

LONERGAN'S MEANING OF *COMPLETE* IN THE FIFTH CANON OF SCIENTIFIC METHOD

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I follow the editor's suggestion in dividing this essay into sections dealing with a) content, b) context, c) personal context. However, I break the personal reflections into two sections that bracket the presentation of content and context. So, sections 1 and 4 present my personal perspective; section 2 is a shot at a hypothetical expression¹ of the content of Lonergan's meaning of *complete*; section 3 handles the context problem. The immediately relevant expressed contexts for the

¹ "Hypothetical expression" comes from the context referred to in *The Sketch* (CWL 3, 579-81). The expression in sections 2 and 3 are attributed to Lonergan. This includes the footnotes. Occasionally I add 'my own' comments in these notes: these comments are in square brackets. I must add that those sections are not at all an effort at adequate interpretation and expression. The function of this essay is to illustrate, to get the show on the roll. So, I would need the functional feed-up of adequate research not only on Lonergan but on 20th century work in the area. I think, for instance, of one author and one book in both these contexts: Arthur Eddington, *Space, Time and Gravitation* (Cambridge UP, 1920), a really fine mid-level introduction to the problems dealt with in this essay. I shall return to the book later. Did Lonergan read it? The direction of Eddington's searchings parallel remarkably Lonergan's push in chapter five of *Insight*. I do not recall finding any reference to the work in the archives, though he knew of Eddington (index, *Method*). And the canon of residues steps in, joined by the canon of forgetting. I recall asking Lonergan in the mid-1960s about his possible reading of S. Alexander and O. Veblen on questions of space-time (see comments relevant to the present topic in *Randomness, Statistics and Emergence* (Gill Macmillan and Notre Dame, 1970), pp. 115-116): he was not 'up' on his own research.

effort here are *The Sketch* in *Insight* and page 250 of *Method in Theology*. *The Sketch* speaks of content and context of an interpretation; the page pushes uncomfortably for a personal stand.

1. Personal Context I

No one needs reminding, perhaps, that the meaning Lonergan gives to *context* is existential. It is the incarnate character's setting of answers and questions (*Method* 163-4; 183-4). That setting, within a developed functioning of specialization, has its *per se* creative lifting and expression in the operations described so bluntly on page 250 in *Method in Theology*, and I take it that the intention of the editor, whose plan includes a following volume centered on this page, is to invite some elementary attention to the perspective of that page within the present effort. That is what I attempt now, in a manner that I have described for decades as "rambling dialectics."

The mention of decades locates me as someone who has been struggling in this zone for some time. I suppose in the *Assembly*² that this would lead to my self-*Classification* (*Method* 250) – in my life-style of the mid-1940s – as a groupie of Frederick Chopin and René Descartes (the Mathematician). The affinities (*ibid.*) seem to have "other grounds" than dialectical, yet was there, is there, not the seeding of a tunneling here towards a positional stance compatible with harmonious theoretic sensibility? But the tunneling became one of a Lonergan groupie only in 1956, when I completed graduate studies in mathematical physics and moved to the study of philosophy. A timely business: the shock of extreme realism came out of the first *Verbum* article³ and, in the following year, the humility of discovering the Chopin of – among so many other zones – relativity theory as expressed incomprehensibly in chapter five of *Insight*.⁴ Forty-

² The last word on p. 249 of *Method*.

³ *CWL* 2, 20. An unforgettable moment with the unforgettable text dealing with the "fifth element in the general notion of the inner word," dealing, of course, with you and me as notions, patterns of evolution's chemistry, in our strange layer infolding of energy.

⁴ I had given a great deal of time and energy in 1955-6 to such works

five years later it begins to make more sense, and that *more* is what this little essay is about. But I would draw attention to my seriousness in using the word *begins*: only in the summer of 2003 did I reach a sufficient grasp of Lonergan's meaning of *energy*⁵ lurking subcutaneously in phrases like "tensors are defined by" (CWL 3, 171) and "at a certain temperature" (CWL 3, 189).

Yet such a sufficient grasp is an existential presupposition of interpreting adequately Lonergan's meaning of *complete*: surely a cautionary message in our efforts to interpret Lonergan here, there, anywhere, since that meaning of energy resonated for Lonergan in the very print of the empirical residue of *Insight*.⁶ Still, I suppose I have made enough progress to attempt a poor interpretation of the word *complete*: later generations, operating in the hodic sublation of the third canon of hermeneutics, will recycle my reaching and spin-off, with recurrence-schemes of statistical success, the non-pure.

However, I would risk here a general comment on attempts to interpret Lonergan on any topic, a comment I have made previously in a context of humour and satire.⁷ Normatively, a functional interpretation has a controlled fullness: the control comes from the incarnation of the contemporarily-adequate general categories,⁸ the fullness comes from the orientation of that incarnate effort that guides us luminously to "say definitively" (CWL 3, 583) something precise, novel, neglected, to the community of historians.⁹

as Schrödinger's *Space-Time Structure*, - a book I refer to later (see note 55 below) - but this was a shockingly new ballpark.

⁵ I deal with that in *Cantower XXX*, "The Conservation of Energy." This essay, and others of the 117 so titled, are on www.philipmcshane.ca.

⁶ It is sobering to ponder, in the inwardness of extreme realism and of a committed explanatory heuristic, the status of the already-out-there-now *Insight*. The status of the already-out-there-now space-time is, of course, the larger problem lurking here. The required inwardness is the topic of *Cantower IX*, "Position, Poision, Protopossession," and I return to the larger problem in *Cantower LXIII*, "Considerations of Gravity" (June 1st, 2007).

⁷ See *Cantower XI*: "Lonergan: Interpretation and History."

⁸ *Method 292*: "The use of the general categories occurs in any of the eight functional specialties."

⁹ Functional interpretation and its relation to functional history are

But when we think thus we are thinking forward, in foundational fantasy, of later generations and centuries. The present effort at collaboration in functional specialization has to be an honest effort to lift-off poorly¹⁰ out of more than seven centuries – or seventeen, or twenty-seven centuries – of disorientation and malice into a luminous redress of poise. Page 250 of *Method in Theology* grounds multiply-rich paradigm shiftings of the practice of *Comparison*. Aristotle’s brief dance¹¹ and present minced two-steps¹² have to be replaced by a global symphonic ballet of “the completed assembly”¹³ in which all disciplines madrigal. Present moshpit honesty needs to “protect the future” (CWL 3, 265) with a disconcerting bow to Lonergan’s logic: “the essential logic of the distorted dialectic is its own reversal” (CWL 3, 258).

This volume and the present essay are such a bow and quasi-luminous disconcertedness is part of its curtsy. We fail to step to the measure of *The Sketch*, the Canons, the functional divisions, but we stagger in stumbling tune. My own stumbling avails of a simple strategy of the appearance of blaming Lonergan for my failure: I let him speak imperfectly for himself in the two following sections. How would Lonergan speak efficiently to functional historians of this coming millennium? Certainly, he would still hold that “adequacy is a variable standard” (CWL 3, 580), but how might he reach a transient standard of getting from (A) to (F) and beyond? Would he try for the high achievement of a reflective interpretation despite its “two obvious difficulties” (CWL 3, 586)?

dealt with in *Cantowers XXXVII and XXXVIII*.

¹⁰ In using the word poorly I am thinking of the slogan I invented in the late 1970s regarding functional specialization: “If a thing is worth doing, it is worth doing badly.”

¹¹ I am thinking of the beginning of the *Metaphysics*.

¹² I am thinking especially of the type of comparative study, “Lonergan and X,” where regularly the categories of the interpreter remain unrevealed. *Comparison* is given quite a precise status on page 250 of *Method in Theology*.

¹³ *Method* 250. Note the later creative addition by Lonergan to his early notion of *complete*: to the data of space-time we are to add the data of spacetime print and imprint on the sand of time.

Any of my present readers, many of whom, hopefully, find the following two sections inadequate, could attempt that high reflectiveness that involves an estimate, (B''), of readers' habitual grasping (C'') of the self's intellectual development (C') (*ibid.*). In this way we might stumble towards later whirling. But please, don't just sit there, bitching at this mazurka: I have had enough of that in the past decades.¹⁴

2. Content

"The canon of complete explanation is culturally conditioned. By this I mean that it will fade in so far as explanatory heuristics develops and is implemented.¹⁵ The cultural condition tends, however, to be an attractive disorientation, so the canon may have an indefinite future relevance.¹⁶

But first I must note its central point. It is that experienced extensions and durations are no less data for inquiry than any other zone of experience. Indeed, they are to be identified as the data of physics when that science is viewed only in its objective content.¹⁷ The data of physics in its fullness, of course, includes the physicist: that is the claim of my full expression of the meaning of generalized empirical method.¹⁸

¹⁴ A deliberate little shock of style at the end of this first section. A matter of being complete, as will appear when we take up again after Lonergan has hypothetically spoken in the next two sections. I return to the question of shock, style and dissent below, at note 32, and conclude in that tone from note 64 on.

¹⁵ An extremely important text on this matter is my *De Deo Trino II. Pars Systematica*, Gregorian P, Rome, 1964, 306-11. See especially section 3 on p. 308, which indicates the inconvenience of using descriptive relations even in the beginnings of scientific investigations.

¹⁶ The problem that I raised at the beginning of chapter fourteen of *Insight*. I do not foresee an institutional overcoming, in the next few centuries, of the pressure of naive realism on scientific conversation. [See note 6 above]

¹⁷ *CWL* 3, 80 permits this distinction but it should fade operationally under the pressure of my later definition of generalized empirical method. See the following note.

¹⁸ "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

But for the moment I focus on objective content. Then extensions and durations are objects to be investigated in physics: indeed their investigation is an investigation of the conjugate forms and conjugate acts of the things of physics.

Why, then, the special canon? After all, there is no need of such a special canon in chemistry or zoology. There is a push for explanation, for complete explanation, in these areas. That push is sufficiently expressed in the other five canons. If the same were true for physics there would be no need for a separate canon of explanation. Is the need just cultural or is it more deeply human? That topic carries me into the question of context, and I am trying to home in here on content. Let us take it in stages.

The issue is massively complex, especially as I am writing from the non-moving viewpoint that controlled the moving presentation of *Insight*. *Complete* means that physicists have to push forward, in collaboration especially with geometers, towards an asymptotically adequate conception of the real geometry of the cosmos. That real geometry involves not only a determination of the conjugate forms of all the things of physics – one might think in terms of an analogue of the periodic table of chemical things – but also, heuristically, the acts by which these forms generated and generate and carry forward to its destiny the rich mesh of dispersedness that is its dynamic potency. It seems to me that physics to date has carried us sufficiently forwards to enable the identification of that dynamic potency with what the physicists call energy, always so called in a context of actual or proximately-potential formedness. It is that “always so called” that brings into focus the fundamental difficulty.

The difficulty of physics lies in what I might call its helplessly empty beginning. It is the emptiness identified by Aristotle in the non-identity of a prime part-reality which made here and there merely here and there. One is somehow helpless in referencing it unless one avails of... well, either of some things that are here and there that need not be things of physics, or of some quite subjective referencing system. Different plants identify places in a primitive garden: or one

corresponding objects.” 3 *Coll*, 141.

can leap ahead beyond Descartes to label somehow the undifferentiated places and times, Places and Times. Immediately we are trapped in the primitive garden that lies between China and Egypt, measured off by the additions of the Greeks. But is the Euclidean referencing system quite arbitrary and subjective? Indeed no: it turns the helplessness to advantage in emphasizing a sameness. It is an ordering on a principle of sameness. Rulers and clocks can be moved around safely in the ordered emptiness – but only if they are not there!

Obviously, I am pointing you towards my previous expression of this problem, and into that context I add the present starker pointing. What is the frame of reference of real geometry? It is the concrete network of conjugate acts of the things of physics that pattern material finitude. How do we move towards the conceiving of that pattern and its forms? By sleepwalking.

The adjective *complete* points to a danger in that sleepwalking, a danger not eliminated by the shift from Euclid to Minkowski: that is a large part of the message of chapter five of *Insight*. Perhaps I might identify the danger roughly by saying that the geometry of the cosmos is not some overlay on a simple four-dimensional structure of sameness gifted to us by either special or general relativity. The elimination of the danger, at least for the psyche of the intellectual pattern of inquiry, requires a shift to a luminous physics: “the extroverted subject visualizing extension and experiencing duration gives place to the subject oriented 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). When holding to that pattern – but not luminously – people like Einstein can move forward within the ethos of the fifth canon to conceive of laws invariant under certain transformations: another key topic of chapter five of *Insight*. So, he arrives at a view of cosmic geometry as involving symmetric and anti-symmetric tensors, despite a massive lack of heuristic luminosity regarding things, conjugates, and the real dynamic potency of the complex patterning of the secondary relativities of real forms.

Of course the canon of explanatory completeness reaches

further. In the first paragraph of chapter five of *Insight* I write of “a bridge”: if this canon is not cultivated existentially, the rest of the book lends itself to systematic mis-reading, even for those with the sophistication of intellectual conversion.

What, then, do I, did I, mean by *complete*? “All we know is somehow with us” (CWL 3, 303) and “theoretical understanding seeks to solve problems, to erect syntheses, to embrace the universe in a single view” (CWL 3, 442), “a single intelligent view” (CWL 3, 544) which is itself brought forth in the embrace of the universe seeking its own unity. The first and fourth contexts mentioned in the first paragraph of the next section are central here. My non-moving viewpoint at the age of 46, when I wrote this canon, placed me integrally and heuristically and existentially beyond imaginative synthesis.¹⁹ The integrity, of course, was existentially incomplete: I was very much a displaced person both privately and socially. But I was dominated by the notion of *complete*.

So, my meta-physics led me to envisage and indeed achieve to some extent an on-going enlargement of the meaning for me *as physicist* of the canon of complete explanation. But I wrote, even from a moving viewpoint, in the manner of a doubly-displaced person, of “an intelligibility grasped in the totality of concrete extensions and durations and, indeed, identical for all spatio-temporal viewpoints” (CWL 3, 195). And only a doubly-displaced person could follow those phrases with a paragraph beginning, “The answer is easily reached. One has only to shift” A serious pause over the first paragraph of the next section would bring forth the humour, or perhaps the satire, that I did not notice as I typed the words *easily* and *only*.

I had placed Thomas’ reflections on the beginning – or non-beginning²⁰ – of the cosmos and on its destiny in the

¹⁹ *Insight*, section 6.4, “deals with” the contrast between systematic unification and imaginative synthesis. What might I have said here, about personally dealing with the contrast? [It involves the long haul described particularly in *Cantower IX*: “Position, Poosition, and Protopossession” and *Cantower XXXII*: “The Empirical Residence.” But what is needed is the new culturally-encouraged contemplative stance described in *Cantower XXI*: “Epilodge”].

²⁰ I refer here to Aquinas’ tricky answer to the problem of an infinity

context of centuries of science's infant struggle with the matter, the energy, of that beginning and destiny. I had done this in the context of the creative innovations regarding the normative patterns of human and divine economics that held my attention through the 1930s and the 1940s. I had taught Christology the year I began *Insight*, 1948-49, and taught it a second time in 1952-3, the stressful year of my enforced incomplete completion of *Insight*. What, then, did I mean by *complete*?

"What, then, is being? Let us begin by taking our bearings" (CWL 3, 665). This question, and its 46-year-old determinations, were my bearings, Trinitarian bearings, but held down and hidden by the device of a moving viewpoint, a device that broke down here and there, but most especially when I rose, in the thirty-first place of the final chapter, to speak of "a love that, so to speak, brings God too close to man" (CWL 3, 747). I rose, or was lifted, to make mention of God's concept, God's Concept, the Heart of my Christological teaching. "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 of universal order that is God's concept and choice" (CWL 3, 747-748). I had already discovered the "single frame of reference" (CWL 3, 761) that held together what might seem "a large number of otherwise unrelated aspects" (CWL 3, 761) of being, such as the frames of reference of physics. "Did Jesus Christ, his only Son, our Lord, suffer, or was it somebody else, or was it nobody?" (CWL 4, 179). A descriptive frame of reference would place Him, God's concept, and His suffering gravity, on a hill in this galaxy of the cosmos. An explanatorily controlled asymptotically-complete histogeometry would help to identify the fore-ground radiation of His effective presence in a eucharistic finitude.

Did I mean all this when I wrote of the canon of *complete* explanation? As my spiritual mentor St. Ignatius wrote in *The Exercises* regarding the unmentioned first apparition of Jesus to his mother, "Are you also without understanding?"²¹

of days before today: see *Summa Theologica I*, q. 46, a.2, ad 6m.

²¹ I translate from memory, from my old Latin *Exercises*, in my

3. Context

“My Context is a complex of overlapping cultural and personal contexts. I draw attention to four main contexts in the order of their importance for the present topic. There is the context of the past century or so in physics (1850-1950), represented fairly adequately by the books mentioned below.²² There is a second context to which I draw attention in my expression of the canon in *Insight*, a context ranging through Galileo and Kant (CWL 3, 107-109). There is the context – an early development for me – of my work on science and logic and the geometry of Euclid.²³ There is the fourth context of my work in theology, especially as it impinges on problems of

possession since the end of my novitiate. It obviously is a central principle of my life. Perhaps you noticed something of Ignatius in my reflection on the Assumption? “Can one say that she adores in heaven the body to which she gave birth, yet is somehow without the body that gave it birth? Can one invent some metaphysical law or some principle of divine justice that overrules the best of sons’ love for the best of mothers, that permits the Sacred Heart to be a living heart but forces the immaculate heart to be a dead heart?” (CWL 4, 73) [written in July of 1948: see Crowe’s comment on Lonergan’s piety, *ibid.*, 267. On Lonergan and the *Exercises*, see Gordon Rixon, “Bernard Lonergan and Mysticism,” *Theological Studies* 62 (2001), 479-497.] And in that context I end my reflection on content, assuming that you can understand that I had also thought of the meaning of *complete* in relation to our “destiny” (*Method* 292): the full vertical finality of real geometry. The operative geovision of the wombed Word was a central interest of my life, a strange mutual self-mediation of a finite and an Infinite wayfarer. My last effort at Latin theology was in this area, continuing my struggle to improve thesis 12, on the knowledge of Christ, in *De Verbo Incarnato*.

²² A list could be compounded of my readings in physics but I mention here the two most relevant works: E. T. Whittaker, *A History of the Theories of Aether and Electricity* (Dublin UP; Longmans, 1911); R. B. Lindsay and H. Margenau, *Foundations of Physics* ([1936] Dover, 1957). The latter book was something of a bible in the field for me. [See my comment in note 1 above on research into Lonergan’s readings].

²³ Again, I limit myself to key references. H.W. B. Joseph, *An Introduction to Logic* (Clarendon, 1906; rev. 1925) was a central text. The final chapters, on explanation, on induction, on mathematical reasoning, on the methodology of the sciences, were especially relevant. Then there was my focused work on Euclid, which I brought to bear on Peter Hoenan’s rich searchings in my “A Note on Geometrical Possibility” (CWL 4, 92-113). A relevant overlapping is “Isomorphism of Thomist and Scientific Thought” (CWL 4, 114-132).

space and time: *Gratia Operans, Verbum*, the Trinity and the Incarnation. It was in hintings of that last context that I concluded the section on Content.

It is of interest to note that these contexts were personally overlapping rather than culturally over-lapping: one must advert here to the fact that the broad definition of context that I later gave in *Method in Theology* covers the case of non-overlapping contexts where the aggregate of answers and questions are distributed over diverse communities. This non-overlapping exacerbates the problem lurking in the word *complete*.

Elaborating here, old-style, on these contexts, would be lengthy and superfluous: the old-style expression is available in the texts noted. Elaborating new-style would, in the present state of hermeneutics and functional specialization, be lengthy and differentiatedly creative. Further, I would note that this paragraph does not belong in the new-style interpretation. In functional interpretation one would no more have to draw attention to the style than one has to draw attention to theorems of tensor invariance in an advanced paper of contemporary relativistic physics. That new-style would be dominated by the second canon of interpretation (CWL 3, 609-610), which sublates the fifth canon of science towards a pure context of complete explanation. In a developed specialist collaboration, shared and sophisticated general categories would control the level of specialist work and inter-specialist communication so that "cumulative and progressive results" (*Method 4*) would occur with a *per se* accuracy and efficiency that would give a new unity to the enterprise of metaphysics.²⁴ One must think, then, of a community sharing, in a manner quite beyond public discourse,²⁵ a full genetic systematic control of the ongoing

²⁴ I urge your attention to the context given by line 16 of page 160 of *Topics in Education* [CWL 10]. A science has unity and beauty in its efficiency. Functional specialization shifts metaphysics discontinuously towards that efficiency. See below, note 27.

²⁵ It is enormously important, personally and communally, to take a stand on this. It is all too easy, for instance, to think of the eighth specialty as somehow bordering on popularization. The eighth specialty requires an understanding of popularization not only categorially but in the possibilities made statistically probable by ever-freshening genetic systematics. No

genesis of meaning.”

4. Personal Context II

So, I step now back, or forward, to personal and rambling musings about the fifty years since Lonergan finished the climb of 1953 to his final words: “once that mind is reached it is difficult not to import his compelling genius to the problems of this later day.”²⁶ What the implementation of functional specialization does, will do, is increase, with a precise statistics,²⁷ the making it “difficult not to import” the genius of the past through operative embarrassment. It is a brilliantly human cosmopolitan twist on method that I rejoice in mentioning: “doctrines that are embarrassing will not be mentioned in polite company” (*Method* 299). It is an embarrassment that is to place the global culture, in the concrete good of a fresh pragmatism,²⁸ on a merciless roily rollaway.

But into my rambles here it is as well to place a shot at a precise and fuller meta-physical embarrassment that accrues to Lonergan’s view of *complete* by its multifaceted “*Completion*,” adding evaluative completeness in the fullest possible context of object and subject in a completeness that in this life remains essentially incomplete, but with possible and probably growing luminosity.²⁹ First I draw attention to the subjective completeness, then to the objective completeness. But I already drew attention, drew your attention and your attendant feelings,

mean challenge.

²⁶ The final words of the Epilogue of *Insight*, referring there to Aquinas.

²⁷ *CWL* 3, 144 describes how probabilities are shifted from products to sums by scheme-structures. Functional specialization is a scheme-structure.

²⁸ A context of reflection here is “Inventing Pragmatics” and “A Fresh Pragmatism in Education,” chapters three and five, respectively, *Pastkeynes Pastmodern Economics: A Fresh Pragmatism* (Halifax: Axial P, 2002).

²⁹ I think it relevant to brood in this context over a remark Lonergan made in a book review in *Gregorianum*, 1955: “What then is needed is a qualitative change in me, a shift in the center of my existing from the concerns manifested in the *bavardage quotidien* towards the participated yet never in this life completely established eternity that is tasted in aesthetic apprehension ...” Lonergan, review of J. Chaix-Ruy, *Les Dimensions de l’être et du temps*, *Gregorianum* 36 (1955), 138.

towards that *Completion* listed on page 250 of *Method in Theology*, at the conclusion of section 1, when I wrote of the mazurka that you might bitch about. Did that stir and comfort - or discomfort - your molecules? We are here at a very fine point of the communication that is dialogue in either its common or its dialectic form, biography speaking completely to biography in history, where the personal relating is burdened and bubbling with vertical finality.³⁰ In functional specialization we reach for the pure cycle of efficiency in so far as the cycling triggers an effective lift in energy's your-heart loneliness for a freshfelt turn to the idea. It is then an echo of the economy that is the divine cycle.³¹ How do you feel about about about³² this emotional twisting in and round page 250's residual finality?

But the twisting and perhaps the discomfort is now more refined through the addition of what I call objective completeness, the addition of companionship, in the *assembly* of those who reach towards complete explanation in physics.

³⁰ I would note that the third line of the 'diagram' of page 48, *Method in Theology*, is within the vertical finality of incompleteness. Authentic personal relating is a reaching beyond established relating, indeed, at its best, in the mood described in the previous note. Add the context of "Mission and Spirit" (3 *Coll*, 23-34). Of course, the context of the following footnote is the Heart of the matter.

³¹ The context here is the reflection on "novae relationes personales" in Lonergan, *De Deo Trino II. Pars Systematica*, Gregorian P, 1964, 240ff. And so we may point to the complete meaning of *complete*, the complete meaning of energy, in the strange incompleteness of eternal surprise. Even, I would note, for the human mind of the second divine person. See *Summa Theologica*, I, q. 17 a. 7; III, q. 9, a.2, ad 3m; q.10, a.1. This is important in the conceiving of the eschaton in terms of "Infinite Surprise" (*Wealth of Self and Wealth of Nations*, 111).

³² Reflection on this peculiar triplicity runs through *Cantowers XXVII-XXXI*, five essays which parallel the first five chapters of *Insight* with the first five chapters of Feynman's 3-volume work, *The Feynman Lectures on Physics* (Addison Wesley P, many reprints). The five essays provide a context for understanding the present effort. The "about about about" comes from Lonergan's distinction of three orders of consciousness made in a draft, in early 1965, of a first chapter of *Method*. See Darlene O'Leary, *Lonergan's Practical View of History* (Halifax: Axial P, 2004). We are again in the shock and annoying zone of the end of part 1. Are you annoyed with my triple 'about'? Well, that makes you annoyed with Lonergan, so I am in good company. Now try note 64.

Here it seems important to pause over the difference between future normal theological science and our present situation of massive impoverishment and the shocking multilayered paradigm shift.

In the normal hodic science of later centuries what the cycling normally adds is a transforming piece to an already solidly established content. All the functional specialists will then go about their business of lifting history still further in the context of a systematic beauty shared like a post-Messien melding of East and West: a new chord, a piccolo note, is added to the expansive control of mature musical meaning. It can be a lift in any specialty, but it is a kindly ripple, not a shock wave desperately avoided by lesser folk trapped in convention. Perhaps the best analogue for such a hodic development is contemporary chemistry in its successful though non-hodic form: at its front-edge there is a massive complex implicit heuristic that grounds the ordering of discoverings in various domains.³³ In contrast, present “normal theology” has no serious heuristic, even in the non-hodic sense.³⁴

But let me get closer to my topic of completeness, of Lonergan’s meaning of *complete*, and of the completeness that he adds to twentieth and twenty-first century physics, by turning my attention to present “normal physics.” That last sentence and the last phrase are amusingly, challengingly, ambiguous. Part of the achievement of this essay is the thematization of myself for myself of just what I am “turning my attention to” in the next eight years, and central to that turning, turn-about, is the shocking discovery of the meaning of *complete* as it lifts the book *Insight* into a quite new context of answers and questions. So, “let me get closer to my topic of completeness” is at least ambiguous, at most false. I do not wish you to “let me”; I wish some of you to come along in the

³³ A context here is *The New Chemistry*, edited by Nina Hall, (Cambridge UP, 2000). On the heuristics of chemistry and its school teaching see *Cantower XXVIII*.

³⁴ I reflect on this problem in *Cantower XXXIII*, where I survey from this perspective the last decade of Christological theology presented in the journal *Theological Studies*.

search.

The search as I see it now, in this next two-thirds of my *Cantowers*, is for a meta-physics in a quite novel sense. There is a narrow novel sense contained in the heuristic program that I name GEMb, the implementation of the later view of Lonergan.³⁵ Physics and metaphysics must travel together in the new normative culture. Nor do I mean by that a limited metaphysics: this I shall illustrate below. There is the further full novel sense of hodic physics, physics twirled into the cycling process of functional specialization. Is this further novel sense really “further”? On the contrary it is the prior and dominant sense, as it is to be in theology. What I mean by this is that it is functional specialization that will bring about the lift - by embarrassment and peer-pressure and various other low human motives - towards the first novelty of GEMb either in physics or theology or any other zone of culture.

So, again, let me get closer - come with me obscurely³⁶ - to the topic of completeness. The problem has been emerging since the dawn of physics and chemistry. It emerged in the past few centuries of physics with more precision, especially because the contexts of Newton and Maxwell lent themselves to a mess of dialectic muddling regarding what we may name the couplings or conjugations of the things of physics and

³⁵ See note 18 above. I deal with a classroom form of this implementation in “A Reform of Classroom Performance,” *Divyadaan; Journal of Philosophy and Education* 13 (2002), 279-309. This article is the concluding section of *Cantower VI*.

³⁶ The character of obscurity, popular or otherwise, is a vast undeveloped topic of methodological analysis. I opened it up in chapter three of *Lack in the Beingstalk: A Giants Causeway*, return to it in *Cantower LVI*, “Quantumelectrodynamics, Pedagogy, Popularization,” in the context of one of the most brilliant pedagogical efforts in physics that I have come across: R. Feynman, *QED: The Strange Theory of Light and Matter* (Princeton UP, 1985). What is needed is a precise normative account of the strategy and content of popularization. “Never has the need to speak effectively to undifferentiated consciousness been greater” (*Method* 99). What we need to work towards is the luminous presence - characterization in the existential sense - of the understanding of the need. That luminous presence has to become an operative statistic of local community: this relates to “The Problem of General History” raised by Lonergan in the final section of his *Topics in Education* (pp. 250-57).

especially regarding the potency of that conjugation.³⁷ The muddling is easiest recognized in the present popular captivation of the minds of physicists and non-physicists with the structure of space-time: there seems to be an entity - it replaced the aether of the nineteenth century - in which we live and move and have our being, that has a wondrous complexity of wriggles and bumps in three or four dimensions, but also beyond that in baffling larger dimensions of quantal and stringy foams.³⁸

My difficulty now is how to handle for you - presumably a non-physicist - the illustration of interpretation that places Lonergan's in the dialectic of the past century's physics. I wish to do this in two stages: one focused on the work of the Irish

³⁷ This is a massively complex topic of reaching for metaphysical equivalents and for a new language of the forms, acts, and potencies of coupling (coupling values, constants, 'particles,' factors, whatever). For people of the Aristotelian tradition there is the error handled by Lonergan in a fragment that I reproduced in *CWL* 18, 13, note 13. The handling pushes one towards a view of conjugate potency that ties in both with a new metaphysics of energy (see note 8 above) and with a fresh clarity on the primary and secondary relational elements of real geometry. How, for instance, might one reach methodological luminosity on the claim that "the distinctive feature of the gravitational field is that it is *self-interacting* ... it defines the space-time over which it propagates. In order to obtain a definite equivalence class of metrics which represents a space-time, one introduces a fixed 'background' metric and imposes four 'gauge conditions' on the covariant derivatives of the physical metric with respect to the background metric." *The Large Scale Structure of Space-Time* by S. W. Hawking and G. F. R. Ellis (Cambridge UP, 1973), 227. There are many paperback reprints: my own is 1999. This places Lonergan's problem of measure-standard (*CWL* 3, 190) in an up-to-date context. See also notes 52, 60, 61, below.

³⁸ A recent *Scientific American* (January 2004) gives the tone of present popular mythological writing by serious scientists. The cover-story this month tells in Blue and Red of "Loop Quantum Gravity. A Physics Theory Shatters Space and Time." I already commented on popularization and its problems in note 36 above, where I mentioned Feynman. I should refer to him again here, for those interested in a serious glimpse of the problems of quantum-gravity: *Feynman Lectures on Gravity*, edited by Brian Hatfield, with a foreword by John Preskill and Kip S. Thorne (Addison Wesley, 1995). Lectures 12 and 13 are especially good as a broad introduction to problems of cosmic structure and the limitations of our struggles towards a full physics (leading, of course, to issues of eschatology).

physicist Lochlainn O’Raifeartaigh, the other on the context of the work of Stephen Hawking. Let us begin with the restricted zone of physics relevant to the meaning of *complete* with which O’Raifeartaigh deals. I focus on a single book, providentially and suitably titled *The Dawning of Gauge Theory*.³⁹ It is the beginning of a dialectic analysis of twentieth century physics by a scientist working quite outside the Lonergan tradition.⁴⁰ Lonergan, then, is not in there, as he will be in analyses later in this century.

In those later analyses, not only will the writing be comprehensible to physicists but the elders of dialectic will also be in the ballpark. After all, we will only be moving forward on lines suggested by the theologian, the 45-year-old Lonergan of the mid-twentieth century. Further, the cycling of functional specialization at that stage will be such as to lift the entire community of specialists to this new level of comprehension. You find this claim strange, unacceptable? I recall now a Boston Lonergan workshop of the 1970s on

³⁹ Lochlainn O’Raifeartaigh, *The Dawning of Gauge Theory* (Princeton UP, 1997). I may as well introduce here his second book that is relevant to our considerations: *Group Structure of Gauge Theory* (Cambridge UP, 1986).

⁴⁰ Lochlainn and I had in fact done graduate work together, 1955-6. The following year he was a research fellow in the Dublin Institute (where Schrödinger had worked, 1939-56) and then went on to study in Zurich under Heitler. He came to visit me in 1964, during my fourth year of theology in Heythrop College, Oxon. (Lewis Watt, Lonergan’s economics inspiration, was still there). He knew of my interest in Lonergan but we were on different tracks. Yet at the time he was pushing towards a no-go theorem (see note 44 below) of fundamental significance in the conceiving of space-time. I met him last in the summer of 2000, when he was full of fresh hope as he talked about the long active life of some theoretical physicists. He died a few months later. I add these reflections here because it seems to me that there is a bio-lesson for theologians in the life of this brilliant man. There is a tendency in theology to expect creative contributions where few may be possible or probable. Most of us are simply learners, some of us may contribute a theorem, but in the main it is a matter of recognizing that symphonists are few, second-rate fiddlers in plentiful supply. But now I am rambling back to the message of the concluding page of “Features of Generalized Empirical Method. A Bridge Too Far?,” *Creativity and Method*, edited by M. Lamb (Milwaukee: Marquette UP, 1980).

“Theology as Public Discourse” (which of course, normatively, it is not and will not be) the reply of Lonergan to the question, “How much physics should a theologian know?” Lonergan’s reply was “well, he should be able to read Lindsay and Margenau.” *She*, of course, is included in his old-style talk. Theology has seven centuries of disorientation from which to recover.

What might I say here and now? To those very competent in physics I would say, read O’Raifeartaigh’s book with a hodic eye: I come back to that shortly. What is the key point in it, that happens to bring Lonergan’s brilliance into focus? In my first draft of this paper I foolishly envisaged some sort of a swing through the works of Weyl, Kaluza, Klein, Schrödinger, etc, made available in translation and commented on by O’Raifeartaigh. Instead it seems more appropriate just to quote summary introductory pointings by him. The pointings are pretty incomprehensible, even to many who graduated in physics, but you might get a sense of the shift in the past century regarding what I call **real geometry**.

.... Almost entirely due to the genius of Einstein, geometry graduated from being the stage on which the drama of physics took place to being a major player in the drama. There remained, however, the electromagnetic and the nuclear forces, and the geometrization of gravity raised the question as to whether these other fundamental forces were ‘true’ forces operating in the curved space of gravitational theory or whether they also were part of the geometry. This question has still not been fully answered. But what has become clear is that these forces and gravitation have a common geometric structure. This is the so-called *gauge* structure. The purpose of this book is to explain how this structure gradually emerged.

It was actually the theory of gravitation that opened the way for the development in physics and mathematics that led to gauge theory. Although gauge theory is now universally accepted, its geometric nature is not always fully appreciated. This is partly

because the success of gravitational theory has made the idea of geometrical forces less remarkable, partly because the geometry of gauge theory is not metrical and is therefore less intuitive, and partly because the geometry is not yet the whole story. Furthermore, the emergence of gauge theory has been a gradual process, a slow evolution rather than a revolution. The emergence of gauge theory has been gradual for two reasons. First, on the physics side, its importance for gravitation and electromagnetism was not appreciated for various reasons that will become clear later, and its role in the nuclear interactions was hidden by the phenomenology. Indeed, the short-range of the forces and the apparent absence of vector-like interactions in both nuclear forces, seemed to rule out a gauge structure. Only in the past two decades has it become clear that these were phenomenological effects due to spontaneous symmetry breaking and confinement respectively and that they masked the true situation. Second, on the mathematics side, the gauge structure that was eventually required, the fibre-bundle form of differential geometry, was itself in process of development, taking its final form only in the early fifties.⁴¹

Perhaps this quotation, however obscure, gives you a nudge towards glimpsing Lonergan's eventual place in this development, grounded in a product also of the early fifties. But before moving on to Lonergan's ongoing place in the *complete* development of physics, I wish to note a few features of O'Raiifertaigh's work in physics helpful towards understanding the functioning of the specialties.

O'Raiifertaigh unknowingly⁴² illustrates that functioning magnificently through two books. The one just quoted, *The Dawning of Gauge Theory*, anticipates dialectic. The second of

⁴¹ *The Dawning of Gauge Theory*, 3-4.

⁴² One must be clear on the meaning of 'knowingly' to detect this unknowingness. Lochlainn 'knew' in a culturally acceptable sense and was capable, as I witnessed personally, of sophisticated discussion. I am talking here about "about about about." See note 32 above.

his books that I reference in note 39 is clearly systematic: indeed I wish to draw your attention to the notion that it is the expression of an up-to-date slice of the systematic physics. Coming to grips with that *slice* notion is important, though I cannot enter into detail here.⁴³ I would note that O’Raifertaigh shows in *The Dawning* that he is competent in what I might call all the slices right through the twentieth century, beginning with the early slices that include the usual Maxwell stuff, the special relativity stuff, the ‘black body’ stuff. He could have written a 1918 slice, or a 1958 slice, etc: most of the top physicists are like him in this. I would further note that he wrote *The Dawning* in a way that helps the reader to ‘get’ the moves that sets up the dialectic stuff towards its function of generating the full genetic systematics that is to be the communal possession of those working in the seventh speciality. He writes with the twisting tactic that reveals and reverses the counterpositions. Detailing this would be at least a long article. How is he able to do this? Because he brings to the work a genetic perspective: it is part of his incarnate heuristic. He has a powerful control of meaning. So, for instance, he was the master in the relevant mathematics of group theory, in a full control from Lie and Cartan on. Indeed, out of that context came his no-go theorem, which cut off a line of work decisively. One expert remarked, “I felt Lochlainn was going to kill the program. He was sharp and his knowledge of group theory was way ahead of anything I or most physicists knew at that time.”⁴⁴

⁴³ For a beginning, see *Cantower VIII*: “Systematics and General Systems Theory.”

⁴⁴ Quoting the physicist McGlenn, from p. 288 of “Lochlainn O’Raifertaigh 1933-2000” by Siddhartha Sen, *Physicists of Ireland. Passion and Precision*, ed. Mark McCartney and Andrew Whitakker (Institute of Physics Publishing: Bristol and Philadelphia, 2003). It was McGlenn that first formulated the problem that led to the no-go theorem. “The prize was to discover a symmetry that combined the internal symmetry of the Gell-Mann with the full Poincaré symmetry of space-time associated with Einstein’s special theory of relativity, as it was well known that rotational symmetry was only a part of Poincaré symmetry. O’Raifertaigh showed that under very general conditions the problem posed no useful solution. The methods used by O’Raifertaigh to prove his result were subtle and made use of deep results from the theory of Lie

This, I hope, is helpful in our efforts to envisage the later working of the functional specialties in theology.⁴⁵ The front-line people – and it is these that are to occupy the Tower, competitively screened, selected – will share a heuristic that resembles but varyingly surpasses the heuristic named in *Method in Theology*.⁴⁶ A few cycling generations in this century will generate a community of the calibre of O’Raifeartaigh in physics, but luminously so.⁴⁷ Can you

groups way beyond the topics covered in Racah’s Princeton lectures and hence unfamiliar to most physicists. This work brought to an abrupt end major efforts to combine internal and Poincaré symmetries” (*ibid.* 287-8).

I leave the reader to think out this illustration of inverse insight and the character of the systematic lift it grounds. “When you discover these limitations, the real significance of them is that you know that such-and-such is a dead-end street and that you have to find another street. What are the implications of this looking for another street?” (*CWL* 18, 62).

⁴⁵ What I have written here supplements the prolonged analogy I drew in chapter 4 of *Lack in the Beingstalk* (www.philipmcshane.ca) between the calculus of variation (the basis of Least-Principle investigations: see note 60 below) as studied by Husserl in his thesis of 1882 under Weierstrass and the calculus of variation that is Lonergan’s methodology. Husserl was on the edge at that time of a central field of inquiry that he abandoned in favour of a brand of conceptualism. What I cannot emphasize enough is the stand against *theoria* that keeps theology out of the significant climb to desperately relevant meanings. Perhaps my own single contribution to theology is my push for a no-go theorem regarding the sick merging of serious theology with sophisticated but readable description. Serious theology is not open to commonsense reading: full stop. See the final two notes below. And in line with the conclusion of the previous note, I would ask you to connect my no-go theorem with the higher system that is functional collaboration.

⁴⁶ 286-291. There is something to be said for locating these at the end of page 250: they were Lonergan’s stand.

⁴⁷ Recall the challenge pointed to in note 32 above. The move towards postaxiality will be complex, embarrassing, fostered by linguistic feedback and narrative bio-exposure. I would draw attention especially to the place of a fresh communality of kataphatic contemplation: Aristotle’s finest way is not just for the privileged few. Here we must look to a new economics that “adds to aggregate leisure” (*CWL* 21, 20). “Such leisure may indeed be wasted, just as anything else can be wasted. But if it is properly employed, then it yields the cultural development that effects a new transformation” (*ibid.* 22). In the concluding notes here I draw attention to the manner in which both the leisure and the transformation can be blocked by academic busyness.

envisage this series of cyclings? It is not easy: it is, *per se*, a function of the community whose contemplative vocation is foundational fantasy.⁴⁸ Let me throw out a few suggestions.

In the first place, you have to think out *Research* functionally. At its best it involves the same heuristic as any other specialty. She or he is tuned to the contemporary cycling, capable of catching a relevant cultural imprint and passing it on. The Interpreters? Well, that is what this volume seeks to illustrate: they sniff out, with H₁ help, significant emergent or neglected gems, and steer them on to the community of historians. But note, please, that this is not “uniform”: take Benton’s point, central to his article, regarding a spectrum of tracks. So, in physics there is a subgroup puttering along for and against the Copenhagen interpretation of Quantum Theory who are less and less in the main stream of seriousness. In theology there will be those marching for Karl Rahner or Martha Nussbaum. In linguistics there will be die-hard Chomskyites. And so on. But there is the beauty and efficiency of Controlling Meaning, shadow of the Word, lifting luck to luminosity, lifting the global culture towards an open critical cosmopolis.

I have already attempted to spell out the character of functional history and shall later attempt to nudge forward the heuristics of the following three specialties. Here I would simply recall the complexity that I have insisted on for three decades, symbolized in the matrix that I presented in the mid-seventies.⁴⁹ C_{ij} is a non-symmetrical matrix of 64 types (i, j, each going from 1 to 8) of exchange: it is to become a taken-for granted ethos of the twenty-second century and beyond. And into this anticipated context one may fruitfully put the anticipation of the tasks and conversations of dialecticians: the refined relative invariants to be aired with foundational

⁴⁸ This *per se* character of foundational vocation needs detailed spelling out. I shall attempt that in *Cantower XL*: “Functional Foundations.” But you can, perhaps, detect its pragmatic reaching in this essay on two levels. There is the vision of a lift in physics, front line and frontclass; there is a vision of a stumbling hodic lift in Lonergan studies.

⁴⁹ First published in chapter 4 of my *The Shaping of the Foundations*; it is reproduced on page 108 of *A Brief History of Tongue: From Big Bang to Coloured Wholes* (Halifax: Axial P, 1999).

colleagues; the remote policy-meanings to be suggested;⁵⁰ etc.

We may now usefully turn to Lonergan's place in all this. A general context is already available in "Elevating *Insight: Space-Time as Paradigm Problem*"⁵¹ so I focus on a few particular points here.

In the full dialectic and the full systematic ordering that my sketch above anticipates,⁵² Lonergan's achievements will represent distinctive slices: indeed two slices in each, corresponding to his published contributions of 1957 and 1969. I say nothing much more here about his illumination of functional specialization: that is his outstanding achievement, shifting metaphysics to its due and overdue contemporary unity, beauty, efficiency. I focus, then, on his fifth *completeness* canon. It was an extraordinary anticipation of the drive of the next fifty years. No, he did not arrive at gauge theory or fibre bundle geometry: but he was quite clear heuristically on the geometric character of the forms of physics, on the possibilities of anti-symmetric coefficients in a generalized relativity theory, and he would not have been surprised at the richer and non-metrical character of such geometries.

What is richer, however, is his general heuristic of physics or of any enterprise, a richness which I have symbolized particularly in two of my words of metaphysics, the first and the third. W3 makes symbolic and embarrassing the achievement of 1969, but let us pass over it for the moment; W1 gives the full context for any serious consideration of the structure of space-time and its measurements.⁵³ According to

⁵⁰ I am holding to elementary pointings here. You may notice that, e.g., policy-gestation is at least three layers of larger group-conversations!

⁵¹ *MJLS* 19 (2001), 203-229.

⁵² Throughout the *Cantowers* I have been gradually developing the parallel between the drive of physics towards GUTs (Grand Unification Theories) and the reach in culture for functional specialization, a reach which sublates Lonergan's earlier notion of UV (Universal Viewpoint). One can fruitfully parallel GUTs and UVs, but the fuller view, to emerge in *Cantower LXV* of August 2007, "The Guts Diagram" sublates both, and other disciplines' searches for unity, into an integral hodic anti-foundational perspective.

⁵³ W1 is simply a symbolization of the heuristics of a hierarchic aggregiformic cosmos. W3 diagrams a heuristic of the implementation of

the levels and convictions of the physicist it invites, cajoles, forces, explanatory attention to the total concrete cosmos.⁵⁴ I can only give two instances here of the rich nudging of that perspective, relating to two works on *Space-Time Structure*. I give there the title of the first work, written by Schrödinger in Dublin in the late 1940s, a brilliant and clear book that I highly recommend.⁵⁵ He begins with the problem of labeling: Lonergan's work not only puts that labeling into a full context of meaning but it specifically identifies the formed dynamic ground of the labelability.⁵⁶ The other work I would invite you to attend to is a standard classic on relativity theory: *The Large Scale Structure of Space-Time* by S. W. Hawking and G. F. R. Ellis.⁵⁷ A few scattered comments on the latter book are useful:

functional specialization. These symbolizations are recurrent in the *Cantowers*, but were originally made available in chapter 4 either of *Process: Introducing Themselves to Young (Christian) Minders* (available on www.philipmcshane.ca) or in *A Brief History of Tongue*. The topic of measurement has come up here in the context of classical physics, but there is the more complex context represented, e.g., by the work of John Bell, who raises also the larger issues of metaphysical equivalence. See, e.g., J. S. Bell, *Speakable and Unsayable in Quantum Mechanics: Collected Papers on Quantum Philosophy* (Cambridge UP, 1987). John Bell's life and work is described briefly, in the work cited in note 44, by Andrew Whitakker, "John Stewart Bell 1928-1990," 273-281. A disturbingly honest Belfast man.

⁵⁴ See CWL 3, 421, 423. A homely push for the concrete envisagement of metaphysics in operation is pp. 27-38 of *Cantower XIV*, "Communications and Ever-Ready Founders," dealing with the metaphysics of Manhattan.

⁵⁵ (Cambridge UP, 1950). I commented in "Elevating *Insight*..." on the problem, in Schrödinger, of attending to things and their notion. It would be a whole other topic to move into the relevance of Lonergan's perspective for Schrödinger's other lines of thinking, e.g., regarding Quantum Mechanics. Further, some of my comments here on the second work apply equally to Schrödinger's book if considered in isolation, but Schrödinger's perspective was a much richer one: see for instance his little book *What is Life?* (My own copy [photocopy] of the book does not give details, but it is a set of lectures in Trinity College Dublin, many times produced.)

⁵⁶ *Cantower XXX* pushes towards a conception of the prime matter of Aristotle and Thomas in terms of energy, something compactly suggested by Lonergan in section 4 of chapter XV of *Insight*. See note 4 above.

⁵⁷ See above, note 37.

a serious consideration belongs in the specialty dialectic.

It is obviously far from the silly world of Hawking's pop-works.⁵⁸ But how does it stand in the context of the new "GEMb" physics? First, I recall now a previous effort to deal with deficiencies in a contemporary classic regarding the meaning of *cause*: we really are way beyond time for the community of science to step forwards out of its ignorant stupidity in this area.⁵⁹ In the case of the work of Hawking under consideration, the simplemindedness of the view of causality is perhaps obscured by the context of the reflections of Hawking and Ellis. As with O'Raiartaigh's work, so here the possibility had occurred to me to deal in some detail with this and with other problems that arise regarding relativistic modeling, but such detail would probably be beyond even the graduate in physics. The straightforward question of causality itself – for the authors mainly either a simple matter of consequence-possibility or a more complex issue of boundary-problems⁶⁰ – would call for a separate essay and quite

⁵⁸ I have written critically previously of Hawking and of his naive notion of popularization in the Introduction to *A Brief History of Tongue*. My title may remind you of his first popular book. His second pop-book is still more 'popular' and more expensive: *The Universe in a Nutshell* (Bantam, 2001).

⁵⁹ *Cantower XV* deals with the final work of Stephen Jay Gould, *The Structure of Evolutionary Theory* (Harvard UP, 2002). Section 15.2 focuses on "Causes and Laws."

⁶⁰ The index to Hawking and Ellis gives jump-off zones, but the context must be lifted to that hinted at in notes 37, 52, 61. It seems worthwhile to add here that a full causal analysis of the Principle of Least Action, which underpins model and Lagrangian selection, is a central need in contemporary physics. Both Feynman and Eddington were sensitive to this. I may quote Eddington. He is on the edge of a discussion of entropy as he writes "since the logarithm of a probability is necessarily negative, we may identify action provisionally with minus the logarithm of the statistical probability of the state of the world that exists. This suggestion is particularly attractive because the Principle of Least Action now becomes the Principle of the Greatest Probability." (*op. cit.*, note 1: page 178 - my copy is Harper, 1959) The Principle was a central interest in Feynman's life (*The Feynman Lectures*, II, chapter 19, which also happens to be a good introduction to the topic): it is most evident in his path-integral approach to quantum theory which meshes action and statistics. See R. P. Feynman and A. R. Hibbs, *Quantum Mechanics and Path Integrals* (McGraw-Hill, 1965).

specialized considerations. It seems best, then, to be as brief here as possible, holding myself to making a main yet central point.

The point regards context, the massively rich heuristic context required and offered by Lonergan, the slim context of the presentation in *The Large Scale Structure of Space-Time*. A proper focus on that large scale structure is the focus given by a general heuristic that would acknowledge the problems of things and conjugates layered aggregformically in a hierarchy of informing acts of dispersedness, a dispersedness moreover, which grounds sets of sets of divergences from determinate modelings. The astute reader will have noticed that here I am sweeping the first half of the book *Insight* into the fuller context of its sixteenth chapter. One might claim that the Hawking-Ellis presentation does not need that, since it is a sort of graduate introduction to a specific topic. I refrain from going into technical details but I would make the general popular point that a reader would be better off with at least some appreciation of the facts that there is no such entity as space-time, bounded or unbounded; that study of the large-scale structure is on a par with the study of Boyle's Law and its descendants; that neglect of scales below 10^{-13} cm puts the considerations in a strange context, especially when issues of extreme densities are at issue; that indeed, the structure of the universe on the level of physics is to be conceived heuristically as a real space-time geometry of aggregated events quite beyond formal definition, but whose forms are to be grasped through the discovery and testing of ever-more complex possible geometries.⁶¹

⁶¹ I do not see this ambitious project moving forward in any genetic seriousness without the perspective hinted at in notes 37 and 52 above, which would lift the words and sentences of physics into a due critical and normative metaphysical equivalence. Meantime, one must hold to parsimony. "The next step in creating a more unified theory of the basic interactions will probably be much more difficult. All the major theoretical developments in the last twenty years, such as grand unification, supergravity, and supersymmetric string theory, are almost completely separated from experience. There is a great danger that theoreticians may get lost in pure speculation." L.O'RaiFeartaigh and N.Straumann, "Group Theory: Origins and Modern Development," *Review of Modern Physics* 72

My compact random comments on this work and on present work in physics and metaphysics are obviously a pale foreshadow of the rich dialectic collaboration that is to eventually emerge and integrate dialectic work across all areas of culture. So, for instance, instead of Hawking you might consider Heaney or Heidegger, to discover parallel needs in poetic and philosophic criticism.⁶² But at least I have given an impression of a need, a direction, a relevance of reaching for Lonergan's perspective if we are to interpret, narrate, criticize, ground, progress. The problem, of course, is the receiving of the impression.⁶³ Again, in the mature cycling of later times the giving and receiving will be institutionalized in an embarrassing efficiency: there will be a receiving by historians, sets of discomfiting nudges for dialecticians, foundational shiftings, and so on. In our current situation, however, there is the clear and present danger of the silent treatment for eccentric reachings such as this essay, this volume.

So, I return to the conclusion of the first section, swinging into the discomfiting mode of narrative aggression, something that occurs regularly in physics.⁶⁴ Am I, are we, wrong about

(2000), 15. And certainly parsimony requires the elimination of strange galactic observers: "This raises the intriguing possibility that one might be able to travel to other universes by passing through the 'wormholes' made by charges. Unfortunately it seems that one would not be able to get back again to our universe to report what one had seen on the other side" (Hawking and Ellis, *op.cit.*, 158-9). More generally, there is the messy moving between general and particular that haunts both relativity theory and quantum mechanics. I attempt to say something on these matters in *Cantowers XLII-LXIV*.

⁶² In *Cantower VIII*: "Slopes: An Encounter," I draw attention to the manner in which disciplines converge in dialectic in a concrete completeness. In particular, I draw attention to the weakness of Heaney's foundational perspective. See there pages 16-17.

⁶³ At an elementary level one may think of *impressio* in terms of *species impressa*: then the problem is current molecular indisposition to enlarged harmonious intellectual living. But there is the elementary and embarrassing impression that the shambles of culture in all domains cries out for the division of labour suggested by Lonergan. See note 52 above.

⁶⁴ Heated disagreement was the order of the day in twentieth century physics: such feelingful disagreement is to be lifted into the context of the fourth specialty. It is desperately needed in theology, where biographic absence in implementing the task of *Method in Theology* - as expressed

the neglected power of Lonergan's suggesting of a complex of paradigm shifts quite beyond our present instituted habits? At least read with us seriously that quite clear page 250 of *Method in Theology* which unambiguously asks you to take a stand, "indicating the view that would result from developing what you have regarded as positions and by reversing what you have regarded as counter-positions."⁶⁵ The issue is not just some armchair stance but a quite novel, even terrified,⁶⁶ poising before the shambles of our autobiohermic intussusception of

feelingfully on page 250 - can hide rejection behind pious and detached generalities and misreadings. We need something of the spirit of "the nasty things I said" (*The Dawning of Gauge Theory*, 108) - Pauli regarding Weyl - or of Carver Mead's critique of his friend Feynman's presentations in Mead, *Collective Electrodynamics. Quantum Foundations of Electrodynamics* (MIT P, 2000). "I remember being very angry when I sat in on this particular lecture. Why hadn't he started this way in the first place, and saved us all the mess of the **B** field, which, as he told us himself, was not real anyway?" (xiii-xiv); "If Feynman was stuck about something, he had a wonderful way of throwing up a smoke screen; we called it 'proof by intimidation'" (xviii). Mead's little book is a great feelingful scientific rejection of the "Copenhagen Clan" (78, 122) that dominated the twentieth century. Do we not need such a rejection of the smoke screen of the B-field of sophisticated description that dominated twentieth century theology? We desperately need explicit stands on the homely no-go theorem that Lonergan points towards: "systematic theology is elitist: it is difficult" (*Method* 251). See above note 44. Further, note that systematics is the key cyclic operator in the efficient hodic process, and that it is also on the edge of its street value. Communications "bears fruit. Without the first seven stages, of course, there is no fruit to be borne" (*ibid.* 355).

⁶⁵ *Method* 250. "Indicating the view" are the discomforting words here: how do I really stand, in my daily and annual doings, taking my place among the lonely, the lame and the poor, taking us all forward as best I might during this bone-twisting axial horror, in the deep loneliness of eschatological invitation? Dare I reach for, express, indicate, my stand, even to myself?

⁶⁶ "If a man is a hero, he is a hero because, in the first reckoning, he did not let the monster devour him but subdued it not once but many times" C. G. Jung, "The Relations between the Ego and the Unconscious," *Collected Works, Vol. 7* (Princeton UP, 1966), 173. I especially look for heroines (see *Cantowers IV* and *XXVI*) in these desperate days of quiet Lonerganist terrorism, but the heroics need the cunning of serpents, as the end of the next note hints. But make no mistake about the serial killers in the classrooms, committed to a stable culture of suit and tie conventional wisdom and continuity and to a subtle discouragement of adult growth.

axial pretense. Lonerganism travels along in centuries-old stale ways, in a committedly and destructively⁶⁷ untheoretic fashion. There is nothing wrong with good popularization when it is recognized as such: there is a desperate contemporary need for a turn to the lonely daft subject in all zones of present unlife. But what is a sin against history is popularization comfortably pretending seriousness. The fifth canon of empirical method invites high seriousness in physics and metaphysics. But that metaphysics is not just the metaphysics of physics. It is the terrifying cultural challenge to slowly and hoddically conceive, affirm, and communally implement the integral loneliness of cosmic physics and cosmic chemistry and their highest achievement, the psychic wayfaring of our human hearts.

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⁶⁷ I wish to draw attention in this final note to the primary destructiveness that must be existentially remedied: classroom destructiveness. The first three generations of Lonergan scholars were, are, incapable of teaching either *Insight* or *Method in Theology*. This real situation must be made relatively luminous and faced pragmatically, if we are to move forward together. But the key to progress lies, I would say, in the hodic cycling that will emerge in other disciplines. Then the doctrine of embarrassment that lies in my policies will become a discomfort in the halls of academe. Meantime, however, the presentation of Lonergan in the context of the confusions of contemporary commonsense pundits needs to be flushed. But if you are a student, don't try to remedy this: recall Lonergan's advice: "never try to teach your professor anything"!