Terry Quinn, "Reaching for Collaboration in *Insight* (and Beyond)"
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Reaching for Collaboration in *Insight* (and Beyond)

Terry Quinn

Introduction: Reachings for Reachings

Attempts to think out practical philosophies of culture have been rare. Two early, incomplete attempts stand out, those of Plato and Aristotle. [1] More recently, there were Lonergan's reachings in *Insight*,[2] which included his beginnings toward a solution that he named *cosmopolis*.[3] A first purpose of this article is to bring out a few details of Lonergan's reachings for a heuristics of progress,[4] for a solution that also will protect the future.[5] A second purpose is to discuss briefly a few present options following from his later "major breakthrough" [6] to a solution, his 1965 discovery of the structure[7] of cosmopolis.

My article has the following structure. In Section 1, I give some context for the paper by sketching out a few aspects of the present-day situation. For some readers these are well known. Section 1 is not intended as a summary, but to contextualize, and as an outline of some major issues that will need to be resolved in the climb toward

[1] I am thinking of Plato's concrete concern for a better *polis*, manifest in the *Republic* but not in many commentaries on it, as well as his failed attempt at implementation through tutoring the ruler of Syracuse, as recounted in the famous *Seventh Letter*. This concrete concern also finds expression in certain passages of Aristotle's *Magna Moralia* and *Nicomachean Ethics*. See note 32 for more bibliographic detail.

[2] Bernard Lonergan, *Insight: A Study of Human Understanding* (5th ed., rev.), vol. 3, *Collected Works of Bernard Lonergan*, ed., Frederick E. Crowe and Robert M. Doran (Toronto: University of Toronto Press, 1992) (hereafter, *CWL* 3).

[3] *CWL* 3, §7.8.6, 263-266.

[4] *CWL 3*, 259.

[5] *CWL 3*, 265.

[6] Bernard Lonergan, *The Triune God: Doctrines*, trans. from *De Deo Trino: Pars dogmatica* (1964) by Michael Shields, ed. Robert Doran and H. Daniel Monsour, vol. 11, *Collected Works of Bernard Lonergan* (Toronto: University of Toronto Press, 2009), xviii. See also Frederick E. Crowe, "February 1965: Breakthrough to Functional Specialties," in chapter five of *Lonergan* (St. John's Abbey: The Liturgical Press, 1992), 106 ff.

[7] See note 75.

cosmopolis. It is only in Section 2 that I get to some details. To do that I use biology as a context for helping call attention to specific issues, and that way to then also intimate contextualized aspects of the solution identified by Lonergan in *Insight*. Present readers, however, will be of various academic backgrounds. Section 2, therefore, is not intended as a replacement for having expertise in biology, but is to give some impression of plausibility and feasibility. This can help in at least two ways. First, it invites readers toward engaging in biology. That way one can acquire data helpful for growing into a "basic position,"[8] and eventually (after some years) growing into that further development that is a "*come about*."[9] Second, it makes a beginning toward eventually bringing out a few of the subtleties of the problem otherwise only compactly and doctrinally expressed in the book *Insight*.[10] Lonergan wrote *Insight* with a precision and control of meaning in the sciences and more, quite remote to present day achievement. And so some experience in the sciences will be needed in order for the community to make progress toward getting an inside tracking[11] of the book. In the meantime, even though the present discussion is brief and descriptive, looking to contemporary biology can highlight certain features of the problem, and that way contribute to a focusing of the need for *cosmopolis*.[12] In subsections 2.1–2.3, I therefore discuss *systems*

[8] *CWL* 3, 413.

[9] "So, it *comes about* that the extroverted subject visualizing extensions and experiencing durations gives place to the subject orientated to the objective of the unrestricted desire to know and affirming beings differentiated by certain conjugate potencies, forms, and acts grounding certain laws and frequencies." *CWL* 3, 537.

[10] Eventually, we will need ranges of textbooks.

[11] I am thinking of *inside* and *track* in two related contexts. Data of sense and data of consciousness are *inside*, given, within human consciousness: Then, "empirical method, at least in its essential features, should be applicable to the data of consciousness no less than the data of sense. … respect for ordinary usage would require that a method which only in its essentials is the same be named a generalized empirical method." *CWL* 3, 95–96. See also *CWL* 3, 268. Later, Lonergan gave a precise definition: "Generalized empirical method operates on a combination of both the data of sense and the data of consciousness: it does not treat of objects without taking into account the corresponding operations of the subject; it does not treat of the subject's operations without taking into account the corresponding objects." Bernard Lonergan, "Religious Knowledge," in *A Third Collection: Papers by Bernard J.F. Lonergan, S.J.*, ed. Frederick E. Crowe (New York: Paulist Press, 1985), 141. As indicated in Section 3, eventually, there will be functional *tracking*. See metagrams W5 and W3, in Philip McShane, "Metagrams and Metaphysics," *Prehumous* 2, http://www.philipmcshane.org/prehumus.

[12] The need to have some background in the elementary sciences will be essential for following up on Lonergan's achievement, and also more generally, for philosophy and theology to reach beyond descriptive talk. At present, however, an education in the sciences is not assumed in philosophy and

biology.[13] In subsections 2.4–2.5, I point to certain aspects of the solution evidenced from that context. Where subsections 2.1–2.3 to some extent bring out the plausibility of cosmopolis, subsections 2.4–2.5 emphasize feasibility. In footnotes, I include some details intended for readers who already are familiar with systems biology. The discussion here of systems biology is new, but skimpy. It is not intended as a contribution to dialectics. It is, instead, intended to help draw attention to some of the present-day confusions in biology that will be resolved through *future* dialectics in our community climb toward cosmopolis.

In Chapter 20 of *Insight*, among other things, Lonergan works out further heuristics for the solution to the problem of evil in human history, a "harmonious continuation of the actual order of this universe,"[14] "a new and higher collaboration"[15] of humankind with God, and with each other. In that chapter 20, Lonergan mentions *collaboration* at least 60 times: 23 times in Section 20.4; 36 times in Section 20.5; and once in Section 20.6. What, though, will that collaboration look like? Without in any way denying that the basic solution is divinely initiated,[16] how will

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theology. What can be done? A helpful short-term strategy would be for teachers to encourage students to acquire some background in the sciences. A helpful book is John Benton, Philip McShane, and Alessandra Drage, *Introducing Critical Thinking* (Vancouver, BC: Axial Publishing, 2005). The challenge is not unique to Lonergan Studies, and the possibility of future community progress in up-to-date issues calls for a comprehensive solution. That larger solution will be *cosmopolis*, the generic and genetic structuring of which was only later identified by Lonergan, in February 1965. This anticipates the discussion of Section 3.

[13] Systems biology emerged partly because of the philosophical work of Ludwig Van Bertalanffy. See, e.g., Ludwig Van Bertalanffy, "Problems of General System Theory," *Human Biology*, December, vol. 23 (1951): 302–312. Much of the same issue was devoted to publishing a symposium by various authors on the same topic under the title, "General System Theory—A New Approach to Unity of Science," *Human Biology*, December, vol. 23 (1951): 302–345. One of Bertalanffy's well-known books is: *General Systems Theory* (New York: George Braziller, 1968). A brief description of some of the more recent internal debates within systems biology can be found in Jane Calvert and Joan H. Fujimura, "Calculating Life? Duelling Discourses in Interdisciplinary Systems Biology," *Studies in History and Philosophy of Biological and Biomedical Sciences*, 42 (2011): 155–163.

[14] "Thirdly, the solution will be a harmonious continuation of the actual order of this universe." *CWL* 3, 718.

[15] "In the sixteenth place, then, the solution in its cognitional aspect will consist in a new and higher collaboration." *CWL* 3, 740. Because human "collaboration is a fact, because it is inevitable, because it spreads into a highly differentiated network of interdependent specialties, the mentality of any individual becomes a composite product in which it is impossible to separate immanently generated knowledge and belief." *CWL* 3, 727. See also *CWL* 3, 269 ("Each department has to work out its own specialized criteria").

[16] "In the seventeenth place, the new and higher collaboration will be, not

we do it? There is the need of a "specialized auxiliary,"[17] mentioned within the discussion of "In the thirty-first place …"[18] This leads to Section 3 below, which could be a stand-alone short article. But, I include it here since I wrote it in continuity with my effort of the previous sections. In Section 3, the discussion moves beyond *Insight* to Lonergan's later "major breakthrough"[19] in 1965, his discovery of the structure of cosmopolis, the solution to the problem outlined more than a decade earlier when writing *Insight*. There are global crises; people are suffering; cultures, education, economies, and ecosystems are being seriously damaged. Collaboration of some kind is inevitable,[20] but the lessons of the longer cycle of decline[21] call us to some better way. Section 3, therefore, is to invite interest in the 1965 solution discovered by Lonergan, a normative all-inclusive eightfold functional collaboration.[22]

1. Some Present-day Challenges

A simple but useful way to begin is to recall an English dictionary definition, where *collaborate* is "working together, especially in an intellectual endeavor."[23] If we look to examples of human collaboration, it is evident that collaborations unite us globally and historically. In Chapter 7 of *Insight,* Lonergan draws attention to some features of our global struggle—our lives, our cities, our professions. He describes the "longer cycle of decline," not as some *a priori* cycle, but rather as ways in which problems in fact are accumulating globally.

Before entering into the details of Section 2 on *systems biology,* I first contextualize the discussion by recalling various features of the larger problem. If we look to the sciences, certainly it is through collaborations that there are ongoing developments. But contemporary developments also include fundamental confusions. For example, diagrams of molecules often are thought to represent what molecules look like, even though such images are non-verifiable. Reductionist views continue to be formative of successive generations of students and scholars. In theology and philosophy there is an emerging need for heuristics that would take into account the fact that living things are

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simply a collaboration of men with one another, but man's cooperation with God in solving man's problem of evil." *CWL* 3, 741. For Catholic theology, there is the context that includes 'operative grace' and 'cooperative grace.'

[17] *CWL* 3, 746.

[18] *CWL* 3, 746.

[19] See note 6.

[20] Regarding collaboration called 'belief,' see *CWL* 3, 726.

[21] *CWL* 3, 258.

[22] Bernard Lonergan, "Functional Specialties in Theology," *Gregorianum* (1969): 485-504; chapter five of *Method in Theology* (Toronto: University of Toronto Press, 1990) (hereafter, *Method in Theology*).

[23] See, for example, http://www.merriam-webster.com

chemical. While neuroscience struggles within reductionist views, there have been important advances that include beginnings toward classification of intellectual and volitional acts in terms of aggregates of neurochemical states. In philosophy one may describe insight into image as part of a dynamics of knowing and doing.[24] But, images are within human biochemical consciousness. What, then, are explanatory heuristics for genera and species of insight into image, and of knowing and doing? Evidently, such heuristics will subsume present-day progress in neuroscience as well as descriptive results about dynamics of knowing and doing.[25] If we look to economics, it is well known that there are major problems in establishment views. On the other hand, more than 70 years ago Lonergan discovered that there are "two stages"[26] verifiably functioning in any economy. However, establishment economics seems quite locked within a tradition of non-verifiable economic models, and remains unaware of Lonergan's breakthrough to an explanatory[27] economics. Consequently, even when intentions are kindly,[28] establishment economics is compatible with institutionalized greed and stock-market gambling-houses, the effects of which in so many ways are contributing to an accelerating breakdown of cultures and ecosystems.

There is a growing interest in the inter-relatedness of disciplines. Nobel Prizes have been won for work that has depended on experimental and theoretical linkages between physics, chemistry, and biology. In philosophy, we find interdisciplinary fields such as Bioethics. In religious studies, there is now a body of work that includes ecology and environmental science. In Christian theology, there is a growing interest in understanding the historic Jesus, as well as the resurrected Jesus. In

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[24] Bernard Lonergan, *Phenomenology and Logic: The Boston College Lectures on Mathematical Logic and Existentialism*, vol. 18, *Collected Works of Bernard Lonergan*, ed. Philip J. McShane, (Toronto: University of Toronto Press, 2001), Appendix A, "Two Diagrams," 319–321.

[25] Robert Henman, "Can Brain Scanning and Imaging Techniques Contribute to a Theory of Thinking?," *Dialogues in Philosophy, Mental, and Neuro Sciences*, 6 (2) (2013): 49–56; and Robert Henman, "Neuroscience and Generalized Empirical Method: a Response to A. Rastogi," *Dialogues in Philosophy, Mental, and Neuro Sciences* 7(2) (2014): 70–71. http://www.crossingdialogues.com/journal.htm.

[26] Bernard Lonergan, *For a New Political Economy*, ed. Philip J. McShane, vol. 21, *Collected Works of Bernard Lonergan* (Toronto: University of Toronto Press, 1998)(hereafter, *CWL* 21). See, e.g., "The Basic and Surplus Stages of the Economy," §15.6, 238–241. See also Philip McShane: "There Are Two Types of Firm," in chapter seven, "The Ongoing Economic Helliday," *Futurology Express* (Vancouver: Axial Publishing, 2013); and "A Grade 12 Introductory Class in Economics," *Fusion* 2, http://www.philipmcshane.org/fusion/.

[27] Michael Shute, *Lonergan's Discovery of the Science of Economics* (Toronto: University of Toronto Press, 20011).

[28] http://econ4.org/.

religious traditions, we find efforts at interfaith dialogue. Certainly, increasing openness to interdisciplinary collaboration is part of development. At the same time, hybrid disciplines and interfaith work-groups do not in themselves move us closer toward resolving basic issues. Instead, interdisciplinary developments establish further layerings of complexity. Such results do not in themselves reveal the subjective and objective grounds of interdisciplinary studies; they do not draw our attention to sources of decline; nor do they provide heuristics for effective collaboration. Still, the trend toward interdisciplinary work evidently is increasing the pressure for us to sort out how to work together, and in particular, how to combine results from diverse disciplines. In particular, that same pressure is bringing out the need for us to make progress toward heuristics for things that otherwise are only partially explained in physics, chemistry, botany, zoology, philosophy, and theology. And, of course, that new heuristics will need to include an explanatory heuristics of human things who do physics, do chemistry, and so on.

Why is the effort to collaborate effectively so challenging? Is not collaboration something spontaneous and obvious? Some light can be shed on the difficulty through self-attention. Even the simplest instances of collaboration involve knowing and doing that are not limited to, but include: individuals in some kind of communication; individuals having some kind of understanding of circumstances; individuals wondering what to do and then deciding what to do. With astonishing skill in self-attention, St. Thomas was able to work out that the dynamics of human choice verifiably are a subtle mix of twelve distinct steps.[29] For the question of collaboration, then, we have various indications of the need of a sophisticated explanatory heuristics for an aggreformically layered dynamics of knowing-and-doing[30] on a geo-historical scale. Of course, such heuristics will be something for the distant future.[31] Indeed, explanatory heuristics for any type of insight is remote to present achievement in the human sciences. What, then, of a future explanatory heuristics for collaboration, which in particular would need to give some account of a collaboration such as: ‘I see that you are thirsty my beloved. Drink this water’?

Some 2,500 years ago Plato posed the problem of determining the finest implementable philosophy—if you like, an invisible ingredient to culture’s progress. Later it would be called a search for metaphysics and, for some, associated with Aristotle’s musings about a happiness beyond military and political endeavor, a happiness in a life seemingly too high for man, yet a life that could add character to the affairs of state. “We must first inquire of what character is a branch. To speak concisely, then,

[29] Thomas Aquinas, *Summa Theologica*, Ia, IIae, QQ 6-17.

[30] Lonergan, *Phenomenology and Logic*, 319–321.

[31] See, however, “Lonergan’s Dream” and McShane’s W3, mentioned in Section 3, below.

it would seem to be a branch of nothing else than statescraft." [32]

Later, Charles Darwin wrote: "In the long history of humankind … those who learned to collaborate and improvise most effectively have prevailed."[33] Look now to Lonergan's comments *circa 1942* on human progress which, in view of contemporary global events are especially poignant: "Unity without freedom is easy: set up a dictator and give him a secret police. Freedom without unity is easy: let every weed glory in the sunshine of stupid adulation. But unity and freedom together, that is the problem."[34] Some years later, in *Insight*, there is Lonergan's reaching toward a solution: "What is necessary is a cosmopolis that is neither class nor state, that stands above all their claims, that cuts them down to size, that is founded on the native detachment and disinterestedness of every intelligence, that commands man's first allegiance, that implements itself primarily through that allegiance, that is too universal to be bribed, too impalpable to be forced, too effective to be ignored."[35]

2. Biology, Collaboration, Cosmopolis

"Still, what is cosmopolis?"[36] Whatever else it will be, cosmopolis will be some kind of collaboration. And so appealing to the sciences can help us reach toward getting some impressions of Lonergan's heuristics for a solution. For that way we can obtain data on the problem. By the same token, that approach can help us avoid sliding into speculation about non-verifiables and non-implementables. In fact, reflection on any discipline could provide important data on the problem. I choose biology because it is a science that, in some sense, sits midway between the lower sciences of physics and chemistry and the higher human sciences and theology.[37] Certainly, biology is a collaborative enterprise, global

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[32] Aristotle, *Magna Moralia*, trans. St. G. Stock, in *Complete Works of Aristotle: The Revised Oxford Translation*, ed. Jonathan Barnes (Princeton: Princeton University Press, 1984), vol. 2, 1868 (first paragraph of the text) (quoted in Philip McShane, "The Origins and Goals of Functional Specialization," *Quodlibet* 17, http://www.philipmcshane.org/quodlibets). The prior sentence (above) alludes to the passage in *Nicomachean Ethics* X, 7, 1177, lines 2–30. See *Complete Works of Aristotle*, vol. 2, 1861.

[33] Although this sentence is often attributed to Darwin, I have been unable to locate its original source. In any event, here I am transposing Darwin's words about collaboration to refer to "working together, especially in an intellectual endeavor" (see above, note 23).

[34] *CWL* 21, 20. "This volume of Bernard Lonergan's economic writings contains almost the entirety of the fragments of typewritten work on economics prior to, and including, the 1944 version of Essay in Circulation Analysis." *Ibid*., "Editor's Introduction," xv.

[35] *CWL* 3, 263.

[36] *CWL* 3, 263.

[37] However, foundations of biology is inclusive. "Foundations of Physics

and historical. Still, one may wonder, 'Is there a *problem*?' Is not biology an empirical science that follows its own norms, and makes its own progress? Or, is there data in biology on the problem of decline? Is there data relevant to cosmopolis?

2.1 Biochemistry in *systems biology*

In the late 1930's, after several years of theoretical and experimental work, Krebs and his collaborators worked out that there is a *cycle* of chemical reaction equations for aerobic organisms that secure energy through the oxidization of acetate derived from carbohydrates, fats, and proteins into carbon dioxide.[38] The result, now standard in undergraduate and graduate textbooks, is known as the Krebs Cycle, the "tricarboxylic acid cycle" or, for short, the TCA cycle.[39] But what does it mean? Of course, the only way to begin to get ahold of this is first to learn some of the biochemistry. You may remember, however, that I am not assuming that readers are up on 20th century biochemistry. I will, though, try to give some impression of work-to-be-done that will be relevant to cosmopolis.

It will help to obtain one of the diagrams for the TCA cycle. A diagram is available easily online as well as in most undergraduate textbooks in biochemistry. As you will see, the TCA cycle can be written out in a circular pattern of biochemical reaction equations. Some of the biochemical products of each reaction appear as reactants of other equations in the cycle, until products of a last equation also appear as the reactants of the first equation. Allowing for all necessary catalysts in some way being present in an organism, there is what is called a *cycle* of chemical reaction equations.

There is, however, the future challenge of reaching a "control of meaning"[40] about the result. In contemporary systems biology,[41] the TCA cycle is said to be a *network* or *metabolic pathway* or *cycle* of chemical reactions *per se*, in an organism. In that way, each pathway is thought to be included within further vast aggregates of chemical networks, and chemical reactions are thought to occur between imagined macro-molecules. A living organism then is thought to be an imaginable aggregate of molecular reactions that, in principle, could be computed

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[and I would add Chemistry, Biology, etc.] is to be an omnidisciplinary Foundations." Philip McShane, *Sane Economics and Fusionism* (Vancouver: Axial Publishing, 2010), 64.

[38] H.A. Krebs, "The History of Tricarboxylic Acid Cycle," *Perspectives in Biology and Medicine*, Autumn (1970): 154–170.

[39] "The Nobel Prize in Physiology or Medicine for 1953 was divided equally between Hans Adolf Krebs 'for his discovery of the citric acid cycle' and Fritz Albert Lipmann 'for his discovery of co-enzyme A and its importance for intermediary metabolism.'" http://www.nobelprize.org

[40] *CWL* 3, 530.

[41] See above, note 13.

(e.g., using supercomputers). Avoiding details for now, one obvious problem is that there is no data available on such imagined aggregates of imagined molecules. Even if there were, such data would be merely images in one's consciousness, not explanations. If, however, we attend to what *is* attained and verified,[42] then even when it is for single-celled organisms (let alone a multi-cellular organism like a dove), we will need to account for the fact that experimental verification of the TCA cycle is not obtained by looking at molecules, but through sequences of reactions baths and combinations of verified reaction experiments involving large aggregates, interpreted within the context that is all of biochemistry.

2.2 Mathematical models in *systems biology*

When Bertalanffy's *systems biology*[43] was first coming into fashion in the 1950's, new mathematical methods were being developed for biochemistry and biology. In what is still a common approach, the mathematical biologist works out systems of differential equations with the idea of using such systems of equations to explain, for example, the motion of a cell membrane. Early work along these lines involved just a few equations at a time. In more recent versions, applied mathematicians routinely handle systems of hundreds of simultaneous equations, in the attempt to simulate multi-scale[44] metabolic networks in an organism. But, we can look to early simpler systems of equations to see some of the problems that still are present in contemporary results for both large and small systems of equations.

One difficulty is that mathematical results about ideal aggregates of events regularly are interpreted in reference to individual events. Among other things, this leads to non-verifiable numerical probabilities. A related problem is seen in systems of equations whose mathematical solutions are mean paths and time-dependent ideal concentrations of large aggregates. Even when, for example, computations reveal limitations on boundary conditions and reaction rates, such results do not refer to, nor are they verifiable in, any single aggregate, let alone any individual cellular membrane.[45]

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[42] I note that my few statements here are empirical, requiring self-attention within biochemistry.

[43] See note 13.

[44] Weinan E and Björn Engquist, "Multiscale Modeling and Computation," *Notices of the Amer. Math. Soc*., vol. 50, No. 9, Oct. (2003): 1062-1069, http://www.ams.org/notices/200309/fea-engquist.pdf.

[45] The biophysicist Nicolas Rashevsky was born in 1899 and died in 1972. His basic approach (which in his case was for studying the physics of membrane motion) remains prevalent in 21st century systems biology. See, e.g., Nicolas Rashevsky, *Mathematical Biophysics: Physico-mathematical Foundations of Biology* (3d rev. ed.), vol. 1 of 2 volumes (New York: Dover Publications, 1960). Rashevsky supposes various physical and chemical boundary conditions (chemical reaction rates, chemical flux rates, mass

2.3 Development in *systems biology*

Systems biology also is a basis for theories of biological development. For instance:

> A developmental system is analogous to a program, a sequence of prescribed events following a temporal order toward a goal. A set of coded instructions responsible for its execution resides in the totality of genetic information in

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densities, etc.). He then derives his equations of motion in terms of averages of intra-cellular concentrations, under assumed average boundary conditions. This leads to systems of ordinary differential equations and partial differential equations, mathematical solutions of which are mean paths and time-dependent ideal concentrations of large biochemical aggregates. Note, again, that there is no evidence of aggregates of molecules *per se* within an organism; and that neither mean path nor ideal concentration refer to, or are verifiable in, any particular motion of any individual cell membrane. Also, because of extremely rapidly changing intra-cellular boundary conditions, even when in reference to representative samples of cell populations under relatively controlled average boundary conditions, coefficients of each such system of equations would need to be re-calibrated over extremely small time intervals. This does not mean that such systems of equations do not contribute to our understanding of organisms. For instance, it is known that such equations can lead to metabolic rate limitations, etc. (as regularly verified in contemporary laboratory work). But, where such systems of equations provide (short-time rates of change of) ideal relative frequencies of events in representative populations, they do not explain any individual cell or any individual organism. An extension of this approach now in vogue is to add statistical driving terms, *ad hoc*, producing what are called stochastic differential equations, a generalization of Brownian motion equations. However, this additional layer of randomness does not move closer to resolving basic confusions about aggregates, averages, individual events, and probability frequencies. In the last decade or so, there have been attempts to push the systems biology approach to further refinements, by constructing what are called 'multi-scale systems.' In that case, the basic systems premise is the same, but now reaction terms from physics are included. One of the computational challenges then considered is that physical events, chemical events, and biological events occur on very different time scales. An example is found in the multiple time scales of protein folding. "While the time scale for the vibration of the covalent bonds is on the order of femto-seconds (10^{-15} s), folding time for the proteins may very well be on the order of seconds." Weinan E and Björn Engquist, "Multiscale Modeling and Computation," *Notices of the Amer. Math. Soc*., vol. 50, No. 9 (Oct. 2003), 1062-1069, http://www.ams.org/notices/200309/fea-engquist.pdf. With such limitations, supercomputer algorithms can be used to approximate averages, through large numbers of iterated computations and estimated approximations to averages, energy levels, and so on. Such computations, though, are very remote from concrete aggregates of events in organisms, and do not explain any particular organism.

> developing cells. This information is stored as information tapes, nucleic acid macromolecules assembled in chromosomes and cytoplasmic organelles. Since these molecules code for all proteins in an organism, a developmental program may be defined as a timed sequence of synthesis and assembly of new protein populations in cell clones. … As cells proliferate into multicellular sheets, the information content of the system increases. Information processed by one group of cells is communicated to the adjacent and distant cells by diffusible molecules. … Most questions about developmental information relate to its organization, storage, and use as macromolecular tapes.[46]

Of course, eventually it will be necessary to enter into details.[47] Again, though, my present aim is mainly to draw attention to a few key issues. In that spirit, I note that as mentioned in Sections 2.1 and 2.2 above, "tapes," "sheets" and the like are merely diagrams. They can be convenient as phantasms. But, unlike, say, the image one may have of a dove in flight, there is no experimental data for imagined molecular tapes, sheets, receptor sites, and the like. In fact, both contemporary theory and experiment indicate the non-availability of such images. Note, too, that "information," "information content," "storage," "program," and "genomic information" all are non-verifiable, terms imported from computer science. There is, in fact, no data available supporting claims about computability in individual organisms. Instead, data from modern physics, chemistry, and biochemistry verify something quite different about actual organisms living in environments. That is, there are stages of growth, mutually sensitive layerings of differently defined capacities-to-perform, complexes of conditional probability distributions, and all of this with tremendous degrees of freedom.

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[46] Philip Grant, *Biology of Developing Systems* (New York: Holt, Rinehart and Winston, 1977), 5. This is somewhat dated in some details, but in orientation is still orthodox *systems biology*. For the reader interested in pursuing these matters with more recent examples, the following book is a convenient point of entry into the literature: Marian Walhout, Marc Vidal, and Job Dekker, eds., *Handbook of Systems Biology: Concepts and Insights* (Amsterdam: Academic Press, 2013). In particular, see Isabelle S. Peter, Eric H. Davidson, "Transcriptional Network Logic: The Systems Biology of Development," ch. 11 in *Handbook of Systems Biology*, 211–228. By contrast, there is Lonergan's verifiable definition of *development*: "development may be defined as a flexible, linked sequence of dynamic and increasingly differentiated higher integrations that meet the tension of successively transformed underlying manifolds through successive applications of the principles of correspondence and emergence." *CWL* 3, 479.

[47] Among other things, there is the need to reach for metaphysical equivalence, primary relations and secondary determinations. See *CWL* 3, §16.3.4.

2.4 Implementing generalized empirical method in biology

In recent decades, biochemistry has been making extraordinary progress. There is, though, confusion about the nature and significance of results. As mentioned above, among other things, we find images combined with explanatory relations; as well as basic errors regarding the meaning of empirical probability. There are also notions of *information* that are non-verifiable, that are inconsistent with available data, and that contradict known theory. But, a point here in this subsection 2.4 is that these are not merely academic issues. For, among other things, systems biology now contributes to the propagation of horrific views of human growth in terms of fictitious information tapes, coded instructions, and biochemical logic-networks. And *systems theories* reach into other areas as well, such as education and the social sciences. In other words, systems biology, and more generally *systems theories* are further showings that philosophers "through doctrines on politics, economics, education … have been trying to remake man, and have done not a little to make human life unlivable."[48]

Are these not problems that cosmopolis will need to be able to resolve? Yet, how might that be done? Certainly, cosmopolis will need scholars who are up-to-date in biology. But, as we see from results so far, something more will be needed than traditional methods that have led up to and sustain disorientations in contemporary systems biology. Evidently, part of the problem is a lack of control of meaning:[49] In particular cases, is one describing, imagining, grasping unity, obtaining an ideal relative frequency of some explanatorily defined event, verifying a physical, chemical, or biological property? How, precisely, do physical properties and chemical properties of an organism go together with biological properties? What are verifiable explanatory heuristics for genera and species of aggreformically layered biological organisms?[50]

What is needed in cosmopolis, therefore, will be a generalized empirical method,[51] implemented, in particular, within biology. Not only will investigators attend to data, but investigators also will attend to that attending to data. And so, within a future generalized empirical method

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[48] Bernard Lonergan, *Topics in Education: The Cincinnati Lectures of 1959 on the Philosophy of Education*, ed., Robert M. Doran and Frederick E. Crowe, vol. 10, *Collected Works of Bernard Lonergan* (Toronto: University of Toronto Press, 1993), 232.

[49] *CWL* 3, 530, §16.3.4, "The Significance of Metaphysical Equivalence."

[50] Following his discussion of cosmopolis in chapter seven, Lonergan's next chapter in *Insight* includes results on "Species as Explanatory," §8.6. This is later given a fuller treatment, in §15.3, "Explanatory Genera and Species." On organic development, see §15.7.2, "Organic Development," especially the paragraph beginning, "Study of an organism begins …" *CWL* 3, 489.

[51] See note 11.

we also will relate biological understanding and expression to the "neural basis"[52] in the biological organisms who are the biologists.

2.5 Division of labor and differentiation of functions

In biology, there are experts who do field work; others who work in the laboratory; there are theoreticians; specialists in biophysics and bio-chemistry; scholars in evolutionary studies, ecosystems, and population dynamics; there are philosophers of biology whose work influences research directions and shapes community ethos; there are teachers, chairs of biology departments, consultants to biotech firms, and so on. The range of collaborations is vast, complex, dynamic, and developing. Whether we keep our focus on systems biology, or look to all of biology, we find ongoing "division of labor and differentiation of functions"[53] with "adaptations of human intersubjectivity to that division and differentiation."[54] Will not a control of meaning about such division and differentiation also be normative? A division of labor, though, is a division of labor among conscious subjects. And so cosmopolis will grow in its grasp of explanatory heuristics of "relations between different conscious subjects,"[55] indeed, between vast aggregates of subjects, historically linked, a developing geo-historical "space-time unity."[56]

3. Reaching Beyond *Insight*

3.1 Finding a solution

Peoples of the world are struggling and suffering. Ecosystems are in crisis, economies move from one critical point to another, and cultures are increasingly damaged by corporate ambition, aberrant notions of human growth, totalitarian states, strange dictatorships, and ongoing wars. Evidently, we need a new way which, in chapter of seven of *Insight*, Lonergan named *cosmopolis*. In chapter twenty of *Insight*,[57] Lonergan worked out further heuristics of a solution. It was, however, with an extreme brevity and meaning quite remote to the contemporary academy that he wrote there of a solution that will be a "harmonious continuation of the actual order of this universe,"[58] "a new and higher collaboration"[59] of humankind with God, and with each other.

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[52] *CWL* 3, 269.
[53] *CWL* 3, 263.
[54] *CWL* 3, 263.
[55] *CWL* 3, 268.
[56] Bernard Lonergan, "Finality, Love, Marriage," in *Collection,* ed. Frederick E. Crowe and Robert M. Doran, vol. 4, *Collected Works of Bernard Lonergan* (Toronto: University of Toronto Press, 1988), 38.
[57] *CWL* 3, 709-751.
[58] *CWL* 3, 718.
[59] *CWL* 3, 740, "In the sixteenth place …"

Certainly, that there is a need for improvement is not news. There are groups the world over who call for world peace, clean air, food for all, including food for the mind through education and culture. But, even when that calling for change comes from world humanitarian organization, or is motivated by benevolent religious concern, the practical question remains: What are we to do? How, in fact, can we feed our people? As history reveals, standard methods so far (fragmentation, tunnelings, non-luminous combinations of commonsense, theory, and faith) are not up to the task. And, of course, the inadequacy of standard methods includes standard methods of scholarship, which, as touched on in Section 2, are contributing to the problem.

Our solution will have two parts: "conception (and) affirmation" of a better way; and "implementation."[60] Later in *Insight*, Lonergan says more:

> The antecedent willingness of hope has to advance from a generic reinforcement of the pure desire to an adapted and specialized auxiliary ever ready to offset every interference either with intellect's unrestricted finality or with its essential detachment and disinterestedness. The antecedent willingness of charity has to mount from an affective to an effective determination to discover and to implement in all things the intelligibility and universal order that is God's concept and choice.[61]

The new "effective"[62] collaboration, however, will "not (be) something altogether new."[63] For, among other things, collaboration always will be through human capacities to perform, division of labor, differentiation of functions, and adaptations of human inter-subjectivity.[64] How, though, can we promote emergence and ongoing development of an as yet unknown collaboration? In *Insight*, the 49 year-old Lonergan writes: "For the present, we must be content to indicate a few … aspects and to leave until later the task of reaching conclusions."[65] Later in the same section of the book he writes: "So far from solving [the problem] in this chapter,[66] we do not hope to reach a full solution in this volume."[67]

But the genius Lonergan did not stop in his reaching for a solution

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[60] Together, these outline what Lonergan called "explicit metaphysics": "conception, affirmation, and implementation of the integral heuristic structure of proportionate being." *CWL* 3, 416.

[61] *CWL* 3, 747-748.

[62] *CWL* 3, 748.

[63] *CWL* 3, 266.

[64] *CWL* 3, 263.

[65] *CWL* 3, 263.

[66] *CWL* 3, 232-269.

[67] *CWL* 3, 267.

to the collaboration problem. In the years following *Insight*, drawing on data from more than 2500 years of human history, science, and theology, we find him working on questions of method, progress and decline, history and collaboration.[68] Finally, in February of 1965, he made his "major breakthrough"[69] to what he called *functional specialization*:[70] Lonergan discerned the already subtly-present "vital"[71] "central"[72] eightfold unity of history.

3.2 Symbolism

To go into detailed discussion of the solution would go beyond the scope of the present paper. Such follow-up will be work for the whole community. Instead, I add a few paragraphs that I hope will invite interest in Lonergan's solution, and help encourage community follow-up. One place to begin is Lonergan's 'discovery page,'[73] available from the Lonergan Research Institute in Toronto, Canada. The hand-written page is as lively as it is complex. It includes intricacies, connections, and points to dynamics of a "central structure."[74] A later and more staid presentation was his 1969 article in the *Gregorianum*,[75] which also became chapter five of *Method in Theology*. How, though, can we combine these two presentations of his breakthrough? For this, we can take some help from Lonergan, advice he gave to his students:

> [C]omprehension of everything in a unified whole can be either formal or virtual. It is virtual when one is habitually able to answer readily and without difficulty, or at least 'without tears,' a whole series of questions right up to the last 'why?' Formal comprehension, however, cannot take place without turning to phantasm; but in larger and more complex questions it is impossible to have a suitable phantasm unless the imagination is aided by some sort of diagram. Thus, if we want to have a grasp of everything in a unified whole, we shall have to construct a diagram in which

[68] References are too numerous to cite here, and include his Christological works. See, however, Frederick E. Crowe, *Christ and History: The Christology of Bernard Lonergan from 1935-1982* (Ottawa: Novalis, 2005).

[69] See note 6.

[70] See note 22.

[71] The word "vital" may be found at the bottom of the "discovery page," file no. 47200D0E060 in the Lonergan Archives, now available online at http://www.bernardlonergan.com.

[72] See note71.

[73] See note 71.

[74] See note 71, center of discovery page, in brace brackets: "[central structure]."

[75] Bernard Lonergan, "Functional Specialties in Theology," 50 *Gregorianum* (1969): 485-504.

> are symbolically represented all the various elements of the question along with all the connections between them.[76]

Think, for example, of the Chemical Periodic Table, one of chemistry's diagrams for chemistry's grasp of everything chemical (a vast matrix-mesh of genera and species of elements and compounds, non-organic and organic). Like Mendeleev's discovery approximately 100 years earlier, Lonergan's 1965 discovery also is empirical, but it is far more reaching and complex than the chemical periodic table. In fact, Lonergan's discovery is inclusive of the periodic table. We may note that, among other things, functional collaboration will include genera and species of human collaboration. And, whatever else we are, we are bio-chemical collaborators! Again, growth in understanding the chemical periodic table depends on patiently working through (strategic selections of) ranges of experiments, learning theory, and methods. Growth toward understanding and implementing omni-disciplinary functional collaboration also will depend on slowly working through (strategic selections of) experiments, theory, and methods, within an increasingly nuanced generalized empirical method.[77] Instead of a Chemical Periodic Table, though, functional collaboration can be represented by a diagram called The Tower of Able: Lonergan's Dream.[78] Another diagram for everything in a unified whole is McShane's *metagram W3*.[79] Are those the last words, or rather, the last diagrams and metagrams on the subject? As chemistry makes progress, the chemical periodic table also develops. In a similar way, we can anticipate increasingly nuanced diagrams and symbolisms for, and within, functional collaboration. In particular, there will be development of symbolisms for aggreformic layerings (physics; chemistry; …; and theology).[80] Certainly, implementation will be a future community achievement. Already, though, appropriate symbolisms and diagrams will be important. To get a sense of this, recall that a contemporary Chemical Periodic Table is only slowly mastered. Yet, simplified versions of the Periodic Table appear in high-school textbooks. In a similar way, even now we need to start making use of diagrams and metagrams such as the Tower of Able and *W3*, precise heuristic pointings toward future progress.

3.3 Present options

We know that a new way is needed. But, is Lonergan's solution really

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[76] *CWL* 7, 151.

[77] See note 11 above.

[78] Pierre Lambert and Philip McShane, *Bernard Lonergan: His Life and Leading Ideas* (Vancouver: Axial Publishing, 2010), 163.

[79] Lambert and McShane, 161.

[80] Philip McShane, "Metagrams and Metaphysics," *Prehumous* 2, http://www.philipmcshane.org/prehumus/.

the way to go? One may recall that functional specialization was an empirical discovery. Much as beginners in chemistry start with elementary experiments, one part of a follow-up to Lonergan's discovery is to obtain data from disciplines. Initially, results will be descriptive. But, without too much difficulty, one may begin to discern for oneself the subtle presence of an eightfold dynamics in history. In fact, there are already a number of articles and books available where authors have made preliminary progress along these lines.[81] But Lonergan's result is intended to be practical, to be implemented, to help us climb out from the longer cycle of decline. Another part of a follow-up will be to try it out, sooner rather than later. No doubt early efforts will be awkward and clumsy. We will learn by doing. But, we can begin by making efforts to organize our work in ways that will increasingly approximate a normative eightfold functional division of labor.

However, Lonergan's 1965 discovery is not yet widely known. One may not yet have heard about functional specialization and so not yet be ready to engage in verification, let alone attempt implementation. But, the problem of the longer cycle of decline remains, and there are many who are serious about the question: What are we to do? Without adverting to Lonergan's 1965 solution, one could work toward assimilating the reachings for collaboration in Lonergan's earlier work, *Insight*. This will be challenging work for, among other things, reading *Insight* requires that we appeal to examples in mathematics, the various sciences, the arts, and other areas of human achievement. And, more generally, in generalized empirical method there is the ongoing challenge of working at "the level of the times."[82]

Core questions soon arise: What is understanding? Are there genera and species of understanding? What is objectivity? What is good-will? What are growth and development? What is world peace? What are progress and decline? And, results will need to be shared. Note, however, that the task of working out one's fundamental position already is identified within the fourth functional specialty, functional dialectics. See, for example, Lonergan's 1965 discovery page, in the row that includes "Encounter," "Mediating Subject," and "Conversion," below which (in a short column of words with arrows pointing to past oriented tasks) Lonergan includes "learning from others." A few years later, on page 250 of *Method in Theology*, Lonergan reaches into the distant future with a nuanced compactly expressed precise heuristics for the total dynamics of functional dialectics, and includes the following comment:

> The results, accordingly, will not be uniform. But the source

[81] For a list of references, see Terry Quinn, "Climbing: Toward Functional Collaboration," *Journal of Macrodynamic Analysis* 8 (2015): 51-72, note 56.

[82] Frederick E. Crowe, *Lonergan*, 58.

> of this lack of uniformity will be brought out into the open when each investigator proceeds to distinguish between positions, which are compatible with intellectual, moral, and religious conversion and, on the other hand, counter-positions, which are incompatible either with intellectual, or with moral, or with religious conversion. A further object-ification of horizon is obtained when each investigator operates on the materials by indicating the view that would result from developing what he [or she] has regarded as positions and by reversing what he [or she] has regarded as counter-positions. There is a final objectification of horizon when the results of the foregoing process are themselves regarded as materials, when they are assembled, completed, compared, reduced, classified, selected, when positions and counter-positions are distinguished, when positions are developed and counter-positions are reversed.[83]

What, then, are we to do now in our present reaching for a new collaboration? Five main options are as follows: (1) We can investigate the empirical basis for the solution given by Lonergan. (2) We can discuss Lonergan's claims in what is still the dominant style of philosophy and theology, including present-day Lonergan Studies. (3) In elementary and descriptive terms, we can begin trying to implement functional collaboration. (4) We can make honest efforts to engage in mutual encounter, especially for the purpose of making explicit one's best present categorical stand regarding past, present, and future progress. (5) We can choose to ignore Lonergan's 1965 solution.

In view of ongoing global crises, the fifth option would be unfortunate. Whatever motivation one might have for choosing to ignore Lonergan's discovery, it would be a refusal to at least think about a solution proposed by a millennium-class thinker. If functionality is not the way to go, what is a better heuristics of progress?[84] Whether or not one is in a position yet to advert to functionality, obviously versions of the *fourth* option will be needed. But, as mentioned above, option (4) already is included within heuristics for functional dialectics identified by Lonergan. The *third* option will be the way to begin to promote the proper emergence of functional collaboration. The *first* option will be important for foundational growth and developing control of meaning. The *second* option is problematic. For, while the familiar mode of scholarship has served an historical function, it is no longer adequate, and in fact contributes to ongoing decline. It is, though, the kind of

[83] Bernard Lonergan, *Method in Theology*, 250, lines 18-33.

[84] Strangely, Lonergan's major breakthrough mainly has been ignored by scholars in Lonergan Studies. Nor has an alternative solution been proposed. A hope is that before too long Lonergan Studies will begin to break free of Lonerganism, and begin to move toward challenges of implementation.

scholarship that presently dominates the academy. In the traditional mode, the main focus is on words and concepts. In particular, the scholar is directed away from acquiring and reflecting on experience available only by entering at least some ways into the sciences. Even when correct results are reached, the traditional mode does not promote control of meaning, but admits *ad hoc* combinations of description and theory.[85]

I end the article with a question: In our reaching for a solution to the collaboration problem in *Insight* (and beyond), what are we to choose? Looking to the present list, neither (2) nor (5) are viable. But (1), (3), and (4) all carry promise, along with whatever else we may find that helps us move toward a functional vital progress-oriented all-reach eight-movement Ode to Joy.

O Freunde, nicht diese Töne!
Sondern laßt uns angenehmere anstimmen
und freudenvollere.
Freude!

Oh friends, not these sounds!
Let us instead strike up more pleasing
and more joyful ones!
Joy![86]

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[85] "In the second stage the world mediated by meaning splits into the realm of common sense and the realm of theory." *Method in Theology*, 93. See also *Method in Theology*, sections 10.3, 10.4.

[86] Friedrich Schiller (1759–1805), in the fourth movement of Beethoven's Symphony No. 9, in D minor.