

*Cantower XXVIII***Basic Physics**July 1st, 2004.**28.1 Contexts Old and New**

It seemed to me important to pause at this stage in the effort to reintroduce the book *Insight*. The first shot of reintroduction that is the previous *Cantower* is, perhaps, not too puzzling. There was the simple strategy of taking seriously the challenge of the first page and sharing time with Archimedes in order to discover, self-uncover, the tough task of reaching a theoretic concept. There were, of course, twists and turns in all than, for the issue is a quite new method with its range of new problems, most evidently the problem of its implementation. Aquinas' first biographer, William of Tocco, comes to mind: "Brother Thomas raised new problems in his teaching, invented a new method, used new systems of proof". And we are quite aware of the sorry history of implementation, or rather resistance. It is a repeat of what Voegelin describes in the last little chapter of Volume Three of *Order and History*: the Greek reach for the third stage of meaning died. How will we fare, third time up?

I cannot afford to be optimistic about my own contribution to the promotion of generalized empirical method and its hodic context. But maybe what I write about the first five chapters of *Insight* in these five *Cantowers* will shift the perspective of a few teachers, a few text-book writers. A few years ago I wrote: "In helping local children through their mathematics, chemistry, etc, I am appalled at the bulky conceptualist-nominalist texts inflicted on them. Changing the teaching of one subject in one grade could be a solid lifetime's achievement".¹ I thought of that comment this morning as I struggled to reshuffle the presentation of some few points in regard to chapter two of *Insight* because those points, peculiarly, take a turn towards chemistry. Peculiarly, for the title, borrowed from Feynman's second chapter, is "Basic Physics", yet after some

¹*Economics for Everyone. Das Jus Kapital*, Axial Press, Halifax, 1999, 127, note 29..

months of musing about this chapter I shift its focus in this odd way.

The *why* of the shift will take a while to spell out, but there is the positive hope that some reader may be a teacher of grade ten or eleven chemistry who is then led towards a life-time achievement. But at all events you sense the circumstantial and pragmatic character of this series of 117 essays: Pound's 117 Cantos, too, display such oddness. The overall aim is a focused revolution, but it moves not as a line of redcoats but as a hit and pun affair. I write this in early July 2003 for July 1st of 2004, when no doubt centennial celebrations of Lonergan's hundredth birthday will be underway. Will they continue to represent what Hugo Meynell wrote of as "a small and embattled segment of the learned Catholic ghetto"?² Or will they be the beginning of an outreach beyond the ghetto of current fashionable philosophy and theology? By some miracle, might they take a stand on Lonergan's insistence on generalized empirical method³ and on the redemptive need and value of a global functional collaboration? I very much doubt it, and I shall revisit the question at the end of December 2004, when perhaps I will have to admit cheerfully that I was quite wrong in this doubt. But, at any rate, in July 2003 it seems to me that "in the midst of the vast and profound stirrings of human

²Hugo Meynell, "The Plight and the Prospects of Lonergan Studies: A Personal View", *Journal of Macrodynamical Analysis*, 3(2003), 167.

³It seems convenient to establish a convention. I shall take GEMa to mean generalized empirical method as defined on *Insight* 72[96], where it is empirical method turned to data of consciousness. The later view I designate as GEMb, and there is no harm in recalling once more: "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 subjects operations without taking into account the corresponding objects." (*A Third Collection*, 141). Eventually I shall drop the convention and assume that the reader is with me in meaning GEMb when I refer to generalized empirical method. In the third stage of meaning there is the possibility that this embarrassing doctrine (I have quoted *Method* 299 more than once already: the doctrine is an all-round embarrassment; for philosophers, for scientists, for teachers) will shift culture so that one speaks only of empirical method. It will be taken for granted that if you don't know what you're doing, you are incompetent but it also will be assumed that if you speak of method you are speaking in an up-to-date way about some method or methods. It will be assumed that teachers operate in this luminous context.

minds”⁴ such gatherings purport to be, it could be significant to touch the hearts and minds of a few chemistry teachers.⁵

Of course, I am hoping to touch the hearts and minds of a few teachers of the book *Insight*. And this is one of the reasons for the shift to chemistry. I am being realistic about the present generation’s background and potential. I already noted the difficulty of the last three sections of chapter one of the book: an honest teacher of the present generation simply admits these difficulties and struggles a little with the class. But now we have the adventure of chapter two, which does indeed tend to emphasize basic physics. At the centre of section 2’s discussion of classical heuristic structures sits the key discussions of ‘Differential Equations’ and ‘Invariance’.

Section 3 pitches you into what looks suspiciously like reflection on the planetary system that is governed by such equations, not to speak of the non-systems like stellar explosions. What might one do as a teacher? I have recalled more than once here Lonergan’s view of *haute vulgarization*, and of teaching physics without mathematics: it “gives an illusion of knowledge, a false idea of what the science is. And it clutters the mind”.⁶

The problem is not only that of the present generation of teachers, but the present generation of students. I recall tackling, for a group of talented Lonergan students, what I thought was a very neat derivation of both elliptic orbits and Kepler’s three famous laws from a particular version of the relevant second order differential equations. A communal incomprehension led me to quit after three lines of blackboard work. In the next section we will notice that the problem goes beyond teachers and

⁴*Insight*, chapter one, beginning.

⁵Section 28.4 below addresses them more directly. I think that the structure of this essay should be obvious enough as you read through it a first time. The second section makes pretty evident why I shifted the focus to chemistry. In the third and fourth sections I focus on chemistry but within the context of GEMb. The final section, returning to Feynman’s presentation in his first two chapters, illustrates the need for that context.

⁶Lonergan, *Topics in Education*, 145.

students to issues regarding basic physics, but for the moment you can sense that tacking towards chemistry has a point. I have to hand an introductory text in university chemistry. There are very few differential equations. What about invariance? Well, as Lonergan, notes that works out in the sciences beyond physics without any serious reflection.

We will certainly find that chemistry is not without its own problems of possession and presentation. But we can use them to enlighten in a manner that makes it possible to deal with this chapter of *Insight* within the sad realism of present education.

One bright instance of that enlightening from chemistry relates to the exercise identified in *Cantower XXVII*, note 14, which we will tackle in section 28.5 below: Feynman's neat presentation of 'water things' that still is flawed. It will illustrate both the problem of cultivating the emerging context of GEMb and also the regular context of dealing with students who do not settle easily for the leisured moving viewpoint of *Insight*. So, for instance, the problem of "real things" can bubble up in the first week of a course; what is one to do?

My own first experience in reading *Insight* bubbles up in memory, as probably does yours, if you are an old hand at this. I recall been put onto the *Verbum* articles first and in the winter of 1958 'getting the shock' of extreme realism. I was into *Insight* already but this shift coloured my reading - or mis-reading - so that I was surprised by the famous 'turning of the page' to page 388, and to 'the position' statement and possible assumption. My background and the shock had led me to misread especially chapter 12 on being: so I had read on from there in what I might call a premature realism. I have written about this previously⁷ and wont deviate into it now: but it illustrates the possibility of disoriented reading and so of class difficulties that emerge, so to speak, way too early for teaching comfort. For most students the difficulty is not mine of 1958, but the difficulty of being a naive realist, quite happy with Feynman's

⁷P. McShane, "The Contemporary Thomism of Bernard Lonergan", *Philosophical Studies*, (Ireland), 1961-2.

molecules of water bumping and tugging. It seems to me, then, that the moving viewpoint has to be regularly abandoned as a teaching strategy. My own teaching strategy of 20 years of introductory courses is best represented by *Wealth of Self*. I supplemented the book, of course, by our working slowly through, say, chapter 9 of *Insight* and chapter 3 of *Method*, and reading critically with the class bits of their other introductory texts. Later introductions that I wrote - *Process* and *A Brief History of Tongue* - may well prove useful to those teaching, but they are trickier to use.

At all events, this problem of 'problems emerging before their genetic time' in using *Insight* in an introductory class colours my presentation here, and you may find, as I did, that the book just doesn't work as an introductory text unless you skip, jump around. Where, for instance, does the book begin, existentially? On the first page of chapter 14, supplemented by the paragraph about disaster in the section on the function of humour.⁸

But I must return to the topic of *haute vulgarization*. It seems to me to be the central problem of the presentation of the book *Insight*. It is a problem that emerged more acutely after the appearance of the lightweight descriptive *Method in Theology*. It is a problem that lurks in the presentations of Lonergan, pressured regularly towards the semblance of *haute vulgarization*.⁹ So, it is a problem of the *Opera Omnia*. We are back with the problem of Aristotle's *Opera Omnia*, and with a selectiveness that misses his discomfiting heuristic. Lonergan lifts that heuristic into a massively pragmatic and implementable global challenge: GEMb stands against popularization and hodie is the towering implement of the demise of its Fontenellian respectability. But I am repeating and recalling my message of forty years and perhaps I might bring this venture into context to an abrupt and cheeky end by quoting Samuel Beckett. I used the quotation

⁸*Insight*, 625[648]: the end paragraph in both cases.

⁹See his comments in *Complete Works*, Vol 6, 121,155; also Vol.10, 145. There is a need to study the complete works from this perspective: how much of his lecturing and writing was disoriented by the pressure towards "comprehensible presentation"?

first on page 67 of *Loneragan's Challenge to the University and the Economy*, and it was there that Loneragan read it and marked it energetically, I suspect thinking of his own life-work. So it would seem to be a nice wind-down - or wind-up - to my random indication of contexts.

"Here is direct expression - pages and pages of it. And if you don't understand it, Ladies and Gentlemen, it is because you are too decadent to receive it. You are not satisfied unless form is so strictly divorced from content that you can comprehend the one almost without bothering to read the other. This rapid skimming and absorption of the scant cream of sense is made possible by what I may call a continuous process of copious intellectual salivation".¹⁰

28.2 Problems of Basic Physics

If you have been following along with Feynman's Lectures you will have noticed that his first lecture is very much on chemistry, whereas in the second lecture he turns to physics. Section 2 deals with physics before 1920, mainly electromagnetic radiation; section 3 is titled Quantum Mechanics and the title of the final section is nuclei and particles. The lecture can be accepted as a pedagogical success, but our interest now is in noting in an initial manner the problems that lurk here.

Perhaps it is as well to return to the question of contexts to see better the difficulty of handling these problems, problems that relate to having an adequate thematic of both "the empirical residue" and "the notion of thing". Those familiar with the book recognize immediately the places in which these problems are treated in an initial fashion in *Insight*. Add to this what I wrote in the previous *Cantower* about the difficulty of the topic "empirical residue" and what I wrote earlier about the difficulty of handling the notion of thing.¹¹ I would say further that one is, or could be, brought to

¹⁰Samuel Beckett, "Dante... Bruno. Vico... Joyce", *Our Exagmination Round His Factification For Incamination of Work in Progress*. A New Directions Book, New York, 1972, 13 (first published in 1929), p.13.

¹¹In *Cantower IX*.

the edge of the required thematic by a personal enlargement of the suggestions of *Insight's* chapter 16, contextualized by chapter 17.¹²

What then of Lonergan's treatment of basic physics here and in chapter 5 of *Insight*? It is introductory and strategic: it is not a context for facing seriously the problems of basic physics. Nor, it seems to me, did Lonergan move towards developing that context adequately at any stage in his career. In July 1957, in his extraordinary climb through problems of mathematical logic he touched, in his final lecture on the topic, on the problem of 'substance' in logic¹³ and he was asked in the question session that followed about the relation of what he said to the physics of light. Part of his answer reads: "The treatment of light comes within the general treatment of electromagnetics, and what you're dealing with there, in the earlier physics at least, are Clerk-Maxwell's equations, which are a series of vectorial differential equations. There is no mention of substance in the interpretation of those equations You get into the question of substance in physics when you start talking about electrons, protons, and that sort of thing."¹⁴ Obviously, he could have spoken further from his own context of meaning, the context that lurks behind the book *Insight*, a context sublating parts of Lindsay and Margenau's book. But it would have been a long haul to detail a restructuring of basic physics, even the physics of the 1950s. And the problem has got considerably more complex in the fifty years since: Feynman's account in Feynman 2.4 gives an idea of the complexity that was emerging in the decade in which Lonergan spoke. And I should at least give an indication of the key problems that have complexified: if nothing else it should throw light on the structure and dynamics of

¹²One needs the context of a precision regarding metaphysical equivalence, a topic of chapter 17. In another context I wrote, "An essential supplement to clarification here, and indeed throughout contemporary theories of particle physics, is the distinction between primary relativity and secondary determinations in *Insight* chapter 16, section 2" (note 3 on p. 320 of *Phenomenology and Logic*.)

¹³*Phenomenology and Logic*, 135-7.

¹⁴*Ibid.*, 347.

these *Cantowers*. If you find these indications heavy going, skip on to the next section.

In his second chapter Feynman has three tables. The first table gives “The Electromagnetic Spectrum” that Lonergan was referring to, governed by Maxwell’s equations. The second is a list of “Elementary Particles”: a much larger list now. The third table is titled “Elementary Interactions”. Now the first table bears out Lonergan’s point: Feynman talks of the “rough behavior” related to the Spectrum: Field behavior, wave behavior and - when he gets to frequencies beyond 10^{18} , the zone of X-rays and gamma-rays - particles. In the third table he talks of “couplings” related to laws, and mentions photons, mesons, baryons.¹⁵ So, one might immediately go on to puzzle, Are *these* particles? And what about the electromagnetic radiation, about which Lonergan is speaking when he says “there is no mention of substance in the interpretation of these equations”. But is not light-radiation a matter of photons? - and note here possible twists on *matter*: is the photon a form of matter?... is it a conjugate form, a coupling form, not a particle? And what of this matter of radiation (where you notice again the ambiguity of the word *matter*)? Is this matter of radiation associated with a dispersal, dispersedness, dispersive potential, that we may link up with the elusive empirical residue?¹⁶

Lonergan himself, later in *Insight*, raises questions about the relation of the empirical residue to energy, and there are still further questions of the relation of entropy to the empirical residue.¹⁷ These are fundamental questions of basic physics into which we can only gradually venture. The context of such questions is the context of a proper heuristics of real geometry that would luminously recognize the simplistic subjectivity of A Minkowski perspective, the remoteness of the achievement of

¹⁵Worth remembering here is the problem of gravitons, something Feynman discusses very creatively in notes published posthumously: Richard P.Feynman, *Feynman’s Lectures on Gravitation*, Addison-Wesley Publishing Company, 1995.

¹⁶I will have more to say on this topic when we tackle the relation of energy to dispersedness in *Cantower XXX*.

¹⁷We shall get to that topic in *Cantower XXXXVI*, “Energy and Entropy”.

coherence in the issue of the complex of fiber-bundled forms that would lift primary relativities of physics towards a satisfactory heuristic of the real geometry of material finitude. Nor is that real geometry a matter only of an impossibly full account of forces, connections, gauge fields¹⁸: it is contextualized by the fractals and foibles and forms that constitute flights and freedoms in their empirical innovativeness.

But on the level of physics alone there are confusions of meaning and interpretation. The old quantum mechanics is still a mess, merging foolishness about the meaning of probability with simplistic assumptions about location.¹⁹ Quantum Electrodynamics seems secure as a success story, but - even apart from muddles about central and conjugate forms - its grounds are no more secure than the assumed general context of current physics.²⁰ Quantum Chromodynamics complexifies these muddles: certainly there are now semi-respectable classifications of 'things' of physics, but the classificatory effort is clouded by doubts about the status of states, resonances, point-like and line-like realities.²¹

But even if all were clear, if there were "nothing rotten in the state of Denmark,"²² basic physics is beyond the comprehension of the present generation of students and professors of philosophy and theology. That, in itself, makes a case for

¹⁸I have been regularly recommending Ian Lawrie, *A Unified Grand Tour of Theoretical Physics*, Institute of Physics Publishing, Bristol and Philadelphia, 1990, as an up-to-date supplement to Lindsay and Margenau. Chapter 8 is the relevant chapter here.

¹⁹Topics of *Cantowers XXXXII - XXXXV*. The texts that I propose to use as sources here, and for the topics of the next two footnotes are those associated with Walter Greiner. There is a series of thirteen texts in which he is co-author. I recommend, if you wish to follow the present trail, of availing yourself of the maps provided by *Quantum Mechanics: An Introduction*, *Quantum Electrodynamics* and *Quantum Chromodynamics*. It is a paperback series.

²⁰Topics of *Cantowers LIV-LVII*.

²¹Topics of *Cantowers LX-LXIII*.

²²A regular comment of the Belfast Physicist, John Bell, whose works will be considered when we turn to Quantum Mechanics. The rot, of course, refers to the Copenhagen Interpretation. More on this at the conclusion of *Cantower XXX*.

GEMb: the method of physics is a matter for competent physicists edging their way into, nudged and embarrassed into, the new perspective. And it makes the case for my focus here on chemistry.

I am also, of course, taking a stand against the illusions about communicability that ground the surge of popularization in physics.²³ It simply is not true that “the basic ideas about the origins and fate of the universe can be stated without mathematics in a form that people without a scientific education can understand”.²⁴

Elsewhere I have made the case that the problems of basic physics cry out for the full implementation of hodic method and a brief indication here would be pointless.²⁵ Only such a massive effort can lift us out of the confusions about the fundamental characteristics of empirical being that the scientific revolution inherited from earlier confusions. It has managed to overlay those confusions with necessary mathematical complexities without breaking forward to an equally-necessary supportive heuristic. Might one say of the needs of physics what Lonergan said in his discussion of economics’ needs: “the movement ... of thought ... involves not only an enlargement but also a re-adaptation of the whole existing structure.”²⁶

28.3 Chemistry and *Insight*

I am thinking now pragmatically of the teacher who, unqualified in physics, nevertheless wishes to do a decent job of presenting this chapter of *Insight*. My suggested strategy is to put the burden of emphasis - and of illustration and thinking - on the two short sections, 2.3 and 2.4. Section 3, on concrete inferences, needs to be

²³I raised the question of the nature of popularization first in chapter three of *Lack in the Beingstalk*. *Cantower LIV*, will make a start on dealing with the issue, but its full consideration demands the work of the essays of 2008.

²⁴Stephen Hawking, *A Brief History of Time*, Bantam Press, 1988, 6.

²⁵See P. MCSHANE, “Elevating *Insight*: Space-Time as Paradigm Problem”, *Method: Journal of Lonergan Studies*, 19(2001), 203-29.

²⁶B. Lonergan, *For a New Political Economy*, 6.

handled in a judicious fashion: it is of importance in arriving at a notion of emergent probability, but it is also important in drawing attention to what we might call *implementative* insights, a type of insight that is to be cultivated in ongoing genesis of the forward functional specialties.

First, then, the two short sections. What is imperative is the effort to avoid nominalism and summary, even though one just cannot handle competently the illustrations from physics that would do the job of illustrating 'nature of' and 'two types of similarity'. From my experience and conversations with Lonergan people over four decades it seems that, even with good will, serious control of meaning in even elementary physics is just not on, not without a massive effort. And pop-physics just won't do it. So, I suggest moving into chemistry for illustrations in the two short sections.

This does not mean, of course, that chemistry is a cake walk. But a beginner's chemistry can lift one to an appreciation of the two short sections, indeed to an appreciation of the new CULTURE that should gradually emerge. We will reflect on beginner's textbooks in the next section, but obviously one must have to hand such a textbook if one is to do this teaching with some adequacy. The adequacy is to emerge gradually, both in the individual and in the culture. Initially what one does is provide oneself and the students with selections that help the discussion of illustrations. Obviously the gradualness of the shift would get a lift if someone competent in chemistry, with a metachemical bent, would provide a neat little collection of illustrations that are generated by the GEMb. Such illustrations, of course, would eventually flow into school texts. Not, perhaps, in my lifetime!

So, we launch into chapter 2 of *Insight*. The teacher unfamiliar with science can still manage to present section 1, but it should be done with numbers. I have found it both intriguing and useful to imagine Galileo, not doing the impossible of measuring a free fall, but thinking out (here we are in the zone of implementational insights) how to get by with poor timing instrument, like a pulse or a pendulum. We are back with the attitude of the coathanger. So, here, I find that students enjoy the idea of using a sloped

plank, an inked pen vibrating over the halfway down mark (the oscillating pen can be achieved by suspending it from the end of a saw suitably set up at the top of the plank), then slide a greased board down etc etc. The distance between oscillations give a lead to 'gains in speed'. Got the implementational insights? You can avoid Galileo altogether by using Boyle's Law, as I do elsewhere.²⁷

I would draw attention here to the possibility of doing, in either case, what I do on that page: point to the way of coming to grips with the meaning of "correlation of correlation of correlation". Such a simple exercise opens the door to solving the problem of measurement, already mentioned, that bedevils physics. Are we not back with Descartes and paragraph one of *Insight*? The business is worth a serious pause, but we had best leave it till we get to *Cantower XXXI*. So, one can struggle, in GEMb, with the students, towards some sense of the non-immanence of scientific development.²⁸

On, then, to section 2 and the naming of the unknown. The teacher relatively familiar with the dynamics of the book *Insight* should make this discussion/ dialogue as enlightening and discomfiting as possible. We are back at a topic of *Cantower XXIII*: just how weak an achievement is description, and how much can that weakness be cloaked by erudite descriptive correlations, especially when the cloaking device clings on to scientific language [The Klingon language of popular physics!]?

Here, certainly, we have help from chemistry, with its variety of sights and sounds and smells and tastes and touches. A class should pause over this wonderland of sensibility²⁹, before moving to namings and the refinements towards the edge and heart of science. So, one comes, e.g., towards ancient general terms for acids, bases,

²⁷*Wealth of Self*, 24.

²⁸I would note that an advanced consideration of the final paragraph of section 1.1 would pause over the named immanence of mathematical development: certainly it may be so named, but is it, and what is meant by the full heuristic of that immanence, by mathematical matter, etc etc?

²⁹The fullness of the pause, of course, is that written about in *Cantower XXI*, "Epilodge": such a preying poise, in the mood of the Ignatian *Contemplatio ad amorem*, is a take-off poise for the contemplation that is integral science.

salts. German is most obvious with its unlauted *saure* for acid, and there is the medieval Latin for potassium nitrate, *sal petrae*. But are potassium nitrate and sulphuric acid just new names? So, one engages - perhaps enrages - a class by undermining memorization chemistry and pointing to the road of slow understanding. Is this sodium chloride? Well, taste and see that the salt's not sweet! Not good enough.

How *does* one go from sour and sweet as grounds of distinguishing to the tentative relations of chemical things to one another? Again, there is available implementational insight, and a new level of relating, post-preliminary classifications. There is the fun of qualitative chemical analysis with its colours, smell, sizzles: tasting and touching are not recommended! As teacher you take, with a pace inversely related to your competence, the *via inventionis*. Notice that you need not pursue here issues either in philosophy or in aberrant chemistry. This is direct speech, where proper names are merely names of discoverers. If you are up to it you can take the trail to key parts of the periodic table and then pursue sub-zones that may fascinate: more about this in section 28.4. As a Lonergan scholar and teacher of philosophy you may claim that this is as much out of your ball-park than physics. Well, best tell the class that, and get their help. But please try to avoid flowing learnedly and nominally through these sections, and be honest enough to skip sections 2.4 and 2.5 entirely. A teacher who knows the incompetence that is due to an out-of-date education would surely prefer to tackle a first university text in chemistry than continue to be a serial killer?

At all events, you get my discomfoting drift. Who knows, this may really get to you and get you into metachemistry, or really towards chemistry of the third stage of meaning, where knowing what you do will be intrinsic to doing it: that, after all, is what is meant by GEMb. The further you go in this, the better you can handle these two sections. And of course you get further away from bogus philosophy and theology, where these are not "of" anything.³⁰

³⁰This is a very difficult question, an issue of foundational fantasy. It is raised in very prosaic fashion in *Phenomenology and Logic*: what sort of Queen is needed? (Check the index under *Queen*). The manner in which different areas of inquiry converge through history into

There is a lot more to say about chemistry and its re-orientation. Initially I intended to give some further indications here, but it seems wiser to postpone more precise pointers till we have dealt, in an introductory fashion, with chemicals as “higher things”, a question to be tackled in the next *Cantower*. Still, it seems wise not to move on without two broad and important pointers. The first returns us to the question of ghettos which we raised on the second page above. The second is a reminder of the drive of *CantowerXXI* towards an integral contemplative stance, now focused of the chemicality of the universe.

I wrote on that page two of the ghetto of philosophy, and I must return to the problem in more serious fashion in *Cantower XXXIX*, of functional dialectic. But here we view the problem from the angle of a lesson to be learned from the history of the semi-successful science of chemistry. The science is as old as philosophy, and it has a parallel history of immaturity. Alongside serious ventures into chemical inquiry there lived through the ages a type of inquiry called *Alchemy*, the Arabic way for designating *The Chemistry*. Chemistry has found its identity in the past few centuries, leaving alchemy and poor chemistry - such as that associated with the theory of phlogiston, behind.³¹

But what of *The Philosophy*, the so-called love of wisdom? My claim - a claim haunting these Cantowers and reaching a precision in *Cantowers XXXIX - XXXXI* - is that it still runs parallel with alchemy and poor chemistry. What passes as an introduction to chemistry at present? Well, we talk about that in the next section: but no

dialectics (see *Cantower VIII*) is a nudge towards a fresh post-axial view of foundations, of general and special categories.

³¹I am sketching through here with broad strokes. My problem turns on itself: development of the sketch would be unnecessary in a mature culture of what we now call philosophy, since the history of chemical methods would be a piece of that culture. The point I am making at this stage is that we should - you are invited to - make a start on that culture. So, it would be well if you could fill out the sketch by a venture into the history of chemistry. A decent start is a the recent short paperback, Trevor H.Levere, *Transforming Matter. A History of Chemistry from Alchemy to Buckyball*, John Hopkins University Press, 2001.

matter how poor quality present texts, they do not bring you down the trail of alchemy or phlogiston. Indeed, they throw you in at the deep end, regularly placing the best available structure up-front inside the dust cover.

What might now pass for an introduction to we are stuck for an untainted name might I stick with the name *philosophy* for the moment? Then I would claim that a serious contemporary introduction to philosophy would be something like the book *Insight!* But what in fact is the present situation? It is one in which it is taken for granted that one spends time rambling - or sweating - through the recognized Greats in philosophy. So, the ghetto unwillingly protects itself : there is plenty to do in alchemical philosophy without doing what I would consider philosophy.

We are not getting into that question seriously here, but it needs to be raised to bring you to think of the problem you face, perhaps as a teacher of *Insight*, or certainly as a reader of the book, when I write here of chemistry. You have been, or are, kept busy in philosophy, gathering up or sifting through a history of opinions and positions regarding the old chestnuts. Indeed, a fair population of departments of philosophy devote their lives to the sifting. There has to be a better way; there is a better way: but here I make a single relevant point. Suppose that you had stolen the time you took to read a few books of, or about, the “philosophic greats” and used it to read a few books on chemistry? Then you and I would not be blocked here by a conventional ignorance that, when you pause and brood about it, is a type of horror. No point in halting over that: it is the horror of not listening St. Exupery’s little flower,³² or the sunflower of *Cantower II*, or the frog of *Cantower LVIII*.

But why am I talking about plants and animals, when the topic is chemistry?

There is a sense in which such talk is a glorious stop-gap in the present situation. You and/or your students do not have a sufficient culture in chemistry, and I invite you to struggle out of that deficiency. But I would like to give you a contemplative angle on, a refreshing entry to, that struggle. The angle may seem eccentric and a fringe business,

³²The topic is dealt with in chapter 3 of *Lack in the Beingstalk*.

but it is not. Yesterday I wrote to a friend about my suspicions that this could be the century of chemistry. But still, it is quite a leap of faith to take my invitation seriously, to turn your eyes and eyes to trees and tadpoles at the expense of heavy readings in the history of philosophy.

Now I do mean “turn your eyes” and the eyes of your students. Let us not panic about naive realism. What I am asking is that you view what you view now, be it a room or a field or an ocean-scape, as chemical. We are back, of course, with the mood of that wonderman Archimedes in Sicily, but now our interest has moved, marvelously, from the physics of water to the chemistry of water. To the chemistry of everything. So: think in chemical terms of everything, think of everything as chemical. We are now way beyond the Greek musings about elements: we live in a popular culture of diagrams of DNA and all classes of macromolecules. But bring your curiosity bear fruit from the tree - the seen tree, the real tree, this is not important at present. The important thing is to think of the tree as one big molecule.

Are you with me, willing to pause for more than a moment, perhaps for more than a month? Of course, it is a very strange molecule, standing there on one leg, growing an annual crop of hair on its windblown head. A cow is an even stranger molecule, bonding more visibly with the general territory through dung and urine and milk and grass and tail-flicked flies and calves: and don't forget the in-and-out air.³³ The calf is an evident instance of bonding, but note that the tree is bonding with the sun. Bonding - correlating - is what being a tree or a cow is all about, within or without. Are you with me here, eyes off the page?³⁴ The tree, for instance is a massive molecular bonding, molecules (in truth, only molecularity!) clinging to each other horizontally, and pressing down on each other vertically, a tall balancing act that can sway in the wind. The cow, with three extra legs, also sways in the wind, and neatly balances its

³³You have the opportunity here to go off into the realm of recurrence-schemes etc... but above I stay, so to speak, on a narrower chemical track.

³⁴My implicit reference is to Gaston Bachelard's conviction that one is seriously reading only if one takes one's eyes off the page (see his *Poetics of Space*).

shifts across the earth. Does all this not dazzle, as a molecular achievement?

Not the standard introduction to chemistry, but does it not get you - or your students - Hopkin's "Immortal Diamond", thinking? You, the tree, the cow, are some type of unity of chemical bondings. You may venture further into the problem and find out some oddities of the bonding. Cow bonds with calf as it were on a level of equality.

But what of the tree with the sun? And what of the dead tree - which of course may still stand - with the sun? So one can discover and cherish that bondings "are upward and downward" between these various entities: the tree lifts the photon-greetings of the sun into more complex companionship; the cow's urine falls in different ways to heat the ground and grow cold.

But we are homing in on the manner in which chemicals bond, a "horizontal" business, even when the result is a vertical as a tree, as rounded as a Buckyball.³⁵ How do they bond? That is the story-question of chemistry, pushing forward after millennia to a mapping of bonding that in its elementary form is recognized as the periodic table. But we are quite used to the more complex bondings, when larger molecules relate to larger molecules. Used to? Both in the sense that this is the center-piece of doing elementary chemistry: mixing, making smoke and smell, etc. But also in the sense of the chemistry of everyday life. So, perhaps you recognize the following equation?



The equal-sign is best re-written as \rightarrow to get you in tune with the daily chemistry: calcium carbonate (Tums) reacts with hydrochloric acid (stomach acid) to give calcium chloride, carbon dioxide, and water. Reacts? Bonds. Notice that there are bonds already established: the calcium carbonate is quite a stable little band of bonders. And our old friend water turns up as a threesome. Notice that we are focused here on the co-relating of chemicals among themselves.

But the taste of Tums or the inner-feel (where are these tastes and feels?) is another matter. Chemicals relate to us. Chemical reactions correlate to us: recall your

³⁵The Buckyball, a nicely structured C_{60} , one of the Fullerenes, is diagramed and discussed in Levere's *History*, p.191. See note 31 above.

days in chemistry class, if you had such, with colours and heat and smell, solids and liquids.

The chemical reactions of primary interest to chemists as “pure scientists” are of the type represented by the equation above, which is a type that can be enormously complex. But the question of other types of relating that are “purely scientific” occur: what of chemicals relating ‘up’ to plants, ‘down’ to electrons?

All I am doing here is stirring up some questions of interest in the reach for a heuristics of the real world that might lift these initial chapters into a vibrant cajoling. The relation of chemicals ‘down’ to elements of physics will occupy us in *Cantower XXIX*, section 4: it is a very central problem of methodology that we have already brushed past.³⁶ How much of all this can you bring into your reading or teaching of this chapter of *Insight*? In the present messy situation of *The Philosophy*, you do what you can. But take my suggestion to heart. A few books on chemistry can get you closer to reality than the standard fare of philosophy: what is a metal is a far better question in philosophy than who is a materialist.

We have only touched here on some questions of chemistry and its methodology. We are, if you like, in the moving viewpoint of *Insight*: the next two *Cantowers* will enlarge the view. And I can envisage a presentation of chemistry that would be quite exciting, starting with the topic of energy that we arrive at in *Cantower XXX*, that is treated in a fuller context in *Cantower XLVI*, where we consider energy and entropy.

28.4 Teaching School Chemistry: or Anything Else

I have often recall, in writing and lecturing, my advantage in having a mathematics teacher who was vibrantly incarnate about the stuff. I had the same experience in the two years of school chemistry: a dedicated Christian Brother who delighted in introducing us to sights and smells and bangs. My university chemistry, on

³⁶It emerged when we dealt with systems in *Cantower VII*. It is an unsolved problem in the various types of systems’ theory.

the other hand, was dead and deadening. In more recent years, I have struggled with the problems of local kids. This year's local mathematics texts in grade 11 and 12, for instance, were quite exceptional: for all my background I could not make them out.³⁷ What of the chemistry texts used in our local school? I have to hand the text of the Canadian Maritimes for these grades,³⁸ and I shall use it as an example.

This business of exemplifying is important, and is caught in the meaning of the title which refers to teaching anything. We are up against a cultural *ethos* of serial killing: Jack and Jill the rippers are not, then, the oddities: the oddities are those few teachers who can somehow beat the system, the unsung heroines and heroes.³⁹ But Jack and Jill in the classrooms are really only victims: the knife in their hand is wielded by the cult that generates the texts and the courses, that seeks to control the formation of teachers in committedly truncated B.Ed programs.⁴⁰ I am writing, then, not just of chemistry, but of a dedicated truncation, blood-spilling, of the next generation, at school and university level in almost all topics. And the notion of exemplifying is important, because there surely is no need to repeat in detail what can be made brutally obvious in any one area. So I could be writing here of a text in any other science, in the literatures, the arts, at any level of education. In that sense, the present section could be seen as superfluous, since I have previously written of the sickness when I dealt with that abominable text by Mankiw in a chapter that borrows his own title "Thinking Like an

³⁷Similar texts across North America were a source of general discontent during the year 2002-3.

³⁸Frank Jenkins *et al.*, *Nelson Chemistry*, Thompson Canada Limited, 1996. I shall quote it below simply as **Chemistry**.

³⁹In *Cantower VI* I drew attention, in the final section, on the importance of thematizing their achievements. As we move forwards the place of that thematization in the hodic enterprise will become more evident.

⁴⁰Certainly my own experience of teaching in such a program for a few years - a course on religious education - made brutally evident to me that the students were consistently led away from minding minding.

Economist.”⁴¹

But the section would not be superfluous, even if it consisted only of a series of quotations from BEE, because the present contextualization would give those quotations and that chapter a fresh context. You would read, will I hope read, BEE chapter 3 with new eyes. So, I do not quote at length from that chapter here: if I get a few of you to read it **with some text you are involved with in mind ... AND to do something about it** I should be content. Doing something about it need not mean writing your own text.

In my own odd career of teaching a range of subjects I found that one can teach quite well from a bad text. But one has to struggle towards lifting the culture of the students. How is that done? One makes a beginning by introducing something like the first section of the chapter 3 of BEE: How do you and I really think?, is your question to the class. With luck you will end up with them having some suspicion about themselves that corresponds to the diagram given in the Appendix to that chapter 3: it is the diagram that I have named W4.⁴² But you have to struggle with suitable illustrations within the topic of your class. Obviously, the illustrations most available are the illustrations given in the textbook with which you are afflicted. I have around me texts for university and school in different areas, and I hope you have one such text. Check out the introductory chapter or section about “What we are doing”, be it Grammar, Biology, Psychology, whatever. Digest it critically, then see about lifting the students towards a new level of reading.⁴³

⁴¹The Text in question is Gregory Mankiw (which rhymes with thankyou), *Principles of Economics*, The Dryden Press, Montreal, 1997. I shall refer to it as Mankiw. The chapter I refer to above is chapter 3 of Bruce Anderson and Philip McShane, *Beyond Establishment Economics. No Thank You, Mankiw*, Axial Press, Halifax, 2002. Referred to here as BEE.

⁴²The diagram is given in Appendix A of Lonergan, *For A New Political Economy*, and it is contextualized by the discussion there of modalities.

⁴³Carrying this through the course and the text is a tricky business, especially if your efforts are unsupported by the community of teachers and students and by the pressure of principal and program. One owes it to the students to get them through the hoops etc etc. With a little cunning strategies of memorization can be worked out, as can strategies of handing multiple

A key test, for yourself and for the students and for the author, is the way that the word **concept** is used. Nor, sadly, is this elementary pointing superfluous, even among those who are apparently learned in Lonergan things. I have read distinguished Lonerganesque authors who quite happily talk of “clarifying the concept of ...”. Such authors, or readers, are really not up to cutting through the truncated and destructive attitude of texts like **Chemistry**. Dare I ask you to pause and be honest about your own spontaneous use of the word **Concept**?

Chemistry is quite standard in the way the topic is introduced: so you don’t need this particular text to struggle with the key problem of post-axial teaching. There is an Introduction for the student which focuses on the question **What is Science?** : a big serious black question which manages to miss the question mark’s centrality to science. So it begins: “Science involves *describing, predicting and explaining* nature”. On the side of the page a question-less diagram is laid on, laid on the student like a yoke. It is a diagram that is repeated, with elaborations, in “**Appendix B. Scientific Problem Solving**”, which spreads over five pages what was said at the beginning in three. “Every investigation in science has a *purpose*, to develop a scientific concept to test a scientific concept”. Need I go on? As John Wayne used to say, “Not hardly”.

The description is way off. But notice how axial presentation has made it plausible, acceptable, brutally normative? Recall Archimedes’ book *On Floating Bodies* as we discussed it in *Cantower XXVI*. Recall the lay-out of Euclid. Yes: start with a theorem-statement and develop the concept that it contains; Way To Go! But alas, it is bad teaching: and it is not in the rhythm of scientific procedure. What does it relate to? It relates, on the good side, to the polish and convenience of axiomatic unification.⁴⁴ On the bad side, it is of a piece with the floating body of stuff that has been sinking

guess exams, etc. But to the systems-licking one can add the spice of knowing that the whole process is a matter of covering rather than discovering. A later culture will sublimate these various strategies into a communal perspective on the luminous balancing of understanding and technique in the progress of civilization.

⁴⁴On axiomatization see the index to *Phenomenology and Logic*.

education since Scotus invented conceptual analysis.⁴⁵

Now you may well claim that I exaggerate. The kids do learn chemistry. You may even say that they come out of this with the Basic Concepts of chemistry. So, we get back to the question, What do you mean by **Concept**? Are you not perhaps dangerously close to an identification with a precise verbal definition that is memorized? And could this not be the dominant mode of learning in the chemistry class, dominating the occasional venture and adventure into curiosity-driven searching, messing? So the dominatrix inflicts print-strokes, not leather-bound but cardboarded covered. And the taunting can continue into the deadliness of a graduate thesis. I recall, as I type, my year as the first Fellow of the Concordia Lonergan College. The Chair of the chemistry department was in my seminar group and he was most enlightening about the sad fact that graduating in chemistry required a good memory and some cooking skills.⁴⁶ So, a peculiar mental sadism and masochism parades as the joy of successful learning.

Chemistry certainly could be analyzed in detail.⁴⁷ One might note the regular occurrence of the “Investigation Insert” (pp. 38, 62, 76, 95, 98, 115, ...) that dully repeats the adopted procedure.⁴⁸ One might note the massive coloured cover-up of distractions

⁴⁵See BEE, p. 60, for a handy way of distinguishing, for pedagogy and towards pedagogy, the Establishment model of knowing from the “real” model.

⁴⁶There is, of course, nothing wrong with either a good memory or with cooking skills. Memorization is a topic that needs serious lengthy consideration; absence of ‘cooking skills’ generally connotes lack of incarnate comprehension. But I am skimming over large problems of education here.

⁴⁷But the analysis must be toned up, and the full toning is a hodic matter: only very gradually is the page by page, line by line, horror revealed. There are, perhaps, those among my readers who see the text I write of, or the text they hold in their hand, as really not so bad how else is one to get the basic stuff?

⁴⁸Without a slow critical and fantasy-filled musing it is impossible to envisage the slow corruptive influence of a ‘conceptualist nominalist’ text. A reader might well say that e.g. the “Investigative Boxes” that I write off are really O.K.: they pose a problem and have a procedure that ‘gets’ the answer. In this matter, one needs unhurried reflection on the classroom goings-on related to the “Box”, and that would turn this brief section into a substantial work. Still, I must

and information. But the point of such noting, if it is belong to the beauty of metaphysics, is that it should breed redemption. And how might that be brought about?

So we shift back to the full context of this *Cantower*. In so far as one is teaching *Insight* - or insight - to potential teachers, in the style touched on, say, in the previous sections, then there is hope of bringing about something. But even without this possibility in your life or your career, at least you are coming to notice my push for a change of *ethos*, of attitude, of poise, of metaphysics. Metaphysical interest becomes beautiful only in its luminous concrete concern. In bringing to your attention, in the midst of our lofty reaching, the humdrum problems of classrooms in our time, I am inviting a turn of events, a return to events, that brings fresh and startling meaning to the word *events* as it occurs on the second line of page 250 of *Method in Theology*.

There is the *Assembly* that heads the global community in its dialectic members towards sorting out the dynamics of the past: it must include “the events” to which the searchings into the past refer. Certainly, on the large scale, the neglected events of philosophy and theology include the scientific revolution: but also included are the events of classroom murder, the events of the rotten little dull chemistry lessons. Am I, perhaps, freshening your reading of that first paragraph of chapter one of *Insight*?⁴⁹

give a single illustration. Consider, then, the “Box” on p. 115.

“3.3 Demonstration: Determining an Empirical Formula

The purpose of this demonstration is to illustrate how the technological process of electrolysis may be used to determine empirically the chemical formula of water. ...

Problem

What is the chemical formulas for water?

Prediction

According to previous memorization, the chemical formulas for water is H₂O.

Experimental Design

Water is decomposed in a Hoffman apparatus etc”

You don’t have to be an astrochemist to sense that this is way off, line by brutal line, as teaching.

⁴⁹I would like to think that I am also freshening your reading of Lonergan’s book, *Topics in Education*. Early in this section I mentioned change of context in relation to freshening reading. This is a very deep issue. Any question is total, and for a metaphysician that totality is increasingly luminous. Think of the question What is chemistry, or What is water? The question,

28.5 Feynman Diagrams for the As King

The title of this section is an in-joke to which I shall return only vaguely in some final footnotes. The better title might have been “Feynman’s Diagrams of Water Molecules”, thus recalling the unfinished business of note 14 of *Cantower XXVII*, where I quoted his ‘enlargement strategy’ and left you with the exercise of figuring what was good and bad about the strategy. We shall move that exercise some way forward in this section, and we will do so in the mood - I hope an ethos-generating mood⁵⁰ - of the ‘little water cube’ contemplation of our fresh beginning in the previous essay.

I had the occasion, two days ago, of speaking with a colleague of Archimedes, and bubbled up and on about contemplating the little cube resting happily in the jug of water, balanced there in being. I emphasized the poise, the stillpoint, cherishing the little cube. He remarked later that he was startled, that I had not spoken this way before. Well, I suppose that is true: one does make progress! But the seed of the message is certainly in the third chapter of *Lack in the BEINGSTALK*. There I write of taking a stand against axial schizothymia, of joining the Little Prince’s conversation with the Little Flower, [“.... ‘Oh, How beautiful you are!’ ‘Am I not? The flower responded, sweetly. ‘And I was born at the same moment as the sun’”], of meshing in heartspocket Dogen’s verse about the dewdrop with Tennyson’s verse about the little flower.⁵¹

within the full heuristic that is metaphysics, ranges over all instances of chemicals and all instances of communication or care about chemicals. Any shift of expression or viewpoint is a potential shifting of the totality.

⁵⁰“The style that is the man is not something individual; it belongs to the group. There will be individual variations but there is something common to all. There is something similar in the tone, the color, the way of doing things, the attitudes that are said to be characteristic.. “ (Lonergan, *Topics in Education*, 252) “an existential category... an aesthetic apprehension... that becomes operative whenever the group debates, judges, evaluates, decides and acts - and especially in a crisis” (*Ibid.*, 230). And is there not a crisis, an axial crisis in history, a crisis in the present reading of *Insight*?

⁵¹*Lack in the Beingstalk*, 85: the Tennyson poem, “Flower in the Crannied Wall” is that referred to by Lonergan: see *For a New Political Economy*, 31.

So, I would wish you to bring the reach for that same mood to our exercise about water molecules. First, notice and cherish the positive help that Feynman's imaging gives: magnifying in imagination our little cube a billion times gives you some sense of dimensions, a sense caught better perhaps in his later parallel, "If an atom is magnified to the size of the earth, then the atoms in the apple are approximately the size of the original apple".⁵² This is the sort of pedagogy one needs, as we noted in the previous section, when talking, say, of the size of a mole of oxygen.

But how did you progress in diagnosing the flaws? Or were you leisured enough to attempt the diagnosis? Should I *tell you* the flaws? What sort of telling is required if in fact you did not struggle with the issue? Would it be like the telling of Archimedes that is contained in his postulate about floating bodies? So, you and I may have a problem here in sharing the telling. But at least you should go back now and re-read the relevant passage.

THEN,⁵³ look back at the diagram again, the little square with the black and white circles. Treat the little square as I invited you to treat the little cube. Your wonder

⁵²Feynman, I, 1.3. There is a lot more lurking in the experience of 'magnification' or 'enlargement' that you might delight in following up. Think, for instance, of the large and small in the sculptings of Henry Moore. "Independent of the monument, there was from the beginning another form of art that was gradually to merge with sculpture, but had a separate origin and usage and was never confused with the monument. This was the *amulet* - the small, portable charm, worn on the person as a protection against evil, or as an insurance of fertility. We may decide, after reviewing all the evidence, that there is still a case for keeping the monument and the amulet in separate aesthetic categories, but that the specific art of sculpting, an art with its distinct aesthetics, comes into existence somewhere between these two extremes - as a method of creating an object with the independence of the amulet and the effect of the monument". (Herbert Read, *The Art of Sculpting*, Princeton University Press, pb 1977, 5) Think, further, of the earth-globe as sculpting, of the large and small apples of art. And what of atoms in a helical diagram or sculpting?

⁵³I am referring back to the title of *Cantower V*, "Metaphysics THEN", which is a type of expectation of a new culture, indeed a culture that might be reached for by the ways of the previous, where I wrote of "Molecules of Description and Explanation". You can appreciate a little by this back-reference the difficulty of moving forward in a sort of conceit, or deceit, of beginning again. A new culture will cognize and recognize that the *what-as* to which I arrive at the conclusion of the present essay is their own neurodynamic illuminated molecular skin.

is about the little square just as it was about the little cube, but there is a difference. You have re-read, and so re-read down to “we will magnify it another two hundred and fifty times and we will see something similar to what is shown in Fig. 1-1.” Are you getting there, THEN? You look at the little cube of water: you see a little cube of water, with all the problems of what seeing is. You look at the little square and what does Feynman mean by “something similar”? What do you mean by that phrase herenow?

We skip, obviously, the problems of light and molecules at this new level: we are interested in something simpler, grosser. Does the problem remind you of the old psychology chestnut about the diagram that looks like an old lady and also a young lady? The old chestnut about “seeing” and “seeing as”? You are presented in both cases with a square diagram within which there are lines. In the old chestnut you can see the lines *as* either an old or a young woman: in our little square you can see the lines *as* water molecules. Are we making progress? Seeing the little cube is not seeing water. Seeing the little square’s content *as* water is just that: *seeing as*. In neither the old chestnut nor in our water-problem are you seeing woman or water.

Do I need, at this stage, to plead with you to pause over this business of *as*? If you are a teacher, it is certainly worth the pause of a week’s class time: but it merits ??? at least a month, but certainly a lifetime. We are close to the ontic heart of both the existential and the axial matter. That heart is - ontically - caught up in what you and I and our students mean by *as*: and I would have *as* as king.⁵⁴

Perhaps it will help you to glimpse what I am at here if I point you towards another reading: the high point towards which Lonergan surged as he concluded his lectures of July 1957 on mathematical logic and existentialism: the last lecture, the last

⁵⁴It would be of value to reflect on Lonergan’s comments on the Queen of culture in *Phenomenology and Logic* 126-7, 130. The reign that I write of here is to be internal to the neurodynamics of all, but luminous to the third degree in the Tower People. On the degrees of luminosity, see notes 57 and 58 below.

question session. The topic is 'the subject as subject'.⁵⁵ The key reference for your brooding is the section at pages 314-7.

But now we add our little square of black and white. "What is meant by the subject as subject? When I look at the paper before me there is present to me black on white. That could not be present to me without my being present. But my being present is 'present' in another sense".⁵⁶ That other sense of presence is - am I punning here? - a curious sense. Recall our previous dalliance with odd meanings of 'about', and 'about about' and 'about about about'.⁵⁷ *What* are you reading these *as*? That obviously depends on the *What* that is reading, the *What* that is present. But I mention that dalliance only to nudge you to seriousness by adding a fuller context to which you must return if it is to "come about" that you free yourself foundationally "from the morass of pseudo-problems that otherwise beset" you and the axial period.⁵⁸

But let us get back to our little square of black and white, and focus on that question, *What* are you reading these *as*? Twist that question. I am reminded now of

⁵⁵My index references are xii, 266, 314-317, 360-65. The first reference should puzzle you: it is in fact to note 9 on that page, and to the problem of naive category theory. What, for instance, is Feynman's diagram 'saying' to you? Can you manage a *fare lo stupido*?

⁵⁶*Phenomenology and Logic*, 314.

⁵⁷The brief description in note 20 of *Cantower XXVII* offers initial help. I point with this triplet towards a fundamental issue of methodology's status as a science of methods, and method as a study of unmediated spontaneity. Perhaps it is as well to repeat here the essentials of that note 20. "This is a triplet that I have used frequently in recent essays Roughly, we are curious about things. But we can be curious about that about. And history bears witness to a series of such curiosities, about which we may be curious. So, if you think it out, you find that there are studies that are studies of method; but there is also the study of that study, which is the refined meaning of **methodology**."

⁵⁸The reference is to lines 11-20 of *Insight* 514[537, end] and the context there is the question of metaphysics as science, *as king*. The question is lifted into a fuller context by the discussing of three orders of consciousness in Lonergan's sketch (Spring, 1965) of a possible first chapter of *Method.*, to which I nudge here regularly with my odd triplet of "about about about". See notes 54 and 57 above.

my discussion elsewhere of Arjuna asking Krishna,⁵⁹ “What is man?” And my answer was and is, Yes: what is man or woman.⁶⁰ Then *Whatas* is you, existentially, the reader. “The one to whom presentations are presented”⁶¹, “what presentations are presented to.”⁶² You, Feynman and I read the little square *as we are*. The *as we are* is ambiguous. There is a fundamental - a fund of mental - sense that is stressed by Lonergan in the texts to which I refer. “The prior ontic reality in which one is going to find the norms and invariants that are common to all horizons, that recur in all subjects, the reality that provides the real norms on the basis of which one can select the true horizon, lies in the field of the subject as subject.”⁶³ But here I am pushing you towards another sense: a sense in which the still ontic you is a *whatas*, a spontaneous reader and speaker constituted by your past.⁶⁴

Feynman, in controlled spontaneity, spoke this lecture, drew this diagram. He spoke it *as Feynman*, the bongo player who was also the inventor of the Feynman diagram and who also had little respect for philosophy. Now you might balk at this claim: he is not, for instance, speaking as bongo player. But it is a bongo player that speaks, and moreover a bongo player that is identified, a presence as thus identified, within the *whatas* that he is. Furthermore, there is a spontaneous element in the *whatas*

⁵⁹See chapter one of my *Process. Introducing Themselves to Young (Christian) Minds*.

⁶⁰I make no attempt, either in editing or in writing, to shuffle Lonergan’s expression forward towards a new culture. The culture itself must shuffle forward towards fresh expression. A useful context is *Woman What Gives*, Sandy Gillis-Drage, Axial Press, Halifax, 2004.

⁶¹*Phenomenology and Logic*, 360.

⁶²*Ibid.*, 315.

⁶³*Ibid.*, 314.

⁶⁴Sometimes I find that throwing in a strange context helps to shake up the search. So, I might suggest that *Insight 19.7* be pulled in: the unrestricted act of understanding as a peculiar *whatas* in relation to the secondary component that is the many instances of Feynman diagrams emerging in history after the twentieth century. Further, you might find it illuminating to face the problem of a trinity of subjects: what, now, does the *as* mean in that case of three subjects?

that is a cultured truncatedness, something that could be thematically identified as related to his view of philosophy. So, too, there is the *whatas* that you are. It is that *whatas* that is being asked - "by cajoling or forcing attention"⁶⁵ - to lift existential anxiety⁶⁶ to a strange tranquility of openness, gently, by small unthreatening steps such as are hinted at by the first paragraph of *Insight*.

I would wish you to grow as a *whatas*, but we may, must, extend that wish to the community of physics, so that it is a wish for any physicist to grow as a *whatas* of physics that can read with spontaneous richness - as Feynman could - the Feynman diagrams,⁶⁷ yet going beyond Feynman in that richness. The *beyond* is the mature world of GEMb, where *as* is not just an old Roman measure, but a new measure of human presence, a noosphere attending to the waters of the globe.

⁶⁵*Insight*, 398[423].

⁶⁶Lonergan's discussion of anxiety in *Phenomenology and Logic* (see the index entries there under *Anxiety*) is an attempt to lift its existential treatment into an explanatory context such as is suggested in the long note on Sullivan in *Insight* 533[556].

⁶⁷There is no point in enlarging on this topic here, but someone in physics would appreciate the complexity of the "as" when facing these diagrams properly: the sets of relations and equations that "lurk in the background" of these simple connecting lines. I am pointing to the lifting of that "as" to a new level, a new pace.