierarchical, stratified nature of comprehensive entities as brought forth by the structure of tacit knowing (not the hierarchy itself) that marks a key departure from Merleau-Ponty.

Introduction[1]

Michael Polanyi and Maurice Merleau-Ponty are often viewed as arguing for philosophical positions that are generally non-Cartesian (and/or non-representational). In a previous paper discussing Polanyi and Merleau-Ponty, I claimed that Polanyi's enactive realism "goes beyond" Merleau-Ponty's view of the primacy of lived perception.[2] I still think this is broadly accurate, but perhaps in being too eager to distinguish Polanyi from Merleau-Ponty, I did not situate their differences in terms of their overall projects. In essence, Polanyi only "goes beyond" Merleau-Ponty insofar as Polanyi's enactive realism offers a non-Cartesian *epistemology*. By contrast, Merleau-Ponty offers a philosophy of "expression"—emphasizing the *lived* dimensions of experience—that isn't properly viewed as rooted in epistemic concerns.[3] I shall argue that while this isn't a difference of kind but of emphasis, their overall projects lead to some perhaps surprising departures.

Both philosophers employ remarkably similar notions concerning the lived body, embodied bases for perceiving and knowing, gestalts, forms of emergence, and levels of experience and reality. In the following paper I shall discuss in greater detail the relations between form, boundaries, and levels. My purpose in continuing a dialogue between Polanyi and Merleau-Ponty is to further unfold enactive realism—what is "enactive" about it, what sort of (participatory) "realism" it concerns, and what sort of non-Cartesian epistemology it offers.

Polanyi on Boundary Conditions

The notion of boundary conditions is well established in various sciences, perhaps most especially concerning its use in mathematical applications. The physical application of differential equations is a paradigmatic example of the use of boundary conditions, where certain differential equations can be solved analytically given such conditions (as well as initial conditions). Examples include the heat equation, the wave equation in quantum mechanics, and so forth. From a broader conceptual viewpoint, boundary conditions isolate a system under investigation so that its "inner workings" can be controlled and studied. Polanyi recognizes the importance of utilizing boundary conditions in the sciences, since such conditions, brought forth by what he calls "higher-order principles," help to constrain other (lower-level) principles that operate within a system—even stronger, these higher-order principles *enable and structure* the parts of a system.[4]

The notion of higher-order principles is closely related to what Polanyi terms "comprehensive entities" (or achievements). There is actually a web of interrelated notions: (1) *higher-order principles* enable *other*

principles operating within a system; (2) the distinction between these two types of principles exhibits the *dual control* of systems seen from two mutually related yet distinguishable levels of operation; and (3) these levels of operation are part of an ongoing hierarchy of *achievements*. In the following sections I shall focus on (1) and (2); I discuss (3) more fully towards the end of the paper.

Polanyi distinguishes between two types of boundary conditions: one that allows us to focus on the "natural processes controlled by the boundaries," and one that allows us to harness the "effects of boundary conditions" (*KB* 226). Two simple examples of the former type that Polanyi cites are a saucepan (the boundary) in which soup—the focus of attention—is cooked (the "natural process"); and a test-tube that allows for studying certain chemical reactions. I think further examples utilizing this type of boundary condition include: simple models that serve as pedagogic exemplars in the sciences (e.g., population genetic models, ball-and-stick models of atoms, etc.); setting up experiments in controlled laboratory situations; setting up a proper randomized poll (in gathering data and making statistical inferences); and so on. This sort of boundary condition isolates a phenomenon—and thereby also indirectly structures and enacts that very situation—to more fully grasp the nature of the comprehensive entity under study. Since experience can be "diffuse" as it were, this type of boundary condition functions to harness certain potentialities, thus enabling and structuring a comprehensive entity as a meaningful whole.

The other type of boundary condition poses interest in its own right, and does not merely operate as an enabling background condition. That is, unlike when we use a test tube to study the reaction *within*—we are not interested in the test tube itself—the "reverse is true" (*KB* 226) for boundary conditions that enable *effects*. Using chess as an example, Polanyi writes that the "strategy of the player imposes boundaries on the several moves, which follow the laws of chess, but our interest lies in the boundaries—that is, in the strategy, not in the several moves as exemplifications of the laws" (*KB* 226). If the other type of boundary condition is generally about the isolating aspect of boundaries (to then study what is isolated), for this type of boundary condition the reverse is true: a game of chess, as enabled by the rules/laws, is only interesting insofar as these rules project possible strategies of interest within a game. In this case the boundaries have to do with possible constrained foci of tacit knowing that skillfully negotiate various affordances[5] to create achievements (e.g., conjuring a brilliant strategic chess move).

It is important to note that Polanyi labels this boundary condition a "machine type of boundary condition" (*KB* 226). I think caution is required in interpreting Polanyi's use of the phrase "machine type," since while indebted to a Cartesian legacy of mechanism, his deployment of various machine metaphors is generally non-Cartesian. It appears that Polanyi's machine talk is framed by the notion of "dual control," which has strong affinities with information theory and cybernetics. As I argue later in the paper, dual control (along with boundary conditions of either type) is tied to enactive realism as an *informational* (semiotic) realism.[6] The next section concentrates just on Polanyi's notion of dual control systems. His appropriation of machine metaphors invokes, not inappropriately, the use of dualistic notions that are explicitly non-Cartesian. On the dualistic side, the notion of dual control appeals to boundary conditions that utilize the two poles of "inner" and "outer," bringing comprehensive entities (machines or otherwise) into focus. And the non-Cartesian flavor of dual control systems pertains to how these systems share the same logic as that of tacit knowing, and how comprehensive entities are dynamic, integrated wholes.

The Epistemics of Dual Control

In order to appropriately interpret "dual control," there first needs to be some clarification as to what "dual" means; for whatever Polanyi's dual control is about, it is not to be understood as expressing a full-blooded Cartesian dual*ism*. The reason I emphasize this is that there is an outstanding paper on a kind of reconstructed dualism that lies within Polanyi's thought, to which I am quite sympathetic.[7] In line with such a project (though with a few "reconstructions" of my own) in this section and the next I propose to link an appropriate sense of "dual" with the previous discussion of boundary conditions.

Polanyi writes that "in certain cases the boundary conditions of a principle are in fact subject to control by other principles. These I will call higher principles" (*KB* 217). These higher principles express the recognition, from the standpoint of assessing a system, that comprehensive entities are afforded by lower-level principles, and that these affordances are in turn controlled by higher-order principles that are manifest in those entities' distinctive operations. Thus Polanyi's notion of dual control is really about "the stratified structure of comprehensive entities. They embody a combination of two principles, a higher and a lower [embedded in an ascending hierarchy of achievements]" (*KB* 217).

What does it mean for higher-order principles to enable other principles within a (bounded) system? Also what does it mean for lower-level principles to afford other higher-level principles which are not reducible to such lower-level principles? Polanyi writes that the "*higher principles which characterize a comprehensive entity cannot be defined in terms of the laws that apply to its parts in themselves*" (*KB* 217). Yet these higher principles cannot be understood without the notion of dual control. It may appear that this expresses a latent dualism separating higher from lower; however this would be a mistake. Dual control is expressive of an emergentist stance that epistemically recognizes the stratified *yet mutually informed and informing* nature of the parts and levels of comprehensive entities.

Polanyi cites a number of examples in support of dual control from information theory, language production, levels in chemistry and physics, etc. These are all fine examples that illustrate Polanyi's exposure to many fields of study, which fits with his account of the wide-ranging nature of tacit knowing. However critics may find that the lessons Polanyi draws concerning boundary conditions and dual control are perhaps too diffuse to establish the stratified nature of comprehensive entities as *emergent structures*—structures that have epistemic-ontic import. To counter such a charge, I will appropriate an example from contemporary philosophy of science to serve as an illustration of the hierarchical nature of achievements.

Robert Batterman's Rainbow Example: Illustrating an Emergentist Stance

To set the stage for the rainbow example, Robert Batterman[8] first distinguishes between two types of why-question: one that asks for an "explanation of why a given instance of a pattern obtained," and another that asks "why, in general, patterns of a given type can be expected to obtain" (*DD* 70). The former question can be answered in any number of ways, and to an extent satisfies some explanatory needs. For example, if I am asked why a particular formal derivation has the form that it does, I might respond by appealing to specifics of the conclusion and premises (which may include retracing the steps of the derivation and the rules justifying each step). But if the question is answered according to the second type, I might appeal to a meta-theorem of the system which claims that derivations of a certain pattern arise from the "interaction" of

particular system rules. What is important about the second type of why-question is that there are patterns exhibiting what Batterman calls "universality":

> 1. The details of the system (those details that would feature in a complete causal-mechanical explanation of the system's behavior) are largely irrelevant for describing the behavior of interest.
> 2. Many different systems with completely different 'micro' details will exhibit the identical behavior (*DD* 73).

A particular example of a pattern of universality—a kind of emergent property of a comprehensive entity—concerns the wave-ray account of a rainbow.

Here is a sketch of the rainbow example. (The following discussion is unavoidably semi-technical; the pace is quick. To help digest the material, I flag the key ideas in italics. I also direct the interested reader, via underlined links, to a few websites and to Batterman's diagrams providing assistance with some of the mathematical concepts.) Suppose we have a spherical raindrop where an incoming ray of light is first refracted at the point of entry, then reflected off of the inner "back wall" of the sphere, and then again refracted when coming out of the raindrop. With a set of parallel incoming rays to this sphere (given the appropriate scattering angle), some of the outputted rays form the primary bow of the rainbow, whose curve is known as a "fold caustic" (imagine, for those incoming parallel rays, a set of outputted lines that form "tangents" to define a curved line; see Figures 6.1 and 6.2, *DD* 82-3). *Key idea: what a geometrical/ray theory of optics gives us is the ability to predict the shape of the bow(s).* However, this ray theory cannot account for the "presence of so-called supernumerary bows. These are fainter arcs appearing on the lit side of the main rainbow arc. They are visible in the sky at times as faint alternating pink and green arcs [and are different from primary and secondary bows—which ray theory can accommodate; see http://www.atoptics.co.uk/rainbows/supers.htm]. Furthermore, since actual rainbows do not exhibit light of infinite intensity, [this] singularity [when on the "fold caustic"—informally, the bowed shape of a rainbow after] predicted by the ray theory cannot be realistic" (*DD* 82-3). To cover the former gap, wave theory employs the "Airy Integral" (along with additional tools from the wave theory of light) which yields the interference patterns that account for supernumerary bows (see http://www.ams.org/samplings/feature-column/fcarc-rainbows). So it would seem that ray theory and wave theory are all that is needed. But the question remains, how do ray theory and the Airy Integral interrelate? *Key idea: in providing a proper account of a rainbow, it would be theoretically troublesome to simply patch together theories, appealing to one theory where the other is incomplete in order to cover the phenomena.*

The misleading metaphor that the Airy integral gives "the wave flesh that decorates the ray theoretic bones" (*DD* 84) makes it seem as if in the limit the two theories form a smooth theoretical patchwork. Accordingly, Batterman raises the question, just how much can the wave theory really capture? *Key idea: the answer turns out to be surprising: at the very place in which one would hope that the wave theory transitions smoothly into what the ray theory yields, it actually falls apart.* A qualitative sketch of the idea goes as follows. Take an arbitrary "wavefront" (as a simple illustration, a concentric light-sphere emanating from a candle). The coordinates on the wavefront can then be used to define rays as lines perpendicular to the surface (the light-rays emanating from the candle are perpendicular to the spherical wavefront). Next, take a patch around a ray and project it to get a "ray tube" (also the patch is used to define an energy flux—the rate at which the patch changes). Such a tube can be used to approximate the wave intensity, and the hope is that the tube and the wave intensity will (everywhere) smoothly interrelate to one another (see Figure 6.7, *DD* 89). As this

pertains to the wave-ray account of rainbows, unfortunately what happens is that the energy flux on the light-surface/wavefront and the energy flux at the projected point (on the caustic/bow) don't smoothly interrelate, for when the patch at the focal point shrinks to zero, the function blows up. The "interfering ray sum [which encapsulates the wave-ray patchwork] cannot describe the nature of the wave near and on a caustic. *In other words, it breaks down exactly where we need it most*. . . Caustics and focal points are the primary objects of study in optics, but the interfering ray sum fails exactly at those places" (*DD* 88). *Key idea: in Polanyian terms, it would be hasty to infer from such a failure that boundaries—such as those between the wave and ray accounts—are merely artifacts of an observer's limitations, are merely heuristic devices, or are merely expressions of limited theoretical machinery; for as it will be argued, the implicit epistemic-ontological issues concerning the status of boundaries occur even in "simple" cases like the wave-ray account of a rainbow.*

A further weakness of the wave-ray patchwork is that one of the functions in the "interfering ray sum" depends on the shape of the raindrop. If raindrops deviate from the spherical shape, different solutions are generated that also deviate from actual rainbow phenomena. But "we observe, as a matter of empirical fact, that despite the fact that raindrops have different shapes, the *patterns* in intensity and in fringe spacings that decorate the caustics are similar. *These patterns are universal*" (*DD* 90). The structures that capture such universal patterns are the caustics, which (technically) are "catastrophes." A better account is given in order to understand the limiting, asymptotic borderland between the ray and wave theories—namely "catastrophe optics" (see http://www.phy.bris.ac.uk/people/berry_mv/pictures/poster1.pdf). The central new idea is that a catastrophe defines an "equivalence class" over a range of perturbations (different raindrops), sort of like the way a calculator defines a heterogeneous class of functional "equivalents" (counting on fingers, or using an abacus, or using a digital calculator, etc.). *Key idea: this better account, discussed below, is an instance of what Batterman calls "asymptotic reasoning," which tacitly appeals to boundary conditions and the importance of distinguishing between higher-order principles and the principles within a system.*

In the case of rainbows, asymptotic reasoning occurs in the following way. First, the interfering ray sum is put into a "generalized wave function" form, and then another generalized equation is given for the "fold caustic catastrophe" (the catastrophe type relevant to the shape of rainbows). Finally, a generalized (asymptotic) equation defines a "scaling law" that discloses a (self-similar) pattern which is universal across various perturbations. This scaling law relates the two other generalized equations, one wavelength dependent (and so can give the intensities and fringe spacings needed to account for supernumery bows) and the other wavelength independent (since it describes the stable shape of the rainbow). Taking the wavelength to zero, the fringes and intensities don't exist at the limit and the caustic takes over (we get a "raw, unadorned bow"); when the wavelength is too large the "noise" drowns the caustic pattern (there is no bow—just "colors"); and if the wavelength is perturbed within certain bounds, both the caustic and the interference patterns yield bowed, colorful rainbow phenomena. *Key idea: the scaling law operates as a higher-order principle that structures the principles operating within the system—in this case, the principles embodied in the wave equation and the ray equation (strictly speaking, what are now the wavelength and caustic elements in catastrophe optics).*

What we have is a mediating law (the scaling law) that does not belong to either the ray or wave theories. The first implication is that the mathematical scaling law is not reducible to its component parts, since in particular the singularity of the caustic is different from the wave approximations**.** *Key idea: higher-order principles disclose emergent properties that are more than the sum of their parts, as Polanyi generally claims.* The second and most crucial implication is that the scaling law requires higher-level orientations in order to reveal and delimit the equivalence class of microstates captured by the generalized caustic equation.

Specifically, rainbow phenomena are oriented by systems of raindrops and the (scaling) interrelations they have with perception, optics, and wave physics. These systems are only revealed by the higher-level perspectives adopted—perspectives that afford the qualitative distinctions between macrolevels and microlevels. In other words, to understand emergent rainbow phenomena—the relevant objects of *interest*—higher-level perspectives must be adopted. The upshot is that such perspectives are not merely "perspectival"; rather, the systems orientation epistemically adopted enacts ontological structure.

Summary of key ideas: Higher-order principles not only structure lower-level principles within a system, but such higher-order principles can epistemically enact a hierarchy of levels of reality (more on this crucial claim at the end of the paper). Furthermore, the notion of dual control requires that the interrelations between lower and higher levels be taken into account to bring properly into relief the nature of comprehensive, stratified entities—e.g., at one hierarchical region concerning the relations between lower-level wave and ray elements and the higher-level scaling law (where the lower level provides affordances for this higher level, but the scaling law cannot be reduced to the lower level); moving up the hierarchy, the relations between the (now) lower-level scaling law and the higher-level systems interrelating perception, raindrops, etc. (where this lower level provides affordances for these higher-level systems, but these higher-level systems cannot be reduced to the scaling law—after all, the scaling law by itself has no direct bearing on perception, systems of raindrops, etc.); and moving up again, the relations between the (now) lower-level systems interrelating perception, raindrops, etc. and the higher phenomenal level concerning actually seeing a beautiful rainbow (where these lower-level systems afford phenomenal seeing, but where such seeing has a "horizon" of its own, as Merleau-Ponty generally argues). To quote from Polanyi, "each level is subject to dual control: (i) control in accordance with the laws that apply to its elements in themselves, and (ii) control in accordance with the laws of the powers that control the comprehensive entity formed by these elements" (*KB* 233).

The Ontology of Comprehensive Entities and the Logic of Tacit Knowing

Since I shall later more fully discuss comprehensive entities, the purpose of this section is to draw attention to the parallel between comprehensive entities and tacit knowing. This parallel serves as a transition to Merleau-Ponty's earlier work and his similar use of duality and levels.

Polanyi writes that the "logical structure of tacit knowing covers in every detail the ontological structure of a combined pair of levels [pertaining to dual control]" (*KB* 218). The mapping concerns the four aspects of tacit knowing—the functional (how subsidiaries bear upon a focus), semantic (the meaning of parts as they bear on a whole), phenomenal (the gestalt nature of a whole), and ontological (a whole as a comprehensive entity).[9] To illustrate using the rainbow example, fixing our attention on the scaling law as a whole and its subsidiary wave and ray parts (technically, the generalized wave equation and the fold caustic catastrophe), the *functional* aspect of tacit knowing maps to the manner in which the wave and ray parts are accommodated within the scaling law. Neither of these parts are sufficient to reveal the nature of the scaling law; thus the scaling law operates as a higher principle at work integrating the particular wave and ray parts, where the boundaries concern the structural shapes of rainbows (ray), the colors of rainbows (wave), and the overall delimitation of the interaction of these two. The *semantic* aspect concerns how these parts bear on a whole—the scaling law—since this whole brings into focus the meaning of the parts: wave elements relate to our interest in the colors that rainbows manifest, and ray elements relate to our interest in the shapes of rainbows. The *phenomenal* aspect concerns the emergent scaling law that, *as a whole*, has new properties not found in

the parts themselves (cf. *KB* 218). Lastly the *ontological* aspect pertains to the hierarchy of comprehensive entities—not just at a single perspective of dual control (e.g., at one hierarchical region concentrating on the "lower" scaling law and "higher" systems interrelating optics, perception, etc.), but also at the numerous levels of dynamic interaction.

It may appear that this parallel between tacit knowing and comprehensive entities leaves open key philosophical questions about the exact relation between the two. Is it a coherence relation? A correspondence relation? I suggest that while it contains elements of both, neither suffices, since such proposals obscure the nature of Polanyi's post-critical philosophy. The relation between the two is an enactive one. While there is "coherence within" and "correspondence between" the two—i.e., the aspects of tacit knowing and comprehensive entities are *integrated* aspects ("coherence") that share the *exact same* logic ("correspondence")—what neither of these terms capture is the dynamic nature of Polanyi's fiduciary program. As I will provide a synthesis at the end of paper to address the nature of "enactive realism," it is important to keep in mind that the relation between tacit knowing and comprehensive entities is fundamentally transactional and commitment-based.[10]

I previously characterized enactive realism as "a fusion of being-in-the-world with consequential commitments that aim at levels of achievement—levels that include emergent comprehensions of the world, and their related commitments to emergent realities yet to be discovered" (*TAD* 36:2 [2009-2010]: 36). I interpreted being-in-the-world through the lens of Merleau-Ponty and claimed (somewhat hastily) that Polanyi "goes beyond" Merleau-Ponty due to the consequential, committal nature of tacit knowing. As mentioned at the beginning of the paper, I still think this is generally true, but with important caveats. What I did not realize then is that there are far more profound resonances with (and resources within) Merleau-Ponty's philosophy. In Polanyi's own words, he thinks the key difference between himself and Merleau-Ponty lies in his development of the logic of tacit knowing and his theory of the ontological stratification of comprehensive entities (*KB* 222). This is not wholly true. In Merleau-Ponty's earlier works (specifically *Structure of Behavior* and *Phenomenology of Perception*) there are similar resources that he appeals to: levels of reality, something like dual control, the importance of forms and gestalts, and so forth.

The intent in the next two sections isn't merely to draw suggestive parallels between Polanyi and Merleau-Ponty. Rather the purpose of discussing Merleau-Ponty's similar resources is to indicate how his development of "being-in-the-world," whose trajectory is *not* epistemically oriented, leads to a dissolving of the very parallel between tacit knowing and comprehensive entities that Polanyi needs for his epistemological orientation.

Merleau-Ponty on Form

The notion of form is crucial for Merleau-Ponty since it concerns his interpretation of gestalts and their bearing upon lived being-in-the-world. What Merleau-Ponty has to say about form resonates with the gestalt aspect of tacit knowing and the creation of comprehensive entities: forms "are defined as total processes whose properties are not the sum of those which the isolated parts would possess."[11] Furthermore, such forms are embedded in a dynamic duality that parallels the subsidiary-focus structure of tacit knowing: "There is always a duality that appears at one level or another: [e.g.,] hunger or thirst prevents thought or feeling. . . This duality is not a simple fact; it is founded in principle—all integration presupposing the normal functioning of subordinated formations, which always demand their own due" (*SB* 210). These subordinated formations are viewable as subsidiary, tacit skills that enable further integrations.

As with tacit knowing, these integrative forms are transactional. Thus this duality is "not a duality of substances" (*SB* 210), but rather, to employ Polanyian language, a duality of the subsidiary-focus structure that is geared towards achievements: "The body in general is an ensemble of paths already traced, of powers already constituted; the body is the acquired dialectical soil upon which higher 'formation' is accomplished, and the soul is the meaning which is then established" (*SB* 210). Here "body" and "soul" are understood in a non-Cartesian way; even stronger, the Cartesian order of things is being problematized. Body is always already there, providing a tacit fund for "accomplished formations." The meaning of the bodily subsidiaries is brought into relief by the very enactions of "minding" (to borrow a useful term from Marjorie Grene)—mind is not a separate substance interacting with body; rather body-"ing" and mind-"ing" are configured-and-configuring modes of lived reality.

An example provided by Merleau-Ponty illustrates these claims. The duals of body and mind are not to be separated, on the one hand, into objects of interest and, on the other hand, into the mind's ability to grasp such objects via perception. The picture he is offering shifts the Cartesian problem of the relation between knower and known: the relation is not one of coming to know objects; rather the task is to reveal how objects are "lived as realities" (*SB* 168). Using soccer as an example, Merleau-Ponty contests the view of the soccer field as a sort of projected "Cartesian theater," where the "given" playing field is viewed as circumscribing ensuing games. By contrast, for a "player in action" the soccer field "is pervaded by lines of force (the 'yard lines'; those which demarcate the 'penalty area') and articulated in sectors (for example, the 'openings' between adversaries) which call for a certain mode of action and which initiate and guide the action as if the player were unaware of it" (*SB* 168). Merleau-Ponty is not referencing the literal yard lines as such (nor the literal spaces between adversaries), but rather is gesturing towards the skillful modes of action that can dynamically ensue in the course of the game—dynamics that enact creative, lived realities. Thus he goes on to write: "The field itself is not given to [the player], but [is] present as the immanent term of his practical intentions; the player becomes one with it and feels the direction of the 'goal', for example, just as immediately as the vertical and the horizontal planes of his own body" (*SB* 168). Put in Polanyian terms, the blind man who skillfully projects his cane as a probe enacts creative, lived realities when negotiating his surroundings.

The notion of "lived realities" suggests that there is no genuine divide between knower and known. Merely emphasizing the interaction between these two poles is not sufficient, since one may import subtle Cartesian assumptions when examining such interrelations. As Merleau-Ponty argues, there is an irreducible "dialectic of action and milieu" for the soccer player and the field: "Each maneuver undertaken by the player modifies the character of the field and establishes in it new lines of force in which the action in turn unfolds and is accomplished, again altering the phenomenological field" (*SB* 169). To guard against the lurking dangers of Cartesianism, I submit that Grene's notion of minding is headed in the right direction: to emphasize the irreducible nature of the dialectic of knower and known, the player's actions are expressive of "minding-and-fielding," as it were.

Merleau-Ponty, as with Polanyi, utilizes the notions of form, dual levels of interaction, and so forth. And while both emphasize the irreducible nature of the "dialectic" of knower and known, Polanyi claims that what differentiates him from Merleau-Ponty is an explicit *logic* of tacit knowing, and a *theory* of ontological stratification. As I read this difference, I suspect that it stems from differing overall orientations—in particular, Polanyi's epistemological orientation. For Merleau-Ponty isn't concerned with providing a "logic" of lived realities; he is concerned rather to "re-awaken [us] to the enigmatic richness of [our] own lived experience."[12]

As for Polanyi's theory of ontological stratification, while Merleau-Ponty also employs the notion of levels of experience, I suspect likewise that his overall differing orientation leads him away from an inquiry into emergent levels of reality and instead to concentrate on the "enigmatic richness" of lived emergence. To emphasize this focus on lived experience, in the next section I outline what Lawrence Hass calls Merleau-Ponty's "philosophy of expression."

Merleau-Ponty's Philosophy of Expression

In essence, expression discloses the intertwining of form, duality, and embodied perception. Hass argues that in contrast with Cartesian "re-presentationalism," Merleau-Ponty emphasizes the "presentational" aspects of perception: "Perception is not 'inside' me…but rather emerges *between* my organizing, sensing body and the things of the world. It is a *synergy*, to use Merleau-Ponty's favored term" (*MP* 36). Thus we might characterize form, duality, and perception as "enfolding" synergies. For example, in the *Structure of Behavior*, Merleau-Ponty holds that behavior is a fundamental category of action that is neither a mere outer object of study nor a mere inner idea; it is a *form* that is a configuration of relations—it is a potency of possible *embodied* interactions between *levels* of experience. This synergy is expressive of the enfolded "working together of body, things, others, and the world [which] is an interactional field that emerges at the nexus of its participants [and that] we call *experience*" (*MP* 36).

Duality concerns the enabling synergies that are revealed in forms of experience. Examples of this "two-fold dynamic" include: "(1) the habit body and the personal body, (2) the impersonal and the personal, (3) the biological and the individual, (4) the sedimented and the spontaneous, (5) the organic and the existential" (*MP* 87). These are "dynamic aspects of the same living body" (*MP* 87), where one level enables a higher level and where the higher level also expresses new degrees of freedom, as its own form. What all of these insights are driving towards is expression—the disclosing of lived experience. Since lived experience involves continually adapting to changing circumstances, it should be no surprise that the core idea of expression is creative transformation that responds to created forms as it moves towards creating novel forms.

Expression is thus illustrated by the inextricably interactive minding-and-fielding relation, "whereby some overwhelming initial form, figure, datum, or image, is creatively transformed and reorganized in a way that radiates new meaning or insight, and which brings a strong feeling of necessity" (*MP* 160). In other words, some initial form, etc., presents a feeling-vector that is the occasion for creative transfiguration of those materials into a new dynamic form—a form invested with a committal aspect. In such a manner, as Hass says about Merleau-Ponty:

> truths are "discovered"; in fact, they are *acquired* through the patient, sometimes frustrating, sometimes delirious labor of expression. Again, the reason such a reorganizing, crystallizing operation is required for knowledge is not because our experience of the world is impoverished, but rather because it is so full of half-hidden forms and figures, overflowing in meaning and possible perspectives (*MP* 160).

Merleau-Ponty's philosophy of expression, in the larger scheme of things, ends up emphasizing neither synergy as such, nor dynamism, form, embodiment, duality, and so forth. What expression highlights is the fundamental *creativity* present in such synergy, dynamism, etc. As Merleau-Ponty writes, "lived consciousness does not

exhaust the human dialectic. What defines man is not the capacity to create a second nature—economic, social, or cultural—beyond biological nature; it is rather the capacity of going beyond created structures in order to create others" (*SB* 175).

To revisit the earlier image of the soccer player, the player's relation to the field and other players is one of creative improvisation. In dynamically responding to an opponent in a region of the field, at a crucial period of the game, the player may enact a spectacular play—a play that is an irreducible synergy of "action and milieu." The irreducible, richly contextual form of this play is a fundamentally expressive, creative form. Thus what expression highlights is the overflowing potency of *living* synergy, *living* dynamism, etc.

As it stands, I think the above claims are not incompatible with Polanyi; however the differing overall projects of Polanyi and Merleau-Ponty lead to differing philosophical inquiries. One place where a difference becomes manifest concerns how form is characterized. For Polanyi, form highlights the emergence of comprehensive entities—e.g., the spectacular play as a novel achievement of the skilled soccer player. Certainly such an achievement is "expressive" of a fundamental creativity, and certainly Polanyi's hierarchy of achievements is a dynamic—not static—structure. However the emphasis is on the *structures* enacted by tacit knowing's fiduciary element. By contrast, Merleau-Ponty's philosophy of expression highlights the overflowing *creativity* of experience, where form ends up being used to disclose the "furious" manner in which creativity is irreducibly intertwined with created structures (similar to a fund of tacit skills) and the activity of creating (similar to tacit knowing's "thrusting" aspect) (cf. *SB* 47). While there is duality and levels of experience in Merleau-Ponty, there is no preoccupation with working out a hierarchy of achievements (although he does recognize three general "orders": the physical, the vital, and the human). Similarly, while something like tacit knowing is present in Merleau-Ponty, there is no preoccupation with providing a logic of tacit knowing. These are epistemically driven concerns—which is why Polanyi investigates such matters—requiring some degree of dual-"ism" when stepping back and inquiring into the relations between knower and known. By contrast, Merleau-Ponty concentrates his investigations on the phenomenological dimensions of perception—the disclosure of the grounds for experiencing.

As mentioned earlier, in a previous paper, I argued that enactive realism is "a fusion of being-in-the-world with consequential commitments that aim at levels of achievement," where being-in-the-world was interpreted through the lens of Merleau-Ponty. I also argued that Merleau-Ponty places emphasis on "going back" to the primacy of perception, whereas Polanyi emphasizes the consequential (and hierarchical) nature of achievements. Given the above discussion, the nuance I would like to add is that Merleau-Ponty is not merely going back to the lived dimensions of experience; he is also drawing our attention to the vital aspects of perception and its continual *re*-invested, *re*-vitalized nature—the nexus of creativity as living and continually expressing. In brief, Merleau-Ponty's investigations explore the different ways of "singing the world"—Hass's phrase (taken from the *Phenomenology of Perception*) encapsulating Merleau-Ponty's philosophy of expression. Thus while levels of achievements appear generally compatible with Merleau-Ponty's philosophy, if Merleau-Ponty were presented with a *theory* of ontological stratification, I suspect that he would reject it as a distortion and draw attention to the creative synergies enacting such a theory.

A potential problem arises if we assume that Polanyi retains some residual Cartesianism. For as Hass notes, to start with a "problem" of body and mind is to make a split that itself may be the source of its own entrapment; in particular, to try to put body and mind back together may be impossible given the "humpty-

dumpty" nature of the fractured starting point (*MP* Ch.3). If Polanyi's theory of ontological stratification can justly be accused of containing some residual Cartesian dualism (not merely the employment of duality), then Merleau-Ponty would probably reject Polanyi's logic of tacit knowing and his theory of ontological stratification (but perhaps not the similar resources both employ). I shall argue that there is a way to finesse these issues.

Enactive Realism, Hierarchies, and Information

Phil Mullins observes that many of the "dualistic conceptual metaphors—mind and matter, subject and world, idealism and materialism—that are deeply embedded in the traditions of modern philosophical thought are not very helpful points of reference for Polanyi's constructive thought."[13] In line with this observation, Polanyi's use of machine metaphors pertaining to dual control—which opens a space for ontological stratification—ought to be given a reading that emphasizes the dynamic, constructive elements of his thought.

The idea that a higher level of achievement controls or structures lower levels (and where lower levels afford a higher level) is an idea stemming from Polanyi's employment of boundary conditions. For example, Polanyi reflects on how the idea of boundary conditions is utilized by biologists when "explaining living beings by the laws of inanimate nature…what they actually do is to explain certain aspects of life by *machine-like principles*" (*KB* 154). To illustrate, DNA, whose structure can be delineated at physical and chemical levels, still needs a higher-order perspective to reveal why DNA is the stuff of life. This higher-level perspective is an informational one, where the messages contained in DNA are accounted for via an information-processing perspective—the machine-like principles concern the higher-order "algorithmic" nature of DNA that transforms physical and chemical processes into living processes.[14] What I am drawing attention to in Polanyi's use of boundaries, levels, duality, etc. as they figure in his theory of ontological stratification is the employment of information, broadly speaking: *explaining* done by biologists, the *messages* in DNA that are disclosed via higher-order principles, and more generally the notion of a hierarchy of achievements consisting of *meaningful* wholes.

This insight fits with Polanyi's epistemological stance, as he primarily views things not from an ontological perspective, but from one that takes the fiduciary element of knowers seriously. Thus Mullins notes that the independence of real entities is "fundamentally an affirmation about the nature of discovery, the public nature of knowledge and the importance of inquiry. The few ontological or metaphysical claims that Polanyi makes grow out of epistemological claims and not vice versa" (*RM* 46). It is a seduction of Cartesianism to problematize the nature of things once the separation between knower and known is made. Polanyi appears to manifest a residual Cartesianism when talking about scientific *discovery*, and it may be asked whether the very epistemic enterprise of scientific discovery cannot help but contain some Cartesian and/or representationalist residue (as Lowney has observed). Polanyi writes: "Discovery, invention—these words have connotations which recall what I have said before about understanding as a search for a hidden reality. One can discover only something that was already there, ready to be discovered" (*SM* 35). But he then goes on to note that the emphasis is not on the "there" of a hidden reality; the emphasis is on the fiduciary element: "you cannot discover or invent anything unless you are convinced that it is there, ready to be found" (*SM* 35).

Terms like "discovery" (and to a lesser extent "invention") certainly appear to contain a Cartesian residue. However rather than draw attention to such residues which may lie within duality, boundary, and

hierarchy, I think attention ought to be focused on the dynamic aspects of Polanyi's fiduciary program. This focus brings us to what I term Polanyi's "enactive realism." The participation of a knower, as part of a nexus of hierarchical achievements, emphasizes not a residual Cartesianism but rather something else altogether:

> the *participation* of the knower in the things he knows *increases steadily* as the objects of knowledge ascend to ever higher levels of existence, and that, correspondingly, the observer also applies *ever higher standards of appreciation* to the things known by him. These two trends will combine to an ever more ample and also more equal *sharing of existence between* the knower and the known, so that when we reach the point at which one man knows another man, the knower so fully dwells in that which he knows, that we can no longer place the two on different logical levels. This is to say that when we arrive at the contemplation of a human being as a responsible person, and we apply to him the same standards as we accept for ourselves, our knowledge of him has definitely *lost the character of an observation* and has become an *encounter* instead [emphases mine] (*SM* 94-5).

Thus I suspect that concentrating on Cartesian residues may encourage an unsafe preoccupation with mind-body relations, losing sight of the trajectory of Polanyi's overall project—a project whose epistemic stance is geared towards a continuum of modes of tacit knowing. Without this perspective, it would be problematic to make sense of why "observation" is not the right term to apply to the higher levels of achievement, and why "encounter" is.[15]

To avoid the Cartesian associations of duality, boundary, hierarchy, and the like, I've opted to interpret Polanyi's realism as an enactive realism: consequential commitments and participation in communities of inquiry enact achievements—achievements that disclose these hidden "realities" at any hierarchical level. As with Merleau-Ponty, to start with a problem of how knower and known relate is to start in the wrong place—it is to try to put "Humpty Dumpty" back together when it should never have been fractured in the first place. Thus the "problem" of how the structure of tacit knowing parallels that of a stratified ontology conjures, I submit, a misleading conceptual framework. This is especially revealed at the higher levels of knowing, where, as quoted above, there is an "ever more ample and also more equal *sharing of existence between* the knower and the known." What kind of existence is this? It is an enactive, fiduciary, participatory one. This answer may not appear entirely satisfactory, since it could be argued that it hides an implicit representationalism. Here is where the idea that enactive realism, as an *informational* realism, gains traction; this "informational turn" attempts to address why enactive realism is non-Cartesian and yet can make legitimate use of notions like duality, levels, and the like.

First, I ought to note that the exact nature of information remains open.[16] In spite of the lack of a precise characterization of what information is (given its many senses), one useful working definition of information provided by Gregory Bateson is that information is a difference that makes a difference.[17] Why information matters is that it is something not reducible to either matter or energy, and apparently has fundamental roles to play in all domains of inquiry.[18] I think that Polanyi implicitly recognizes the fundamental importance of information as it bears upon dual control and the generation of hierarchies of being. Indeed, Polanyi draws a distinction between something like syntactic and semantic information when discussing the difference between mechanical types of processes and comprehensive processes, as they are "interwoven" for living beings:

> Living beings function according to two always interwoven principles, namely as machines and by 'regulation'. Machine-like functions operate ideally by fixed structures; the ideal

> case of regulation is an equipotential integration of all parts in a joint performance. Both kinds of performances are defined by rules of rightness and these refer in either case to a comprehensive biotic entity. But there is this difference. Machine-like functions are ideally defined by precise operational principles, while the rightness of a regulative achievement can be expressed only in gestalt-like terms. *One's comprehension of a machine is, accordingly, analytical, while one's appraisal of regulation is a purely skillful knowing, a connoisseurship* (*PK* 342).

On the informational reading I am proposing, the machine-like operations might be cashed out in computational terms (e.g., viewing DNA as a computational process), while regulative achievements require a higher-order account that relates the capacity of a knower—one's connoisseurship—to the objects of study (a signified—e.g., a living, active heart—and a sign—e.g., the physiology of that heart).[19] Each of these levels is informative; furthermore, as the levels dynamically interrelate, they also bring into relief new information (i.e., the levels enable new differences to be seen) about living beings as emergent entities.

Enactive realism is, in brief, an informational realism about emergent entities. The "enactive" dimension concerns information that is always processed within some context: as Evan Thompson writes, a living being "brings forth or enacts meaning in structural coupling with its environment. The meaning of a [living being's] states are formed within the context of the system's dynamics and structural coupling."[20] Thus I propose the following reconstruction of Polanyi: while it appears that there is a residual dual-ism in Polanyi's thought—perhaps due to his residual employment of certain Cartesian presuppositions—duality (boundaries, hierarchies) need not fall prey to the entrapments of dualism or representationalism. Additionally, the term "representation" receives the following reconstruction by Thompson on his enactive approach:

> Representational 'vehicles' (the structures or processes that embody meaning) are temporally extended patterns of activity that can crisscross the brain-body-world boundaries, and the meanings or contents they embody are brought forth or enacted in the context of the system's structural coupling with the environment. . .Instead of internally representing an external world in some Cartesian sense, [such systems] enact an environment inseparable from their own structure and actions. In phenomenological language, they constitute (disclose) a world that bears the stamp of their own structure (*ML* 59).

Rather than recasting the Cartesian body-mind problem, an enactive approach allows for a "recasting of this recasting," as it were. That is, instead of arguing for Polanyi's recasting of the mind-body problem (which apparently ends up ensnaring even Polanyi[21]), an enactive approach proposes a "body-body problem," which "concerns the relation between one's body as one subjectively lives it and one's body as an organism in the world" (*ML* 244). The "gap is no longer between two radically different ontologies ('mental' and 'physical') but between two types within one typology of embodiment (subjectively lived body and living body)" (*ML* 224).[22] On this reading, Polanyi's dual control theory and Merleau-Ponty's use of duality are still broadly compatible, as they (differentially) explore the overflowing, embodied ways of "singing the world."

Enactive realism is an epistemic position that inquires into informational hierarchies of achievements via a two-fold strategy: it investigates each side of a dual to disclose differences that make a difference, specifically the emergent features of achievements (e.g., recall the discussion of duality, boundaries, levels, and emergence in the rainbow example). In other words, an enactive approach to the body-body problem is "best understood not as an attempt to close the comparative explanatory gaps in a reductive sense, but instead

as an attempt to bridge these gaps by deploying new [non-Cartesian] theoretical resources" (*ML* 255). These gaps between duals still crucially fall within "one typology of embodiment," whose duals mutually in-form one another.

Expression, Hierarchies, Rainbows

So wherein lies the difference between Merleau-Ponty's philosophy of expression and Polanyi's focus on the logic of tacit knowing and his theory of ontological stratification? My strategy above was to first argue for a reconstruction of Polanyi which preserves his continuum of modes of tacit knowing and avoids the issues of residual Cartesianism and (analytic) representationalism. Given this reconstruction, I argue that while the difference between these two thinkers is one of emphasis, not kind, their overall projects lead them to explore differing aspects of "tacit knowing's realm," resulting in some significant departures.

I previously claimed that the major difference between Polanyi and Merleau-Ponty is the former's emphasis on consequential commitments afforded by tacit knowing's ontological dimension. This is not quite accurate, since in Merleau-Ponty's earlier work there is apparently some minimal fiduciary element of inquiry that gestures toward hidden realities (what he calls "eternal significations" [*SB* 224]). However it still remains that Polanyi presents a more developed account of ontological stratification, which stems mainly from his epistemic concern with understanding comprehensive entities as emergent entities. If anything, Merleau-Ponty appears to take emergence for granted, drawing attention "back" to the rich dimensions of lived experience. The larger trajectory of Merleau-Ponty's thought actually takes him further away from any potential theory of ontological stratification. His worry about residual dualism in his earlier works and attempt to overcome them in his later phenomenological investigations (using new language such as "flesh," "*écart*," and "chiasm") are prominent features of Merleau-Ponty's overall philosophy of expression.

The broad compatibility of Polanyi and Merleau-Ponty stems from the continuum of modes of tacit knowing and its overflowing, expressive richness. But given such richness, there are innumerable ways to reveal the inexhaustible dimensions of tacit knowing. Thus Polanyi's epistemic concerns, one would expect, would lead to inquiries into dimensions of tacit knowing that, while lived and dynamic, emphasize *understanding* (explaining, describing, etc.) such dimensions. In order for understanding (explaining, describing, etc.) to be meaningful to a knower, it has to be *informative*. Using an analogy to clarify this point, consider the use of computer and mathematical models in climate science for understanding aspects of the global climate system. If our models were so rich as to capture the actual global system, we'd apparently have the "thing itself," but no comprehension since too much information would be present. A crucial component of understanding (explaining, etc.) is that such models streamline information so that they shed light on complex phenomena for situated, embodied knowers.

To revisit the rainbow example, understanding a rainbow's complex dynamics requires levels of understanding that draw from physics, optics, perception, etc. These levels of achievement are informative to varying degrees, all of which can enact a renewed appreciation of rainbow phenomena. But dwelling in these levels to understand how rainbows work still presupposes an implicit appeal to information that is informative *for an inquirer concerned with a certain level of achievement*. By contrast, as with performing an act that relies on a fund of tacit skills—where when performing the act one does not simultaneously inquire into its subsidiaries—focusing on the "expressive" capacities of rainbow phenomena does not draw attention to the supporting structure of tacit knowing (which would correspond to focusing on its enabling subsidiaries) but

rather on the creative, lived dimensions of experiencing rainbows. In brief, focusing on expression is not about an informative understanding, but is rather about a "surplus" of expressively lived information.

It may be objected that Merleau-Ponty's concern with reawakening us to the enigmatic richness of experience is a sort of understanding. True enough, but I think it would be inappropriate to think of such "understanding" as geared towards being epistemically informative. It is better characterized as disclosing creativity-in-action, whose capacities express the overflowing vitality of information. Such a reawakening is not about developing a logic of tacit knowing; indeed, drawing attention to such a logic would be an inappropriate "object" of attention for Merleau-Ponty, akin to re-directing attention to the subsidiaries of an act to further understand how that act works. Drawing attention to the multiplicity of ways of dwelling in phenomenological fields is explicitly not to develop a logic of tacit knowing—nor to develop a theory of its parallel stratified ontological structure—but rather to reveal the contextual vitality of information that is always already (creatively) there.

Thus what these two projects foreground reveals their differing trajectories. Polanyi's enactive realism emphasizes epistemic informativeness, where the informational hierarchies enacted by inquiry are part of an overall philosophical program that departs from Merleau-Ponty's philosophy of expression. The significant differences pertain to the aspects of information they explore—one epistemically oriented, the other expressively oriented. In brief, Polanyi and Merleau-Ponty are drawing attention to different meaningful wholes that are enacted in lived experience. A rainbow, for example, involves a nexus of relations, and as such it can be understood at numerous hierarchical levels of emergent interest, each of which has meaningful wholes pertaining to these background interests. But this overflowing nexus also presents rich phenomenological possibilities, where there are inexhaustible ways of "singing" rainbows as expressive wholes. These two sorts of dynamism are in the end quite different: one seeks to grasp, while the other presents always half-hidden mysteries.

Endnotes

[1]Thanks to Mary Tiles for numerous helpful comments on earlier portions of this paper, and to Phil Mullins and three anonymous referees for their insightful feedback.

[2]Kyle Takaki, "Embodied Knowing," *Tradition and Discovery* 36:2 (2009-10): 26-39.

[3]Lawrence Hass, *Merleau-Ponty's Philosophy* (Indiana University Press, 2008); referred to as *MP*. See also Gary Madison, *The Phenomenology of Merleau-Ponty* (Chicago University Press, 1981).

[4]Compare Harry Prosch, *Michael Polanyi* (State University of New York Press, 1986), 126.

[5]My use of J.J. Gibson's notion of "affordances" doesn't highlight invariant patterns within an optic array; rather I emphasize enactive potentialities that are dynamically enmeshed with the structure of commitments.

[6]The informational account I propose is semiotic in a broad Peircean sense, and is only committed to the minimal triadic dynamical structure of sign, signified, and the capacity in which these two are related. Such an approach appears compatible with any number of accounts of information—whether computational, syntactic, semantic, or causal, for example—although I shall not argue for this claim.

[7]Charles Lowney (with Florentien Verhage), "*Of One Mind? Merleau-Ponty and Polanyi on the Reduction of Mind to Body*" (unpublished manuscript, presented in Nov. 2009 at the Polanyi Society Meeting in Montreal). A referee has offered the following illuminating overview:

> In that paper, Lowney showed how a strong dichotomy between matter and spirit or body and mind is undermined by Polanyi's twin dualisms of a from-to structure of knowing and dual control. Polanyi

presents what Lowney called an "epistemontology" because ultimately knowing cannot cleanly be divided from the discovery or creation of being, but Lowney also showed how Polanyi tacitly retains some residual analytic presuppositions that Merleau-Ponty lacked, primarily (1) the dualistic assumption that underlies representationalism, i.e., that our knowing must re-construct the world and bridge over to reality and (2) the analytic fear that joint comprehensions and hierarchies might dissolve into their atomic components if the unity of wholes are not accounted for. Polanyi sees Merleau-Ponty's work as a brilliant phenomenology but as theoretically inadequate since, Lowney claims, behaviorist and materialist reductionisms are not safeguarded against as they are by the theoretical structure of tacit knowing and emergent being. Merleau-Ponty, in contrast, ultimately sees our experience of the world as primary; it is always already present and efforts to dissect the ground of how we understand or experience it will tend to distort. Merleau-Ponty thus opts for a plurality of being rather than a hierarchy of being. Lowney concludes that without Polanyi's assumptions, Merleau-Ponty does not need Polanyi's safeguards, but if efforts to understand inevitably require that analyses and distinctions be made, it may be better to side with Polanyi and defuse and solve the problem of Cartesian dualisms with his dual dualisms, rather than attempt to dissolve all dualisms. What Takaki seems to emphasize is how analyses and upper level distinctions brought to bear can actually bring reality into focus as a creative discovery (in agreement with Polanyi), rather than as a distortion of primary experience (as Merleau-Ponty might see it). This seems the primary virtue of calling Polanyi's philosophy an enactive realism.

[8]Robert Batterman, *The Devil in the Details* (Oxford University Press, 2001); referred to as *DD*.

[9]In my earlier (2010) paper, I explore in greater detail the four aspects of tacit knowing; here I focus on the claim that this structure parallels the (enacted) ontological structure of a comprehensive entity.

[10]I should note that I downplay the evaluative/normative element in Polanyi's fiduciary program—as crucial and central as it is—and emphasize the committal element (within a community of inquirers) since this highlights the dispositional nature of (semiotic) inquiry. In line with my 2010 paper, the inexhaustible nature of inquiry is bound up with Polanyi's characterization of reality as that which inexhaustibly manifests itself.

[11]Maurice Merleau-Ponty, *The Structure of Behavior*, trans. Alden Fisher (Beacon Press, 1963), 47; referred to as *SB*.

[12]Monika Langer, *Merleau-Ponty's "Phenomenology of Perception"* (Florida State University Press, 1989), 174.

[13]Phil Mullins, "The Real *as* Meaningful," *Tradition and Discovery* 26:3 (1999-2000): 46; referred to as *RM*.

[14]Cf. Prosch, 127-128.

[15]The evaluative/normative dimension of the fiduciary program is especially important here, since engaging another absent certain sensibilities will often fail to rise to the level of an encounter (as a higher-order achievement).

[16]See, for example, Robert Aunger, *The Electric Meme* (Free Press, 2002); and Luciano Floridi, "The Method of Levels of Abstraction," *Minds and Machines*, 18 (2008), nr.3, 303–329.

[17]Marking a difference that makes a difference presupposes a difference between relata (*sign* and *signified*, in a broad Peircean sense) and the *capacity* to see in what way such a difference makes a difference—in what way it is informative. For an insightful discussion of Bateson's definition as applied to numerous levels of investigation—in physics, biology, information science, anthropology, and beyond—see Aunger (2002).

[18]For a popular (and ambitious) overview, see Charles Seife, *Decoding the Universe: How the New Science of Information Is Explaining Everything in the Cosmos, from Our Brains to Black Holes* (Viking, 2006).

[19]Note that the minimal Peircean framework I employ is applicable in both cases. For the former case, DNA's algorithmic *capacity* affords processing a specific "sign" (e.g., a specific kind of protein whose structural form acts as a "key") in relation to a "signified" (e.g., a specific binding site—a "lock" whose function is causally interrelated to the key).

[20]Evan Thompson, *Mind in Life* (Harvard University Press, 2007), 58; referred to as *ML*. My use of "enactive" is indebted to numerous sources (e.g., Varela, Rosch, Thompson, Nöe) as well as to dynamical systems approaches more generally. However it seems to me that the uses of "enactive" in cognitive science are perhaps not as radical as what Polanyi presents. Hence enactive realism borrows only certain elements from enactive approaches (in addition to elements from Polanyi, Merleau-Ponty, Peirce, Grene, and Prosch).

[21]See, for example, Grene's late criticisms of Polanyi discussed in Phil Mullins, "Marjorie Grene and *Personal Knowledge*," *Tradition and Discovery* 37:2 (2010-2011): 20-44.

[22]While it may appear that this is precisely what Polanyi uses to solve the mind-body problem, there is a subtle and significant difference. Firstly, to quote from endnote 7 above: "Polanyi tacitly retains some residual analytic presuppositions that Merleau-Ponty lacked, primarily (1) the dualistic assumption that underlies representationalism, i.e., that our knowing must re-construct the world and bridge over to reality." Concerning (1), this would be a non-starter for an enactive approach, as there is no "bridge" to reconstruct. For the body-body problem realigns what it means to speak of "representations," as noted earlier, actually bringing Polanyi closer to Merleau-Ponty—recall that on an enactive approach representational vehicles "enact an environment inseparable from their own structure and actions. In phenomenological language, they constitute (disclose) a world that bears the stamp of their own structure" (emphases mine).

REVIEWS

Parker Palmer and Arthur Zajonc, with Megan Scribner. *The Heart of Higher Education: A Call to Renewal. Transforming the University Through Collegial Conversations*. San Francisco, Jossey Bass: 2010. Pp. 256. ISBN 978-0-470-48790-7. $24.95, hb.

The authors of this volume invite readers to join a conversation about integrative education inspired in part by a 2007 conference, "Uncovering the Heart of Higher Education: Integrative Learning for Compassionate Action in an Interconnected World." In fact, the practice of conversation is central to the book as it seeks to model something of a conversation. Parker Palmer, currently Senior Advisor to the Fetzer Institute, and Arthur Zajonc, Professor of Physics at Amherst College, contribute three chapters each, while Megan Scribner, an advisor to the Fetzer Institute, puts together a series of appendices that that illustrate different dimensions of integrative education, many of which were presented at that 2007 conference.

Perhaps a good place to start the review is by asking, "What do the authors mean by integrative education?" The answer evolves as the book progresses. Palmer initially accepts a widely-shared understanding of integrative education as one that accepts a widely-shared understanding of integrative education that seems to connect courses in the major, courses in the major with those beyond the major, as well as curricular and co-curricular experiences (8). Zajonc further clarifies this type of education by distinguishing it from interdisciplinary education (90). In the latter, professors often juxtapose knowledge from different disciplines, leaving it to students to connect the dots on their own. In contrast, integrative education makes an explicit attempt to connect diverse disciplines into a larger, more comprehensive whole. By the end of the book, integrative learning has become more expansive as Palmer calls for a curriculum that integrates all human faculties (both intellectual and emotional), as well as "our capacity for relational, contemplative, and bodily knowing" in ways that "employ," "deploy," and "delight" in their creative, sometimes conflictual, interactions (152). In sum, integrative education, as used in this book, refers to a course of study and pedagogy that promotes a kind of personal and communal wholeness.

A large portion of the conversation in this book is devoted to articulating the tacit philosophical basis for integrative education. Palmer and Zajonc do so in different but complementary ways. In the first two chapters, Palmer responds to five criticisms often leveled at integrative education: (1) it has weak philosophical foundations, (2) integrative education is messy, (3) emotions don't belong in the classroom, (4) academic work requires solitude, and (5) academics and spirituality don't mix. In responding to these complaints, Palmer articulates a philosophical perspective that he explicitly says is inspired by Polanyi's insights into tacit knowledge and indwelling. As Palmer builds on Polanyi, he argues that "[h]uman knowing, rightly understood, has paradoxical roots—mind and heart, hard data and soft intuition, individual insight and communal sifting and winnowing…" (22).

He goes on to suggest that "community" is best seen as an "ontological reality, an epistemological necessity, a pedagogical asset, and an ethical corrective" (25). The claim that community is ontological reality is supported by new insights into the interdependence of all that exits. That community is an epistemological necessity is evident not only from the social character of our external worlds, but also because some of the most profound knowledge is derived from attempts to enter into relationship with what is being studied. Although this point clearly resonates with Polanyi's idea of indwelling, Palmer relates it to the work of geneticist Barbara McClintock, who says that part of the secret to great science is developing "a feeling for

the organism" (28). Given the communal character of both ontology and epistemology, Palmer argues that it only makes sense that practicing a hospitality that nurtures relationships between teacher and student will enhance student learning (29-31). Moreover, a communal philosophy will more likely lead to engaged lives (31-33).

Zajonc picks up the conversation biographically by telling how he overcame what he calls the "divided life" of his college education in the 1960's through a relationship with a physics professor (53-56). He connects integrative education to the findings of "the new sciences" that begin to treat nature as activity, rather than simply object (67). In particular, Zajonc draws from work in quantum physics (66-69), as well as theories of entanglement and emergence (77-81) to make his point. He illustrates the payoff by contrasting economics as taught from an impoverished perspective with an economics that reckons more with the relational complexity of human beings (82-86).

In turning to the practice of integrative education, Zajonc commends contemplative pedagogies as ways to teach with this new relational, active view of knowledge in mind. Calling for an "epistemology of love," he describes a way of knowing that moves through several stages: respect, gentleness, intimacy, vulnerability, participation, transformation, and imaginative insight (93-96). He follows this schematic presentation with a call to connect our teaching to research on student development (101-104) and student interest in spirituality (115-122). He also shares his own experiences with experiential learning and describes how others use contemplative pedagogies (108-115).

Palmer concludes the book with a practical guide to staging transformative conversations on campus. Using his experience at the Highlander Research Center in the mid-70's as a paradigm of transformative conversation, Palmer argues that a small, thoughtful group of committed people can foment social change. Acknowledging the privatization and loneliness of academia, as well as the loss of "quietude" (127-128, 145), he invites us to start small-scale conversations with stakeholders that can—even should—include not only colleagues, but also administrators, alumni, and students (128-131). He deconstructs attitudes that often preclude our participation in such conversations before giving tips and prompts for the conversation, the gist of which is continually to connect personal stories to ideas to action and vice versa (138-49). The end result is that he counsels us to develop small-scale communities of resistance and transformation within our larger institutional homes.

Along the way, the authors make several trenchant criticisms of higher education. Besides those implied above, they call attention to how education is often characterized by allegiance to a kind of orthodoxy that can be as stifling—more stifling, even—than religious orthodoxy (23, 48). They point out a widespread unwillingness to admit the weak philosophical grounds for traditional pedagogies (24). They name the hypocrisy of academics who demand that attention be given only to rational thought but refuse to acknowledge decades of research-based thinking on the necessary contributions of emotions to rational thought (42).

Yet Palmer and Zajonc remain optimistic, in part because of the stories contained in the appendixes to the book. These stories cover a wide range of efforts to foster at least some kind of integration on college campuses. These efforts include classroom experiences with service-learning and contemplative pedagogies (Appendix A). Other efforts describe experiments outside the classroom with theme dorms and service-learning (Appendix B). Still other efforts come in the form of administrative initiatives to bridge various campus divides (Appendix C), such as the formation of an informal council of elders who serve as advisor to the President at one school.

Although the book is not literally a conversation between a philosopher and a physicist (after all they author chapters individually), the book embodies a conversational tone and feel, and that feel includes overlap and repetition, just as live conversations do. It also mimics live conversations in how one voice picks up on and amplifies ideas of another speaker,

without repeating them. A good example is the way in which Zajonc's account of the basis for a philosophy of integrative education builds on and extends Palmer's discussion by rooting it in the findings of the sciences.

The conversational tone of the book is both strength and weakness. A strength is the ease of reading for its several intended audiences (faculty, administrators, and students). The weakness is that the book misses the kind of precision many academics will want. For example, it is careless—and misleading—for Palmer to say that Polanyi thinks that all knowledge is rooted in the subjective (28). Also, as noted earlier, the definition of integrative education evolves as the book progresses, which might reinforce some suspicions that the term has no substance. The more cynical of us—or even the more optimistic among us in our more cynical moments—might also wonder if Palmer and Zajonc have reckoned sufficiently with the institutional and cultural barriers to implementing the sort of transformative educational strategies they advocate here. I suspect, however, that the authors would be nonplussed by any of these concerns and instead invite us to make them part of the conversation.

Paul Lewis
lewis_pa@mercer.edu

Steven Johnson. *Where Good Ideas Come From: The Natural History of Innovation.* New York: Riverhead Books, 2010. Pp. 326. ISBN 978-1-59448-771-2. $26.95, hb.

What are the circumstances that promote the production of innovations? In this lucid and engaging book, Steven Johnson suggests seven basic patterns that are heuristically potent.The same properties and patterns conducive to fruitful new ideas and developments can be found at many levels within the natural as well as the human world. Johnson illustrates this claim by stating, "It is not a figure of speech to say that the pattern of 'competition'—a term often associated with innovation—plays a critical role in the behavior of marketplaces, in the interaction between a swarm of sperm cells and an egg, and in the ecosystem-scale battle between organisms for finite energy sources" (18).

The book at hand can be seen as something of a summary of what Johnson has learned through his work-related experiences in information technology and the ideas he has explored in his previous six books. Earlier I read with pleasure and profit his *Emergence: The Connected Lives of Ants, Brains, Cities, and Software* and his book on Joseph Priestly, *The Invention of Air: A Story of Science, Faith, Revolution, and the Birth of America. Where Good Ideas Come From*, like *Emergence*, is protean in character. It proceeds by way of offering a sprinkling of several page vignettes of the processes whereby significant discoveries and inventions came to be. Johnson enjoys following the trails of associated ideas from different domains. This is not a scholarly treatise or a book with in-depth case studies, but if you are intrigued by inter-disciplinary patterns and sparkling little insights, you'll find Johnson delightful.

A basic thesis of his book is that "openness and connectivity may, in the end, be more valuable to innovation than purely competitive mechanisms" (21). The paradigmatic images Johnson offers in support of his insistence on the significance of openness and connectivity are the reef, the city, and the World Wide Web. These are featured in an introductory chapter.

Next Johnson outlines his seven patterns in a chapter each. The chapter titles—some discussed below—indicate the nature of each pattern: the adjacent possible, liquid networks, the slow hunch, serendipity, error, exaptation, and platforms. In a concluding chapter entitled "The Fourth Quadrant," he argues that increasingly in history the most fertile ideas arise in cooperative networks situated outside the marketplace. Businesses use patents and intellectual property rights to protect their innovative ideas from being used by others. A 43 page Appendix listing key innovations from 1400 to 2000 and Endnotes discussing useful sources provide background for further investigating his theses.

"The adjacent possible," Johnson's first pattern, is a term coined by Stuart Kauffman to emphasize the crucial role that context plays in creativity. The process of evolution is a good model here. All the elements that make up a sunflower were available prior to the emergence of life. But a soup of elements, obviously, is the wrong context out of which to assemble a sunflower because a sunflower "relies on a whole series of subsequent innovations" like "chloroplasts to capture the sun's energy, vascular tissues to circulate resources through the plant, DNA molecules to pass on sunflower-building instructions to the next generation" (30). Innovation is incremental. The available resources in an environment (things, ideas, processes) are cobbled together to create something new, which may in turn be recombined with contextual elements in further steps of innovation.

The brain is a good example of a liquid network, the second pattern. Creative networks need to be thickly populated and plastic, "capable of adopting new configurations" (46). The billions of neurons in a brain and the many possible linkages between them make them liquid networks. The development of life on earth can be seen as arising on the earth's environment insofar as it has functioned as a liquid network. The chemical capacity of carbon to make linkages is basic to life, but life would not have arisen without there being a medium to allow carbon to collide randomly with other elements. Water has properties at earth's prevalent temperature to dissolve all sorts of elements and bring them together in a primordial soup. Order can emerge from chaos because carbon bonds have the capacity to store creative new linkages. Similarly, cities provide liquid environments in which persons with ideas can come together in coffee shops and organizations and create new ideas. Language, writing, books, libraries, and now the Web provide increasingly complex mechanisms for storing creative ideas and having them ready for new integrations along multiple unpredictable paths.

In his chapter on the slow hunch, Johnson sounds themes that resonate with Polanyi's heuristic vision, although Johnson never mentions Polanyi by name. Gladwell in *Blink* focuses on the instant hunch, but Johnson sees these as "rarities in the history of world-changing ideas" (77). Most significant discoveries and inventions "start with a vague, hard-to-describe sense that there's an interesting solution to a problem that hasn't yet been proposed, and they linger in the shadows of the mind, sometimes for decades, assembling new connections and gaining strength" (77). Typically, the subject of the hunch gathers strength through metaphoric suggestiveness as the person is involved in a variety of different domains of interest. Just as in liquid networks, useful linkages need to be preserved, so too slow hunches need to be cultivated. The best way to do this, Johnson suggests, is "write everything down" (83).

Some explicit use of Polanyi's epistemology would have further bolstered Johnson's study of the maturing of ideas. In his chapter on serendipity, he speaks of dreamwork (and certain reflective states) as a type of exploration, "trying to find new truths by experimenting with novel combinations of neurons" (102). While he makes some references to brain processes, epistemology per se is outside his zone of interest. Polanyi's notions of frameworks, dwelling in and breaking out, imagination and intuition, and tacit knowing in general are consistent with Johnson's broad vision and would give greater depth and precision to his insights.

Johnson lists error as an aid to creativity. Initially this seems counterintuitive. "The problem with error is that we have a natural tendency to dismiss it" (138). But, Johnson insists, error helps us eliminate problematic assumptions. Moreover, research has indicated that "good ideas are more likely to emerge in environments that contain a certain amount of noise and error" (142). Biological processes provide an example. "Without noise, evolution would stagnate, an endless series of perfect copies, incapable of change. But because DNA is susceptible to error—whether mutations in the code itself or transcription mistakes during replication—natural selection has a constant source of new possibilities to test" (142).

When an organism has developed a trait for a specific use, but then its properties are hijacked for a different function, then exaptation occurs. Johnson claims that many innovators are not only bright and curious, they also have many hobbies, and they use solutions in one domain to suggest solutions in another.

The seventh pattern Johnson develops has strong Polanyian overtones. Platforms are emergent systems that unlock new sets of the adjacent possible, allowing for serendipity and exaptation to occur. The coral reef in nutrient-poor oceans allows for a higher-level environment to flourish. The biological platform of the reef builds on the waste products produced within the system (202). "What makes the reef so inventive is not the struggle between the organisms," which occurs just as much in the Sahara or Antarctica, "but the way they have learned to collaborate" (245). To revert to the opening chapter, cities and the Web also operate as unprecedented platforms that allow for rich new connections to occur.

In his explorations of how creative change occurs in our hierarchically organized universe, Steven Johnson himself operates creatively within a worldview compatible with Polanyian thought. The patterns and processes he describes further illuminate the dynamics of discovery, evolution and emergence, concepts central to Polanyi's philosophical vision.

Walter Gulick
wgulick@msubillings.edu

Lydia Jaeger. *Einstein, Polanyi and the Laws of Nature.* West Conshohocken, PA: Templeton Press, 2010. Pp. 319. ISBN 978-1-59947-247-8. $47.96 pb.

This book, whose title caught my eye, is a conservative Christian apologetic discussion of the topics identified in the title; it is a translation of a 1999 French book, produced by the Templeton Publishing Subsidy Program. The author, a conservative Christian who has studied not only Christian theology but also physics, mathematics and philosophy, suggests the three parts of the book can be read in any order. The first component very briefly treats Polanyi's thought (the component emphasized in this review); the title page of this section, "Michael Polanyi, Personal Knowledge Without Relativism," succinctly identifies why Jaeger takes an interest in Polanyi. The second part moves on to Einstein's religious ideas, which she examines to ask "whether pantheism is a religious approach that can really account for the presuppositions necessary for science" (xii). The third component is an attempt to establish a link between the biblical and the scientific notions about "laws of nature" and this exploration Jaeger suggests opens possibilities for interdisciplinary dialog.

After a biographical note on Polanyi, Jaeger lays out basic elements of Polanyi's account of knowing and science, breaking discussion into brief topical summaries (e.g., scientific research, skill, the tacit dimension, etc.). She is familiar with most major Polanyi texts and makes use of several standard secondary sources on Polanyi (e.g., Sanders, Gelwick, and Prosch). Jaeger does grasp the general shape of Polanyi's philosophical perspective but her very abbreviated discussion—the whole is just over forty pages—sidesteps most interesting (and debated) questions about how to interpret Polanyi. There are hints she sees interesting potential in Polanyi's antireductionism and his ideas about knowing persons but Jaeger is careful to keep her distance from Polanyi since "his thought does not give pride of place to a personal God as we encounter him in biblical revelation." The author's overriding Christian apologetic agenda at times rather shockingly intervenes in her discussion. In the brief comment on Polanyi's realism, Jaeger concludes, "in the final analysis, realism presupposes that the world is conceived of as a creation" (32). She reads Polanyi's invocation of the Pauline scheme to make an epistemological point in an explicitly Christian manner: "He [Polanyi] recognizes that human knowledge ultimately depends on divine action; only a reference that lies beyond the world and human capacities can guarantee the contact that human understanding hopes to establish with reality" (36).

In the final analysis, the author's early comments in her Polanyi discussion forthrightly proclaim what she takes from Polanyi: Polanyi's philosophical "project is all the more interesting for the Christian apologist because Polanyi states that he is introducing a personal dimension into epistemology without renouncing the objectivity of knowledge thus avoiding the trap of relativism." (4). Jaeger contends that Polanyi "maintains the objectivity of human knowledge" by referring to reality as external and that "in the end, he is led to hope for divine intervention to ensure a correspondence between human knowledge and the structure of reality" (5). Polanyi's philosophical perspective thus largely serves as ammunition with which to preserve a particular Christian account. Indeed, Jaeger's boiled down formulation of Polanyi's rich corpus, is, to this reader, just the sort of simplism that it is important to avoid in interpreting Polanyi or any other complex philosophical thinker. Although "relativism" is demonized here, there is no effort to specify with any nuance what sort of social/cultural phenomenon she is pointing to. This is an author who seems to have missed the emphasis upon discovery in Polanyi's thought; she does not take very seriously Polanyi's idea that we dwell in in order to break out. Jaeger's Polanyi is not a figure whose epistemic account of the person challenges us to explore the unknown, inviting us to aspire to achievements that may transform both ourselves and social companions engaged in ongoing inquiry.

The second component of this book turns from Polanyi's philosophical ideas to Einstein, a cultural hero whose life and ideas Jaeger suggests deserve more serious study. This discussion, which is about twice as long as the opening section on Polanyi, clearly shows the author is deeply interested in Einstein as a person, scientist and religious thinker. Jaeger has a short biographical chapter, which also notes Einstein's scientific achievements and this is followed by an expanded chapter that lays out in more detail Einstein's scientific program and its reception. At least to this non-scientist, all of this was interesting and accessible. The final component turns to Einstein's religious beliefs which Jaeger tags a "cosmic" religion that she believes Einstein took to be "an authentic religious experience and the only one that was, for him, compatible with the scientific spirit" (102). His concept of religion he defended against both traditional religion and atheism. The "mysterious intelligibility of the world" (104) grounds Einstein's cosmic religion and his insistence on pursuing scientific research "is like the fervor of the believer who wants to love God for what He is, not for what He gives" (110). But Einstein's cosmic religion, a Spinoza-influenced brand of pantheism, rejects a personal God. Jaeger argues that there is tension between Einstein's "pantheist sentiment of belonging to the great All" (11) and his appreciation of individuality, although he works to try to reconcile these elements. He has a strong intuition about "the profound unity of the real" (117). Ultimately, Jaeger argues Einstein's pantheism does not allow for sufficient detachment of human intelligence from the ground of reality: "Without some separation between knowing subject and known object, the act of knowing evaporates" (119). Further, "since Einstein rejected the idea of a transcendent God, ethics cannot be founded on supernatural revelation" (121). Einstein was not successful in his attempt to work out a "purely human morality" (122). Further his determinism "leaves no space for God's action" (127). Despite her orthodox Christian conclusions, I found Jaeger's careful review of Einstein's religious and ethical ideas which are rooted in his scientific conviction to be sympathetic. In the final analysis, however, she claims Einstein's "attempt to incorporate science into a pantheistic system" is no more than a "stock response," one which sharpens "our critical powers" allowing us to "grasp the level at which faith in the Creator God intervenes in our understanding of scientific activity" (216).

Part Three in Jaeger's book turns to the concept of the "law of nature" in the Bible, in Western history and philosophy, and in science itself. The concept of "law of nature" comes into widespread use with the birth of early modern science; what Jaeger wants to do is illuminate this concept by looking first at biblical notions (primarily the Hebrew Bible's ideas)

of the law of nature, then at some historically and philosophically linked ideas and, finally, at the way ideas about the law of nature have evolved in the modern era. This sort of inquiry, the author suggests, is a kind of cross-disciplinary endeavor that should be part of the science and religion discussion. There is a chapter that provides exegesis of central passages in the Hebrew Bible that link ideas about law and nature. Of the several conclusions about biblical theology that Jaeger draws, the one emphasized is that creator and creation are sharply distinguished and the created order is dependent upon the creator. She argues that biblical notions are clearly pre-scientific but that "the biblical and scientific usages converge for several respects: regularity, causality, universality, intelligibility, and contingency"(214). Thus biblical texts and "more generally the idea of Creation, have been an important source of inspiration for the development of the modern concept of law of nature"(214), although biblical law is "prescriptive" and scientific law is "descriptive"(209). The chapters on historical and philosophical material suggest that many things are unclear (and debated by scholars) about whether there are historical and philosophical precedents for ideas about the law of nature concept that becomes prominent in early modern science. Jaeger thinks, generally speaking, that there must be some link between ideas of a legislator God and the concept of the law of nature; also, among the philosophers, Descartes' ideas present "a theology of the Augustinian type, with its considerable emphasis on divine sovereignty [that] was likely an important influence"(214). Perhaps the most interesting discussion is Jaeger's attempt to explain how ideas about the concept of law of nature evolved in the modern period as scientific ideas grew.

Contrary to the author's finding that "the concept of the law of nature has proved to be a fruitful topic for the dialog between science and faith"(213), many will likely be disappointed with this third component of the book (which is a discussion that, nevertheless, does turn up some interesting things) as a contribution to the science and religion dialog. To this reader (and I suspect many others), it is a non-starter to begin with so many conservative Christian affirmations such as ideas about special revelation and the inerrancy of scripture(206-207).

Phil Mullins
mullins@missouriwestern.edu

Laura E. Weed. *The Structure of Thinking: A Process-oriented Account of Mind*. Exeter, UK and Charlottesville, VA: Imprint Academic, 2003. Pp. 248. ISBN: 0907845274. $49.90 hb.

According to Weed, the human mind is not a computational device, and so efforts by those working in artificial intelligence to model the mind in this way are wrong from the fundamentals. In its stead, Weed proposes a model of human thinking as an essentially human product due to its interactive structure and unique relation to experience (see 6, 167). On this model, there are two different kinds of processes by which experience is organized and knowledge is generated. The first kind, Weed calls object-positing processes (or x-processes). Object-positing processes deal with a knower's ability to recognize and identify particulars, with the ability to select temporally-bound singulars, with singular reference in language, and with other perception-based processes. The second kind of process, called property-attributing processes (or y-processes), deals with a knower's ability to sort, qualify, and quantify particulars. In particular, it concerns the ability to formulate conditions for the conception of a stable object, the computational structuring of raw data obtained from perception, supplying the truth-conditions for sentences, and carrying out a variety of other computational procedures.

Weed insists that both of these processes are needed to give a comprehensive model of human cognition, and so Weed's *The Structure of Thinking* aims at showing that (1) x-processes cannot be reduced to y-processes, (2) y-processes cannot be reduced to x-processes, and (3) the human mind consists of both of these processes interacting with each other and the environment.

While Weed does not take her claims to be decisive (216), she presents a variety of arguments, each aiming at shoring up the conceptual independence of object-positing and property-attributing processes. The primary opposition to her position is the attempt to reduce experiential, object-positing processes to conceptual, property-attributing processes (what she and others have called "Platonism in 20th century analytic philosophy"). According to Weed, the latter reduction serves to undergird the view that the human mind is a computational device. Her major critique of 20th century Platonists is that they "chase a third man" (see 8, 10, 18, 20). Weed writes,

> If… one starts one's inquiry with questions about knowledge, such as 'What do we know?' or 'What can be known?', the natural answers to these questions seem to be 'properties' or 'universals'. Plato and Berkeley both start their investigations with epistemological questions, and both ultimately have trouble with particular, material objects. For, once the properties and universals have been established as prior, objects become reducible to sets of properties. The third man argument exhibits the chief weakness of a property-oriented account of the nature of the world. Properties and relations are too variable to rate as the basic content of a recalcitrantly solid reality (8).

What Weed means by "chasing a third man" is not clearly explained, but the gist seems to be the following: the reduction of an object of thought to a set of properties leads to an infinite regress since the set of properties is also an object of thought, requiring an explanation in terms of another set of properties, and so on, ad infinitum.

According to Weed, this sort of Platonism has its claws in a variety of different philosophical concepts (causation, stable objects, and existence), and a large part of *The Structure of Thinking* aims at replacing these concepts with ones that are sensitive to the need for both object-positing and property-attributing processes. After critiquing 20th century Platonists for their faulty accounts of causation, stable objects, and existence, Weed proceeds to give her own accounts of these notions. In chapters 2–5, Weed articulates and defends her account of intentional causation called 'kausation', which she characterizes as an object-positing process whereby an attentive individual reaches out to her experience, with the intent of understanding it, and recognizes some object (see 90-91, 36-37). According to Weed, kausation is a dynamic, two-way relationship that is marked by intentionality. It is a relation, occurring from a specific point of view, that directly relates observer (call this the 'mind' or 'x' side) to observed object (call this the 'reality' or 'r' side). One of Weed's central claims in this set of chapters is x = r, i.e. the two relata of kausation are semantically identical. In other words, the relationship between the observation of an object (e.g. an experience of an elephant in the zoo) and the existing object (e.g. the existing elephant in the zoo) is a semantic relationship where the observation of an object is just the object (e.g. the experience of the elephant is just the elephant). This is somewhat of a strange claim since there is an obvious difference between our idea *of* some object (the x) and the *existent* object in the world (the r). Weed writes:

> My claim as a direct realist is that an x in thought and an r, taken to be an aspect of reality encountered in experience, are different ways of marking one thing, which typically will be an object. Direct perception is grounded in immediate experience, and is an identity relationship in a very redundant sense. A person who identifies a grayish, fuzzy, scampering form as a mouse is not naming her experience 'mouse', she is naming a mouse 'mouse'. Unless they are doing sense datum philosophy, most people don't bother naming the experience, at all. All that the 'x' in the formula really marks is the point of view of the namer (43).

So, in claiming that x = r, Weed claims that there is not a perceptual awareness of an object *x* and a free-floating, unperceived object *r*. Instead, she adopts the idealist position that an object is an object if and only if it is something which we identify from our particular point of view. Much of chapters 2–5 are spent elaborating, defending, and contrasting this claim with other theories of intentional causation (e.g. Dretske's, Searle's, Hume's, Kant's, et alia).

Chapters 6–8 offer an account of the notion of objects, the types of objects that humans are directly aware of, how this account has implications for various linguistic, logical, and ontological notions, and why Husserl and Stalnaker proposed equally reductivist conceptions of objects, i.e. Husserl's attempts to phenomenalize logic (see 159-163) and Stalnaker's attempt to logicize phenomenology. Wrapping up the book, chapter 9 details how x and y processes interact, while chapters 10 and 11 deal with Plato's Third Man argument in the *Parmenides* and a point-by-point criticism of Quine's philosophy. Finally, chapter 12 offers a helpful summary of the preceding.

Readers should be aware that Weed's book is written for a professional audience working primarily in analytic philosophy. Technical language, themes, and arguments are presumed with very little explanation and so potential readers should come equipped with knowledge of a variety of topics in the philosophy of language, the history of philosophy, and logic (e.g. the de re/de dicto distinction, slingshot arguments, Gödel's incompleteness theorem, the third-man objection from the *Parmenides*, and what Almog means by Kripke's "pre-semantic" causal-historical chains). This is problematic for two reasons. First, the book is very ambitious, tackling a number of difficult philosophical problems, but there are places where Weed's arguments are either not clearly presented or are simply inattentive to the complexity of the problem (most notably her dealing with Kripke's theory of names). Second, while writing for a professional audience is acceptable, it can slow down reading time and can cause problems when there is not a scholarly consensus about certain distinctions and arguments. The literature clarifying and taking sides on Plato's Third Man Argument, Davidson's slingshot argument, and the role contextual factors play in naming is extensive, but reference to it is very much missing in Weed's book. Greater clarification by way of exegesis or engagement with the scholarly literature would have produced a better work and a smoother read.

Another problem with Weed's book is that her imputed villains (Quine, Kripke, Dretske, Mackie, Stalnaker, et alia) are not nearly as bad as she makes them out to be. Here is an example. On p.19 (see also 48-49 and 126-127), Weed interprets Kripke as saying that things get their names at an initial baptism and this baptism establishes that the name is connected to the thing by *de re* necessity. Weed claims that this indexing occurs under the point of view of molecular biology and chemistry (a science-relative view of natural kinds), and that Kripke thinks that this is the only point of view we can imagine. With this interpretation in hand, Weed blasts Kripke and adherents of this view for its scientific chauvinism. Weed argues that although the scientific viewpoint is the dominant point of view it is not the only point of view available to language users (see 19-20). In place of the scientific point of view, Weed claims that an object is capable of being named under myriad points of views. Weed writes that the "point of view adopted can be God's eye, fish eye, microscopic, macroscopic, social, political, or any other kind conceivable, as long as the two way relationship between x and r can be maintained from that point of view" (38). Weed has constructed a straw man here. Among many problems with her description, Kripke does not claim that natural kinds are indexed from a scientific-relative point of view. Indeed, Weed misses the chance to incorporate an ally into her cause by criticizing Kripke's choice of examples, and this criticism is built on a misinterpretation.

Weed's work makes no reference to Polanyi, but there are a number of points where Polanyi might have been useful and also places where Polanyians might find Weed's book useful. In chapter 3, Weed uses Gestalt psychology to argue that many basic mental operations involve *interest*, *intentionality*, and

judgment. Operations involving these features are, so Weed argues, not capable of being simulated into the design of purely computational machines, which supports Weed's main claim that human thinking is essentially a human product (58-59). Weed writes,

> What gestalten have in common is the fact that the whole structural or configurational organization of the gestalten is not a function of, and is not reducible to, the sum of atomistic subunits of the whole, no matter how they might be construed. Thus, the criteria of compositionality, presumed by both Russell and (early) Fodor to apply to all mental operations, is violated by gestalten (61).

Polanyians will, of course, take notice of Polanyi's own variation on Gestalt psychology to support the claim that knowing is an active skill, to articulate subsidiary and focal awareness and to develop his various accounts of perception (PK vii, 55-58, 97-98).

Another point of connection has to do with the fact that for Weed—as for Polanyi—all knowledge is of a personal and fallible variety. For both, the idea of a detached, impersonal notion of objectivity is a false ideal, but this does not lead to rampant disconnection with reality. In *Personal Knowledge*, and elsewhere, Polanyi lambasted critical philosophy and logical positivism for espousing such an ideal yet Polanyi's thought does not collapse into a pessimistic post-modernism that gives up on the scientific pursuit (see Cannon 2008; Gill 2000:71-72, 83-88; 2010:126-128). Polanyi's post-critical philosophy aims instead at preserving the contribution human agents make to inquiry while avoiding a collapse into mere dogmatism (see Sanders 1999; Cannon 1999). Weed's agenda is somewhat similar. Analytic philosophers, modernists, and sense-data theorists are all characterized as reducing the human contribution to experience and knowledge to purely formal and mechanical property-attributing processes (see 88). An analysis of knowledge involving a total abstraction from the tacit contribution of human agents will simply not do for either philosopher.

In the end, Weed's book is overly ambitious, somewhat inattentive to the nuances of its philosophical opponents, but nevertheless is admirably bold in her attempt to distill a number of complex problems across the philosophical landscape to a problem concerning x-processes and y-processes. Readers of Polanyi are likely to find a philosophical ally in Weed and a valuable resource in *The Structure of Thinking*.[1]

David W. Agler
dwa132@psu.edu

Cannon, Dale. 1999. "Polanyi's 'Invitation to Dogmatism'? A Response to Andy Sanders' 'Polanyian Puzzle.'" *Polanyiana* 8(1-2).

———. 2008. "Beyond Post-Modernism via Polanyi's Post-Critical Philosophy." *The Political Science Reviewer* XXXVII: 68-95.

Gill, Jerry H. 2000. *The Tacit Mode: Michael Polanyi's Postmodern Philosophy*. Albany: State University of New York.

———. 2010. *Deep Postmodernism: Whitehead, Wittgenstein, Merleau-Ponty, and Polanyi*. Amherst, NY: Humanity Books.

Kripke, Saul. 1980. *Naming and Necessity*. Cambridge, MA: Harvard University Press.

Sanders, Andy F. 1999. "Dogmatism, Fallibilism and Truth: A Polanyian Puzzle." *Polanyiana* 8(1-2).

Stalnaker, Robert C. 2008. *Our Knowledge of the Internal World*. Oxford: Oxford University Press.

[1]Thanks to Walter Gulick, Toby Svoboda, Elizabeth C. Troisi, Ryan Pollack, Deniz Durmus for comments on this review.

David J. Chalmers. *The Character of Consciousness*. New York: Oxford University Press, 2010. Pp. 624. ISBN 978-0-19-531110-5 $99.00 (hb), ISBN 978-0-19-531111-2 $29.99 (pb).

This book on the philosophy of mind is a sequel to Chalmers' widely praised *The Conscious Mind: In*

Search of a Fundamental Theory (Oxford University Press, 1996, hereafter TCM) by one of the important figures in the debates on the topic. Both of these books grew out of Chalmers' keynote paper, "Facing Up to the Problem of Consciousness" (1995), where he first used the labels "easy problems" and "hard problem" of consciousness, which since then have become common currency. The picture of consciousness in the recent book is largely consistent with his earlier work. This sequel is still a work-in-progress on the "hard problem," but because of its topic and goal it may be of interest to Polanyians.

The book consists of 6 parts in 14 chapters plus an Appendix. In the Introduction, Chalmers gives a users' guide. He suggests groupings of chapters to accommodate the following various interests: the mind-body problem, metaphysics of consciousness, epistemology of consciousness, unity of consciousness and phenomenology. He explains that physical realization of information is not the only way information can be expressed—it is also found in phenomenology, our states of consciousness. *The link between the physical and the phenomenal is the "hard problem."* He calls linking the two levels the "double-aspect principle" that he considers a template for psychophysical theory. He draws on and synthesizes much current research to formulate his epistemology of consciousness and his speculative conception of a metaphysics of consciousness. His aim is to develop a thesis about the unity of consciousness that could have applications. For a satisfactory theory of consciousness, we not only need to know which processes give rise to which experience, we also need an account of why and how (13). He surveys and comments on the reductionistic "extra ingredients" proposed in the past to explain how consciousness arises: theories developed in cognitive science, those making use of quantum mechanics, and the idea of Wigner, et. al., that consciousness plays an active role (but how?) in "collapsing" the quantum wave function. He finds none of these to be adequate.

In the section entitled "The Problem of Consciousness," Chalmers explores further the relation between the physical and phenomenal aspects of consciousness, probing for the regularities that connect them. Neurophysiology and cognitive science deal with the "easy problem." The "hard question" is *why* is the performance of these functions accompanied by experience? There is an explanatory gap between the "easy" and the "hard" problems. *Coherence and invariance are non-basic (high-level) concepts* of awareness and organization, and they act as constraints. The *double-aspect thesis of information is a basic (speculative) principle.*

The rest of the book involves the search for an organizational property linking experience to information. In "The Science of Consciousness," Chalmers synthesizes material from published research as a step toward constructing this science. There is a basic problem: we cannot measure consciousness because it is not directly observable. Since Chalmers considers first-person data about subjective experience to be irreducible to third-person data about behavior, yet each is real, he seeks to find neural correlates of consciousness, systematized by use of *pre-experimental bridging principles (principles of interpretation)*. In contrast to the current form of neurophenomenological research which he calls "investigations on the grand scale," he proposes his own "modest investigation with *refinement of methods for reliability*" (51). He notes that there needs to be a formalism of first-person data-gathering and formulating of principles. The shape of this formalism is not clear, but a science of consciousness needs to be able to replicate first-person data by direct observation since that is "the way science is done" (53, 57).

The sections entitled "The Metaphysics of Consciousness" and "Concepts of Consciousness" get to the core of the philosophical discussions in the book. Three lengthy arguments against materialism are presented in the form of syllogisms with examples: 1) physical accounts explain only the structure and function of consciousness along with their causal roles, 2) it is unclear whether isomorphic physical and conscious systems can not be distinguished, and 3) facts about consciousness are not deducible from physical facts. Chalmers claims that one can legitimately infer ontological conclusions from epistemic premises. The link can be the framework of the "Two-dimensional

Semantics" he used in TCM. He considers the following statement one of his important contributions toward making ontological claims: A given concept is associated with two intensions: referent to the actual world as well as the counterfactual world (which depend on each other), to which correspond primary and secondary intensions; the latter are the "meaning." There are two sets of truth conditions with a statement: primary, for context in the actual world, and secondary, for the counterfactual world (TCM 57, 63).

"Conceptual Analysis and Reductive Explanation" rounds out the core philosophical part of the book. Chalmers asks, "If there is not *a priori* entailment from metaphysical truths to phenomenal truths, does a reductive explanation of the phenomenal fail? We say yes" (207). In this section, he discusses his new sympathies: experiences are phenomenal and beliefs are intentional. They intersect because beliefs are about experiences, the most important of which are first-person phenomenal beliefs about the character of a particular current experience. These point to three issues that may be of interest to Polanyians: the theory of content (for sense-giving and sense-reading), epistemic status of the link between cognition and the external world ("can machines think?"), and the epistemic gap between physical processes and consciousness (the theory of personal knowledge).

He remarks that in recent philosophy intentionality has been sundered from consciousness. This statement ignores the thought of Polanyi and Merleau-Ponty who, as Marjorie Grene points out, connect these realms. In chapter 12, "Perception and the Fall from Eden," he introduces "Edenic content" as unmediated contact with the world, i.e., objects presented to us without causal mediation. He compares this to Fregean content that captures our judgment about veridicality (402), so he opts for an Edenic-Fregean content in the treatment of objects (not of properties). To answer questions about Edenic content requires a *theory of the roots of intentionality.* He speculates that Edenic content is "in the heart of phenomenology, and is a sort of phenomenal intentionality" (418). His foray into speculative metaphysics is his version of the "brain in the vat" problem, but I doubt it clarifies and advances Putnam's hypothesis.

Finally, "The Unity of Consciousness" is reformulated as a thesis and applications are offered for higher-order thought theory and for representationalism. The appendix, "Two-Dimensional Semantics," is an abridged form of Chalmers' 2006 article in the *Oxford Handbook of the Philosophy of Language*, and is based on his discussion in TCM. Here he emphasizes the epistemic features and roots of consciousness plus ties to semantic pluralism; as well, he counters the objections to two-dimensionalism and the role of opinion.

On review, this book disappoints. Its promises have not been delivered. His "modest investigations with refinement of methods" do not seem to have advanced his search for a fundamental theory much since TCM. His refinement of methods is a formalization of his previous and others' ideas. In Chalmers' defense, let it be said that reformulating and formalizing old theories may lead to new insights. However, the "investigations on the grand scale," first-person accounts in neurophenomenology and psychology reported in the *Journal of Consciousness Studies* and in *Behavioral and Brain Sciences*, have contributed more to understanding the conscious mind.

Stefania R. Jha
stefania1@jha.net