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Revista de Filosofía 135 (julio-diciembre 2013)

Contenido

Revista de Filosofía (Universidad Iberoamericana) 135: 5-6, 2013

Presentación

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Bernard Lonergan (1904-1984) ha sido un autor presente en la Universidad Iberoamericana desde los años setenta. Dentro de las múltiples actividades organizadas para la difusión de su pensamiento destaca la traducción y coedición de su obra principal: *Insight: Estudio sobre la comprensión humana*, Francisco Quijano, Salamanca, Universidad Iberoamericana-Sígueme, 1999.

En este número dedicado a su pensamiento se ha invitado a colaborar a muchos estudiosos de su obra de muy diversas partes del mundo. Se han tratado de respetar las secciones con las que actualmente cuenta la Revista, y se le ha dado énfasis a las cuestiones contemporáneas, para tratar de analizar cómo puede el pensamiento de Lonergan servirnos de ayuda en la articulación de nuestras respuestas.

El lector encontrará desde la aportación del profesor Andrew Beards gran conocedor de la filosofía analítica y su análisis comparativo sobre la filosofía de la ciencia de Nancy Cartwright y la de Lonergan, así como las discusiones sobre el controvertido embate de las neurociencias en los problemas tradicionales de la filosofía de la mente, David Oyler y Pat Byrne, hasta un análisis del problema de la violencia en la realidad colombiana con las categorías del pensamiento de Lonergan, en un trabajo de investigación del grupo Cosmópolis de la Universidad Javeriana de Colombia, grupo que hace un trabajo ejemplar en cuanto a llevar adelante el pensamiento de Lonergan. Francisco Sierra también del grupo Cosmópolis, aborda el tradicional tema de la filosofía y la vida cotidiana, para presentar un cierto reclamo a las filosofías, incluida la de Lonergan, que a veces hacen un cierto desdén de ella.

Encontrará también un tipo de análisis que tal vez le resulte muy controvertido en el trabajo de Terry Quinn, como en el de James Duffy, o en el de nuestro querido "maestro" en el asunto de la autoapropiación: Phil McShane. Agradecemos mucho las colaboraciones de Ivo Coelho (actualmente profesor en Jerusalén), Mark Morelli, quien tiene años trabajando el tema que aquí presenta sobre la lectura lonerganiana de Hegel, del P. José Eduardo Pérez Valera, quien tiene más de veinticinco años en la Universidad de Sofía en Tokyo.

Lamentamos por razones de espacio no haber podido incluir la colaboración del profesor Michael McCarthy, y esperamos que tal vez pueda publicarse en otro número. No hubo tiempo de traducir todos los artículos como era nuestra intención original, así como de unificar las citas del *Insight* tomando la traducción de Quijano. Preparando esta edición, recordé los problemas de la traducción de *consciousness y conscience*, *bias*, *pattern of experience*, y por supuesto el principalísimo y fundamental término *insight*.

Quiero agradecer a las personas que me ayudaron en la traducción: Andrés Marquina, Ricardo García, Allan Christian Covarrubias, James Duffy y especialmente a Rodrigo González, quien me acompañó desde la concepción de este proyecto. Agradezco también al doctor Pablo Lazo, director de la *Revista de Filosofía*, por permitirme tomar a mi cargo este número, del cual espero ayude a difundir las ideas de un gran pensador que desgraciadamente no ha sido casi leído.

El debate de la Filosofía contemporánea

memoria y la imaginación. Debido a que el conjunto de los impulsos neurales es a la vez casual y vasto, no hay ningún problema en que la psique seleccione entre los impulsos dispares, admitiendo a la conciencia entre sus representaciones correlacionadas, y organizándolos de acuerdo a sus propios intereses.

Sin embargo, cuando se trata de respuestas corporales (incluyendo el uso de movimientos corporales para comunicarse a través del habla, la escritura, la expresión facial y la postura corporal) que se derivan de secuencias de actos experimentales (es decir, psíquicos) de la conciencia, se requiere más. Por ejemplo, si veo una luz destellar por el rabillo del ojo y vuelvo la cabeza hacia ella, ¿son acaso los impulsos de los nervios que estimulan los músculos de mi cuello directa y exclusivamente el resultado de los impulsos nerviosos visuales? ¿O es acaso que mi conciencia ha seleccionado e integrado al final de eseflujo un conjunto de impulsos de los nervios que estimulan los músculos y que ya están operando en mi sistema nervioso? ¿O quizás el flujo de los actos de la conciencia ha producido nuevos impulsos nerviosos? Y si es el caso, entonces, ¿cómo lo ha hecho?

La última alternativa parece favorecida por los experimentos bien establecidos de la "bio-retroalimentación". Estos experimentos muestran que los sujetos pueden alterar conscientemente sus propios patrones de impulsos nerviosos. En los patrones eléctricos seleccionados en el cerebro se da la representación visual (por ejemplo, en forma de ondas en una pantalla de visualización) y los sujetos aprenden a modificar sus patrones de impulsos con el fin de alterar las representaciones visuales mostradas. Cómo ha de entenderse esto a la luz de la heurística de Lonergan es un reto para la investigación futura. Él mismo hizo alusión a la investigación que sería necesaria para poder responder a estas preguntas en su comentario sobre "los factores impulsivos, sensibles y emotivos que los dirigen y desencadenan" los movimientos del cuerpo (*Insight*, p.241). Pero en realidad hacer esta investigación es una tarea para el futuro.

Éstas son algunas de las principales preguntas que se abren por los escritos de Lonergan sobre este tema. En mi opinión, su trabajo tiene un enorme potencial para elevar y transformar todo el campo de la ciencia cognitiva y los debates sobre las relaciones entre la ciencia neurofisiológica y la conciencia.

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Fledgling functional foundations for the biology of the adult pigeon

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Resumen

El libro *Insight* muestra que Bernard Lonergan logró una maestría poco común, así como una heurística de las ciencias, del desarrollo humano, la metafísica y la probabilidad emergente. Si nos fijamos en el segundo párrafo de la página 489 del Insight (último párrafo de la p.545 de la edición en español) encontraremos una heurística precisa y de gran densidad: "El estudio de un organismo comienza ....". Eventualmente se necesitarán otros textos de soporte para ayudar a los estudiantes y a otros lectores hasta alcanzar el modo de control de los significados de estar atento a sí mismo al que apuntó Lonergan. Este artículo es una búsqueda preliminar hacia tal tipo de crecimiento fundacional, con énfasis en la biología.

Palabras clave: Especialidad funcional, colaboración, fundamentos, biología, Bernard Lonergan.

Abstract

The book Insight reveals that Bernard Lonergan reached an unusual mastery and reaching heuristics of the sciences, human development, metaphysics and emergent probability. In particular, if we look to the second paragraph of p. 489 of Insight, we find a precise and densely expressed heuristics: "Study of an organism begins ...". Eventually, ranges of supporting texts will be needed to help students and other readers climb, in self-attentive mode, to control of meaning pointed to by Lonergan. This article is a preliminary searching toward that kind of foundational growth, with a focus in biology.

Key words: *Functional specialization, Collaboration, Foundations, Biology, Bernard Lonergan.*

Part I - Anatomy of anatomy

1. Preliminaries

Have you ever been captured in wonder by the flight of a pigeon? In this paper I invite your wonder (and self-attention to the experience of that wonder) about the pigeon, and in particular, about flight. My intended reader has made some progress into a "basic position"[1], even if that progress be only descriptive assent, together with, perhaps, hope-enriched consent to the effort of follow-up development. It will also help to have at least nominal familiarity with some of the results of contemporary biology. Although, if this is not the case, then this paper may be used as a guide for readings and background. I hope that you will be open to the possible value of continued foundational development - personally and in the community. I hope that you also are open to the possibility that scientific understanding of biological things of this universe is relevant to metaphysics; and that the aim of metaphysics includes having something to say about, not just any universe, but this real universe. Whatever one's position about the meaning of "real universe", it is difficult to deny that the real universe includes not only biological things that biologists investigate, but also biologists and their efforts to investigate biological things.

As many Lonergan Studies readers will be aware, the dense doctrinal expression that is the book *Insight*[2] reveals that Bernard Lonergan already had an unusual mastery and reaching heuristics of the sciences, human development, metaphysics and emergent probability. In particular, if we look to the second paragraph of p. 489 of *Insight*, we find a precise but densely expressed heuristics: "Study of an organism begins...". As a community, though, we do not yet have a representative subgroup that is either *in position* to read this paragraph or who has reached the kind of further "come about" so briefly described by Lonergan on p. 537 of *Insight*. Eventually, ranges of supporting texts across entire undergraduate curricula will be needed to help readers climb toward being able to read *Insight*. In the meantime, this article is one small contribution toward that needed prior foundational growth. I could say that this article adds (avian) flesh, to the otherwise amazingly compact paragraph of p. 489 of *Insight*. By the same token, I invite the needed self-attention which for each of us means "self-study of an organism". In other words, this article also is a primer exercise toward a future "generalized empirical method", pointed to in Lonergan's *A Third Collection*, p. 141[3]. Whatever heights Lonergan reached, this kind of development will ground our own future flights, including future (functional) recycling of Lonergan's works, works which express an achievement and vision that remain well beyond community reach so far[4]. I invite us, therefore, to start, fledgling-wise, from where *we* are *now*.

I make an effort in this paper at *descriptive*[5] *foundational* "direct speech". In particular, I draw attention to what I think will be foundationally new. I do not mean new compared to what Lonergan attained, but new relative to either the *acquis* of present day Lonergan Studies, or of others seeking the kind of development described in my previous paragraph. I discuss details of what for me has been a nest of displacement experiences. I also share my thoughts on how those experiences can open the way to corresponding foundational development. A centre piece of my article is the effort to make some progress toward a heuristics for an *adult* pigeon. I draw from known biochemistry and biology. I do this not by way of citing authority, but to invite you to engage in understanding some of the ins and outs of standard results, in order to also self-attend to that experience of understanding. In that sense, the paper also is an *invitation* to do at least some biology, but especially in order to see what (or who) we can lift from that experience. It's true, the chemistry and biology can be challenging. You may well find that you need to know more of both. To meet that need may take some months, or longer - as it has for me. But, if you are so inclined, I am confident that, as I have, you also will find such an effort both interesting and tremendously fruitful.[6]

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[1] "basic position": This is described briefly by Lonergan in his book *Insight: A Study of Human Understanding*, *Collected Works of Bernard Lonergan*, Vol. 3 (Toronto: University of Toronto Press, 2000 (1997)), 413.

[2] See note 1.

[3] Bernard Lonergan, *A Third Collection*: Papers by Bernard JF Lonergan, SJ (New York: Paulist Press, 1985), 141.

[4] For completeness, I note that Lonergan's reach also included theology, economics and eventually a heuristic solution to the problem of *cosmopolis*, the solution of which he called "functional specialization".

[5] See also the last paragraph of Section 13.

[6] I say more about the 'basic' value of science in Sections 13 and 14.

I divide the paper as follows: In Parts I, II, and III, I invite the reader through increasingly challenging displacement experiences ("conversion experiences"). I keep the main body of the paper centered on the problem of understanding the *adult* pigeon. Restricting to the *adult* pigeon temporarily[7] allows me to avoid foundational questions of *development* (of, for example, the development from the unformed fleshy "squab" to the highly capable adult pigeon). In Part IV, I include reflection on experience gained in Parts I, II and III. I call Section13 a "communiqué", because it is merely a few comments I have given, rather than any kind of effort toward adequate C(56) functional communication, from functional foundations to functional doctrines[8]. In the final Section 14, I look beyond the biological sciences, and use the present article as a basis for pointing to what I see as future foundational development.

2. What is this *thing* we "name" *pigeon*?[9]

From a continuum of sensible experience - in basic position, all curiously "within" –there can be a special kind of inner *lift* of our own, arcing up-and-into a poise of "What is *it*?" But, you reading and me writing, we also have language. We have a "name": in English, *pigeon*. All of this together, we rise toa holistic dynamic that is a naming-unity-identity-whole-wonder-poise: "What is this 'unity-identity-whole' that we *name pigeon*?"

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[7] I will be doing work on *biological development* in a later article. Our progress there will need to include further "un-packing" of the opaque but brilliant Chapter 15 of Lonergan's *Insight*.

[8] It is somewhat too soon for us in history.

[9] The brevity of this section does not reflect the underlying difficulties. See Section 13, for a few comments on the future challenge of understanding the human dynamics of 'naming'. The fact that being able to *explain* 'naming' is a remote achievement for human science starts to become especially evident after foundational work on the human effort to explain the capacities-to-perform of the bird that (in English) we 'name' *pigeon*. An introduction to the problem of 'naming' can be found in: Philip McShane, *A Brief History of Tongue* (Halifax: Axial Press Inc., 1998), 31-37. See also *Insight*, CWL3, p. 578, where Lonergan speaks of "experiential conjugates, that involve a triple correlation of classified experiences, classified contents of experience, and corresponding names".

3. Anatomy of an *adult* pigeon

In biology, follow-up to the question 'What is it?' has included the study of pigeon *anatomy*. A convenient source is *Laboratory Anatomy of the Pigeon, LAP* [10]. To get experience in anatomy, some such book can help; and if possible, at least some experience in a laboratory (recommended). In *LAP*, the basic anatomy of the (whole) pigeon is "spread out", in nine chapters of annotated dissection experiments, with illustrations and photos. If you explore some such source, you will find that the complexity of the pigeon anatomy is an astonishing wonder to behold.

The chapters of *LAP* are: 1. External Anatomy and Skin; 2. Skeletal System; 3. Musculature; 4. Digestive System; 5. Respiratory System; 6. Circulatory System; 7. Urogenital System; 8. Nervous System; 9. Special Sense Organs. Of course, reading a list is no replacement for doing some anatomy. But, I provide a small selection of topics from *LAP* to give some impression of the broad scope and detailed complexity of even basic pigeon anatomy.

1. External Anatomy: Includes: head, elongated beak, sheath on upper jaw, forelimbs for flight, hind limbs for bipedal terrestrial locomotion and for perching. In more detail: crown, forehead, cere, ..., primary remiges, ..., tarsus, toes. Dorsal view includes: forearm, wrist, hand, propatagium, ..., thigh, tail, ankle, foot {metatarsus, digits}, ... Skin: scales on legs and feet, claws and beak, down feathers, contour feathers, filoplume feathers. Different feather types are found in *tracts* such as capital, spinal, lateral. Various views are given: dorsal view, lateral view, ventral view.
2. Skeletal system: The bones are hollow, contain air spaces, and are often fused together. The arrangement permits strength without weight. There are several pages of details. Figure 18 of *LAP* produces an image for the lateral (dorsal) and medial (ventral) views of the wink skeleton. These include fused carpals, metacarpals, and much more.

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[10] Robert B. Chiasson, *Laboratory Anatomy of the Pigeon*, 3rd Edition, Dubuque (Iowa): W. C. Brown Pubs., 1984. Later, some of the terminology will eventually need to be revised. For instance, the word 'system' is used in many ways: the "locomotor system", the "digestive system", the "respiratory system", and so on. I'll touch on these issues in Section 8 below.

3. Musculature: A highly complex weave of 175 muscles.
4. Digestive system: Starting with mandibular beak, tongue and oral cavity, this part of the dissection includes: body cavity and all viscera such as heart, liver lobes, intestines, membranes that support viscera, ligaments, and various compartments.
5. Respiratory system: This is a complicated system of various air sacs in the body cavities and air spaces inside many bones. Other parts include: larynx, trachea, syrinx, tempaniform membranes, bronchi, lungs.
6. Circulatory system:
   This includes the heart, with its atria, ventricles, veins, arteries, aortic arch, chambers, cup like flaps fused at their borders with adjacent flaps. Also included are the vast vein works with flow patterns of the whole body that in particular, include an intricate mesh of wing veins called radial, dorsal, ulnar, brachial, auxiliary veins, and several others. Major veins can be found and distinguished throughout the body, connecting to all organs, limbs, tracts.
7. Urogenital System.
8. Nervous System.
9. Special Sense Organs.

Data from our experience in anatomy:

- Through dissection we get presentations and representations, diagrams, photos, extensive, intricate, organized data on parts, tissues, membranes, body fluids, and connectivities between all of these, from many points of view, perspectives. Even the most basic and introductory pigeon anatomy requires more than a hundred pages of increasingly complex presentations and representations.
- Within a "basic position", we can begin to be somewhat (self-) luminous about the fact that such images are not "out there", but within consciousness.

Insights from our experience in anatomy:

- Extensive aggregates of nuanced descriptive understandings –of sense experiences, presented or represented parts from many different perspectives, connectivities. Basic anatomy consists of a vast and indefinitely large aggregate of descriptive insights.

- Descriptive local unity: Even though we have an aggregate of descriptions (of a pigeon and its many dissected parts), through self-attention we find that in any instance, within the field of inspection, all parts, membranes and fluids are descriptively connected within that dissection.
- "Unity-identity-whole": Anatomy is under a controlling grasp of unity. There is our question: "What is *it*"? And the 'it' includes all descriptions, all described parts. It is true that at any one time we only have a few described parts of a pigeon's anatomy within consciousness. But all of the *LAP* results are understood to be about a *whole* pigeon.

4. Cell lines, *adherens*, the extra-cellular matrix and connective tissues of an adult pigeon

In dissection, an investigator uses various instruments. Examples are the hemostat, forceps with serrated teeth, scissors with one blunt tip, scalpel with replaceable blades, probe with blunt tip, and elementary magnification devices. But, other more sophisticated technologies also are used in anatomy, including light microscopes (compound, phase contrast, dark-field), fluorescent microscopes and electron microscopes.

Using available techniques and technologies, presentations and representations reveal fine descriptive differences in tissues and body parts; that there are cells and organelles of cells (such as mitochondria); that there are *adherens* (inter-cellular proteins joining cells); many types of fluids; varieties of extra-cellular matrix in various anatomical locales; and so on. The techniques and technologies of contemporary science allow us to obtain complex and extremely nuanced descriptive differentiation of the whole pigeon and its describable parts. This includes the described components of the brain and neural mesh ["central" (within skull and spinal cord) and "peripheral" (outside of the brain and spinal cord) nervous "systems" (CNS and PNS respectively); and an "Autonomic Nervous System" (ANS), by which basic visceral functions and thermoregulation are auto-regulated].

Summary: Contemporary anatomy of the pigeon involves: inspecting and thinking about the whole pigeon and its many described parts; increasingly vast collections of images, presentations, and representations combined and juxtaposed in various ways: "external" features, organs, anatomical parts, cell lines, organelles such as mitochondria, various types of extra-cellular matrix and *adherens*, all descriptively connected and descriptively differentiated, all held together by aunifying question-poise: "What is *it*?"

Part II - Getting "down" to some chemistry of an adult pigeon

5. The wing muscle tissue of an adult pigeon

Biochemistry today is extensive. One of the now well-known basic results is the tricarboxylic acid cycle (TCA cycle), or Krebs cycle[11]. This section is the beginning of a crab-like[12] crawl into some of that biochemistry. Expressions and diagrams of the TCA cycle are easily available in textbooks, or through online internet search. It was discovered by Krebs in the 1930's, in his experiments on pigeon wing muscle. Behind the discovery of the TCA cycle were questions about how various organic (di- and tri- carboxylic) acids are oxidized by animal tissues. Among other things, the cycle consumes O_2 and one of the waste products is CO_2.

The TCA cycle is written as a sequence of nine reaction equations that circle back to the first equation. Some products of the first equation become reactants for the second, and so on, so that some products of the penultimate reaction equation are reactants for the initial reaction equation, allowing the sequence of reactions to start again – hence, a "cyclic" pattern of oxidations. Part ofcontemporary understanding includes: two ATP (adenosine triphosphate) molecules are produced through each cycle; and that ATP is a *coenzyme* that sometimes is called a "universal energy molecule".

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[11] Krebs was awarded a 1953 Nobel Prize for his discovery of the cycle.

[12] Conveniently, 'Krebs' is a German word for 'crab'. To encourage us in our own slow struggles, note that in his own words, Krebs' journey also was a "slow" creative crawl, "extended over some five years beginning ... in 1932". See the first paragraph of: H.A. Krebs, The History of the Tricarboxylic Acid Cycle, *Perspectives in Biology and Medicine*, Vol. 14 (1970): 154-170.

Some of the data on the TCA cycle are available through well known experiments with minced fresh pigeon wing muscle suspended in a phosphate saline solution. (This solution is found to not inhibit metabolic activity of fresh muscle tissue.) Through combinations of *in vitro* experiments, each of the reactions of the full TCA cycle can be verified. For the moment, let's look to just one of those reactions. For muscle suspended in solution, one of the reaction equations is:

$$\text{fumarate} + \text{pyruvate} + 2O_2 \rightarrow \text{succinate} + 3CO_2 + H_20$$

Chemical formulas for the acids are: fumarate, $HO_2CCH{=}CHCO_2H$; pyruvate, $CH_3COCOOH$; and succinate, $HOOC\text{-}(CH_2)_2\text{-}COOH$. Experiments reveal that fumarate acts as a catalyst: O_2 uptake increases with an increased supply rate of fumarate, and decreases when the supply rate of fumarate is reduced. Similarly, the production rates of succinate, CO_2 and H_20 depend on the presence or absence of fumarate and pyruvate.

For this equation, what are the actual data and what is the understanding? Of course, one needs to become familiar with the experimental arrangements, and to have the relevant data and insights from bio-chemistry.[13] Assuming some background in chemistry, what does this now mean about the minced fresh muscle tissue? It may help to draw attention to two aspects of the experiment. This chemical reaction equation is verified when (i) the muscle tissue is present (ii) in the non-inhibitory solution. So, we could also write:

When suspended in the non-inhibitory phosphate saline solution,

$$\text{muscle tissue} + \mathit{fumarate} + \mathit{pyruvate} + 2O_2 \rightarrow \mathit{muscle\ tissue} + \mathit{succinate} + 3CO_2 + H_20$$

Does this not mean that the muscle tissue functions chemically? For, *in vitro*, fresh muscle tissue has the capacity to oxidize in the way expressed by the reaction equation. But, the full TCA cycle is not just this one equation. There are eight other chemical reaction equations. These can

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[13] This is where the need of having some chemistry starts to become unavoidable. If you don't have a background in basic chemistry, then you may take this as a positive invitation. As I mentioned in Section 1, the effort can be extremely fruitful. Of course, it depends on one's interests. But, without making that effort, talk of "chemical equations", "atoms", "molecules" and "compounds" will, of course, be limited to images, words and names.

be verified in similar ways, using other initial conditions. Tissue samples are prepared in the same way, suspended in the same kind of solution, at appropriate temperatures. But, for the other equations, different reactants are introduced into the solution, yielding different products. So, *in vitro* at least, we find that the minced muscle tissue functions througha"cycle" of intertwined chemical reactions.Evidently, the tissue is "chemically multivalent", in a sense "super-molecular". I use the word "super-molecular" not yet as a technical word, but to draw our attention to a verifiable "multivalent chemicality" of the muscle tissue.[14]

These results are for adult pigeon muscle tissue samples *in vitro*. But, what might these results have to do with a living adult pigeon, *in vivo*, and *in situ*? Can we go on to assert something about TCA cycles of a living pigeon, about what is going on *in vivo* and in *situ*? In what sense might a *living* pigeon be "super-molecular"?

6. The TCA cycle and other chemical talents of a living adult pigeon

Part of our challenge is to make some progress toward a heuristic for holding these results together, for a *living* pigeon, a pigeon *in vivo* and *in situ*. One difference between *in vitro* and *in vivo* results is that *in vitro*, the various TCA intermediates are introduced into the *in vitro* solutions by an investigator. The living bird, though, is doing its own thing without any such interference. What, then, about the TCA intermediates in the *living* bird? Standard biochemistry and biology include the following: (i) that the TCA intermediates are"in" the living pigeon; and (ii) that while net concentrations tend to stabilize, the various TCA intermediates are in flux patterns with relative rates, explained by the TCA cycle.

What could it mean to say "in" the living pigeon? How are (i) and (ii) actually verified? A standard approach for (i) is to submit tissue samples to various sequences of chemical "break-down" processes. Along the way, products obtained are combined with other reactants; and so on, all under the control of chemical understanding. Products obtained are isolated (and often further analyzed by centrifuge, mass spectrometry and/or charge spectrometry for isotopes). What is it that is being verified? These experimental procedures help us verify chemical functions of sequences of chemical reactants and products. In particular, at no stage are components of compounds found to be aggregates "imaginably in" compounds. In other words, in *chemical analysis* of tissue samples we find *chemical properties* of tissue samples and reaction products. And, as it happens, for pigeon muscle tissue samples, sequences of *in vitro* reactions can ultimately produce all of the intermediates of the TCA cycle, verifying that fresh muscle tissue samples complexly share the chemical functionalityof all of the TCA intermediates. Or, as is more commonly said, the TCA intermediates are "in" the tissue samples.

Yet, the biochemistry claim (ii) says more, and sheds light on (i). For the claim is not just that the various TCA intermediates are only found in *in vitro* tissue samples, but that they are "in" the living pigeon, dynamically mutually related according to the TCA cycle of chemical reaction equations. To be sure, the *in vitro* results are compelling. But what is the evidence for the claim when transferred to *in vivo*? A small sampling of known empirical results for the *living* pigeon are as follows: (1) Complementing the fact that *in vitro* reaction rates are all mutually comparable, we also find that *in vivo* rates of CO_2 production and O_2 consumption of the whole pigeon closely compare with mutually comparable combinations of *in vitro* rates. (2) If either or both of oxygen and carbohydrate supplies to the living pigeon are reduced, muscle function begins to fail. (3) If selected TCA intermediates are injected directly into local tissue or bloodstream, muscle activity can be catalyzed, in patterns and rates compatible with TCA *in vitro* results. (4) In some *in vivo* experiments, initial conditions for glucose and oxygen supplies to selected muscles can be accurately controlled; and levels subsequently match TCA *in vitro* results. (5) Blood plasma can be extracted from a living pigeon at time intervals of 1 second, 2 seconds, ..., 6 seconds, and so on -- that is, at time intervals comparable to TCA cycle *in vitro* rates. In all cases, we find *in vivo* muscle activity patterns, flux rates in glucose and oxygen levels, concentrations and flux patterns of TCA intermediates present in blood plasma in conformity with estimates based on the TCA cycle *in vitro*.

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[14] Muscle tissue is "super-molecular" also in a sense of being "not-merely-chemical". There will be more on this in sections below.

But, the puzzle continues. For, in a living pigeon, the TCA cycle is understood to be "chemically downstream" from another (non-cyclic) chemical sequence called *glycolysis* - i.e., some products of *glycolysis* are reactants for the TCA cycle. Note that the expression "chemical pathways" is used when such chemical sequences and connectivities are known - such as the *TCA cycle* or the *glycolysis pathway*. And there are many[15] more chemical pathways that are known to function in cells and throughout the anatomy of a living pigeon. Oxygen is said to be carried to cell sites for the TCA metabolic cycle. A "binding" of oxygen is said to take place in the lungs, across what are *described* in anatomy as membranes of small balloon-like structures called *alveoli*, attached to the branches of the bronchial passages. Oxygen is then said to "bind" to a protein that is said to be "in" red blood cells. A special form of hemoglobin produced in this way is *oxyhemoglobin*, found to be formed during physiological respiration when oxygen "binds" to the *heme* component of the hemoglobin protein component in red blood cells. Oxygen is then transported to cell sites so that it may then also function in the oxygen dependent TCA cycle. In another direction, carbon dioxide produced by the TCA cycle binds to de-oxygenated hemoglobin (which is then called *carbinohemoglobin*) so that it can be transported back to the lungs for "removal" from the organism, by being "released" into the environment.

Just like for the TCA intermediates, in standard biochemistry and biology it is said that the hemoglobin protein is "in" red blood cells, blood cells which in turn are said to be "in" the bloodstream. But, again, just as we enquired into whether or not TCA intermediates are "in" cells *per se*, here too we can ask: Are hemoglobin protein molecules "in" red blood cells, and are blood cells entities "in" the bloodstream? Here I refer to experiments from the field, which are not unlike experiments for the TCA cycle *in vitro* and *in vivo*. That is, the experimental results are chemical (sometimes including spectral analysis to help identify chemical products that have been crystallized). In other words, the proteins are said to be "in" red blood cells in so far as the red blood cells *in vitro* chemically function appropriately, or can be chemically "broken down" to yield products or crystallizations of products of chemical reactions that are secondary, tertiary, and so on, and that chemically function appropriately. What about *in vivo*? The bloodstream is a fluidic part of the whole pigeon anatomy. Among other things, O_2 uptake and CO_2 release ratios can be determined. Now, though, the chemical experiments involve the living pigeon. In both cases then, whether *in vitro* or *in vivo*, experiments reveal not hemoglobin "in", but hemoglobin-chemical-*function* "of". *In vitro*, we find chemical function of *in vitro* samples; while *in vivo*, we find chemical functionings of a living pigeon.

What does all of this tell us about the living pigeon? Evidently, the living pigeon has a vast range of chemical abilities, chemical capacities-to-perform, or *chemical talents*. And in particular, a pigeon is "oxygen-capable" in this "hemoglobin-way". Note, in particular, that there is no verifiable evidence of imaginable "binding" or "gluing" or "attaching" of "oxygen to hemoglobin in red blood cells". Instead, what we verify is that the living pigeon has a variable *hemoglobin-chemical-function-capacity*, a capacity to "chemically bind" O_2 from the environment. And the pigeon's capacity to "release CO_2" into the environment is another related hemoglobin-chemical-function-capacity.

We could go on to explore many chemical subtleties of oxygen binding and carbon dioxide release, or review some of themany dynamic chemical pathways that function throughout the pigeon anatomy[16]. There is a staggeringly vast multitude of chemically-verifiable, chemical-function-capacities. A *living* pigeon is an extraordinarily chemically capable entity, a "bird of many (chemical) talents"!

Part III - Assembling our heuristic of an adult pigeon

7. The *super-chemical* pigeon.

As we begin to see from Section 6, in a big way the living pigeon is a unity-identity-whole that is *chemically-multi-talented*. *In vivo*, there are vast multitudes of chemically-verifiable chemical-functions chemically-

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[15] At present, there are more than 500 known chemical reaction pathways in a typical pigeon cell. Although, "almost all pathways lead to the TCA cycle".

[16] For some context, see: Lewis Stevens, *Avian Biochemistry and Molecular Biology*, Cambridge, UK, Cambridge University Press, 1996. Part I is Metabolism; and Section 6.3 includes details on the transport of oxygen and carbon dioxide.

related through extensive complexes of chemical reaction patterns ("chemical-pathways"). Note that the emphasis here is on *chemical* properties. But, in chemistry, we also advert to properties investigated through parameters known to physics – there is, for example, "spectral analysis". Now, in this paper I don't intend to focus on bio-physics. But, a few comments here will help us begin to"fill down" our *in vivo* heuristics. For, that way, we can begin to see how the talents (capacities-to-perform) of the living pigeon also include various physical-functionings, capacities-to-perform known through physics.

Certainly, we may recall that fluids in the pigeon organism have many of the physical properties of Brownian aggregates and statistical mixtures. More, though, is known. For instance, carbon isotopes can be injected into tissues sites. These isotopes are up-taken by the living pigeon, resulting in what is called "labeled acetate". Then, nuclear magnetic resonance apparatus aimed at anatomical sites can track metabolic functioning of "labeled acetates". The results are that fluctuation rates (as well as stabilization patterns) for the spectra of TCA intermediates are in accord with estimates based on *in vitro* TCA cycle chemical reactions obtained under appropriate sequences of staged initial conditions in reaction baths. Again, an adult Rock Pigeon has an approximately constant mass (typically somewhere in the range 0.2kg - 0.4 kg); and *a poseteriori*, biomechanics and aerodynamics partly explain the functionality of various skeletal formations, musculature patterns and feather formations; wing shape; and "lift".

When all of this is brought together with the results of Section 6, a ***pre-heuristic*** begins to take shape: the living pigeon is both physically *and* chemically multi-talented, an anatomical unity-identity-whole that is some kind of ***super-physical-molecular*** entity.

8. "When the (pigeon flies) the whole (pigeon flies)"

The living pigeon (with its TCA cycles and all other chemical pathways) survives not through the interference of investigators, but while it goes through its various activities *in situ*. The pigeon flies; it breathes oxygen; it moves about in its environment to obtain "food stuff"; it sleeps; it

preens its own feathers and spreads oils from a tail gland; it nests in locations that are too high for most ground predators; generally it is a social animal with its own kind; at times it is "mildly" aggressive with other pigeons; at other times it flies away if a predator's moving shadow is detected; and so on.

Let's now push our *pre-heuristic* for the adult pigeon a little further, by including these further verifiable capacities-to-perform in its environment. And to do that, for now, let's start with just one of the activities mentioned, the one that so regularly catches our attention, *flight*. Certainly, something quite marvelous is going on here: For, re-coining an old phrase about *babies* laughing: "When a pigeon flies, the whole pigeon flies!" The empirical fact is that during *flight* (or any other activity) all of the descriptively, physically and chemically differentiated anatomical parts of a pigeon function together.

How can we write this down? Keeping the real pigeon in mind, we might start by labeling the heart H, the lungs L, bloodstream B, wing muscles M, stomach S, and so on, leading to a symbolism that, initially at least, matches the real anatomical differentiations of a pigeon. But, an organ has several cell lines, with differences in chemical functionings. So, to be more precise we would, for example, need to include something like H1, H2, ...; L1, L2, ...; B1, B2, ...; and so on, for the various cell lines of the pigeon heart, lungs; bloodstream; ..., respectively.

Note also that the descriptive and chemical connectivities (that is, the chemical pathways, cycles and other schemes of recurrence within a whole-pigeon anatomy) are vast, diverse, complex and typically multiply link diverse parts of the organism. So, the *ad hoc* symbolism H1, H2, ...; L1, L2, ...; B1, B2, ... quickly becomes unwieldy. For a workable heuristic, we can improve on this somewhat byusing a generic **'P'** to represent a significant (described) 'Part' of the pigeon – descriptively, physically and chemically differentiated within the anatomy. There are of course many parts of the anatomy, so we need to introduce some kind of indexing. For now, keeping it simple, I just use 'k'.

Each anatomical part P(k) has its own physical and chemical functionings, pathways, cycles, and other schemes of recurrence $(pi;cj)_k$, as already pointed to somewhat, in sections above. For example, in the special case of cell populations, the notation $(pi;cj)_k$ includes the intra-cellular TCA cycle, the *glycolysis* pathway, spectral flux patterns; regulated charge gradients across membranes of mitochondria; and so on. Combing all of this physics and chemistry together into our notation, for anatomical part P(k) we get functionality$(pi;cj)_k$.

But, again, the anatomy of a whole pigeon is a unity, descriptive, physical and chemical. Lungs allow for a chemical binding of oxygen to the bloodstream of the organism; the bloodstream is needed to transport "bound oxygen" to cell sites, to then chemically function within the aerobic TCA cycles in muscles, organs and other cell lines. Recall also from *LAP*[17] that there are various complex 'systems' of the anatomy: External Anatomy and Skin; 2. Skeletal System; 3. Musculature; 4. Digestive System; 5. Respiratory System; 6. Circulatory System; 7. Urogenital System; 8. Nervous System; and 9. Special Sense Organs. None of these 'systems' are true independent 'systems'. None function separately from the organism. All of these 'systems' work together, through vast arrays of connective networks of physical-chemical pathways, cycles and other schemes of recurrence. One way to express this heuristically is to use $(pi;cj)_{(k,l)}$to represent all physical and chemical connectivities that functionally connect$(pi;cj)_k$ and $(pi;cj)_l$ of P(k) and P(l) respectively.

Now, during flight, for example, all anatomical parts P(k) function together. So I use spanningbrackets <,> to represent the living dynamic unity-identity-whole *in flight*. Putting all of this together, provisionally, we can write an *organism-wide* "chemical metabolic profile" for*(flight)* = <P(k): $(pi;cj)_k$, $(pi;cj)_{(k,l)}$, $(pi;cj)_l$>*(flight)*.

9. Other activities of the adult pigeon

Of course, a pigeon does many more things besides fly, and as you may have noticed, most of the comments above apply equally well to those other activities. For example, we could also have *(resting)* = <P(k): $(pi;cj)_k$, $(pi;cj)_{(k,l)}$, $(pi;cj)_l$ >(resting), *(mating activity)* = <P(k): $(pi;cj)_k$, $(pi;cj)_{(k,l)}$, $(pi;cj)_l$ >(mating activity)), *(escape predator)* = <P(k): $(pi;cj)_k$, $(pi;cj)_{(k,l)}$, $(pi;cj)_l$ >(escape predator), and so on.

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[17] See note 10.

Here then, our pre-heuristic is bringing us to something both new and coherent with verifiable results of contemporary biology. Instead of trying to artificially impose a non-verifiable imaginative reduction to the "merely physical" or "merely chemical", we are making it explicit that whatever the *activity* may be, it in fact always is the whole organism, with an organism-wide "metabolic profile" for each (*activity*) = <P(k): $(pi;cj)_k$, $(pi;cj)_{(k,l)}$, $(pi;cj)_l$>*(activity)*.

It has, for example, been found through wind tunnel experiments and analysis of plasma that there are specific levels of fatty acids, glycerol and other acids during extended flight, different from when a pigeon is resting; and that it is a total organism-wide metabolic profile that sustains extended flight. In particular, if, for instance, between anatomical parts 3 and 7 say, the physical and chemical connectivities "$(pi;cj)_{(3,7)}$ "are found to be "within flight ranges", this would not necessarily mean that the pigeon is in *flight*. *All* ranges must *simultaneously* be functioning *together* within their respective metabolic "flight ranges". It is a "total package", a "total profile", a "whole pigeon". There is, of course, tremendous flexibility within these profiles. But,in fact, not all organism-wide metabolic profiles correspond to flight. Some correspond to rest; some correspond to mating; some to predator-escape mode; some to sleep; and so on.

We now have a pre-heuristic that explicitly points to *flight* (and other activities of the pigeon) in terms of verifiable anatomically correct organism-wide *metabolic profiles*. There is, though, apparently, a kind of "circular reasoning" involved, at least relative to chemistry. For various activities, metabolic profiles are in local and organism-wide statistical flux within the pigeon. But note also that *in situ* activities of the pigeon also are statistical. What we find, therefore, by doing and verifying the appropriate avian biochemistry, is not circular logic. Instead, we find that in various ways chemical metabolic profiles arenon-systematic with respect to chemical law. At the same time, pigeons also reveal various regularities in their in situ activities. So, while discoveries of complex physical and chemical schemes within the organism reveal that the pigeon is in some sense *super-physical-molecular*, there are further regularities not explained by physical or chemical law. Evidently, the pigeon is in some sense "not merely molecular". In fact, we are touching here on the edge of an important foundational result, a heuristics for the multiple "layerdness" of biological entities. I will, though, be saying more about that feature of our pre-heuristic in Section 11 below. First, let's again extend our description of the living pigeon somewhat -- this time not by going "down" to physics, but by *describing* some of the other *in situ* activities of an adult pigeon.

10. Pigeon functions: below-*conscious*; and *conscious*[18]

It is well known that the pigeon biology has at least two main types of biological function: *below-conscious* and *conscious*. Examples of below-conscious functions are: salivation, digestion, perspiration, pupil dilation, blood circulation; hormone production and circulation; urinary functions; integumentary functions of skin cell lines and feathers, that protect the body from damage from the environment; and so on.

The below-conscious functions generally remain below consciousness, unless problems arise, such as illness. All of these below-conscious functions are known to be regulated through a vast and intricate Autonomic Nervous System (ANS). To mention a few features of the ANS: The ANS itself divides in various ways, in its anatomical configurations and corresponding functions. There are, for instance, the sympathetic parts of the ANS (functional in fight, inhibits digestion, and so on) and the parasympathetic parts (functional in visceral activities such as digestion). For both sympathetic and parasympathetic functions, there are afferent sensory neurons, and efferent motor neurons. And, of course, there is much more besides.

The below-conscious functions continue only so long as appropriate food stuffs are secured, and the pigeon remains in a suitable environment. But, how does food stuff get to the stomach for digestion in the first place? Evidently, the pigeon has a further range of capacities, some of which I have already mentioned in the first paragraph of Section 8. In other words, the pigeon has capacities-to-perform where it is conscious.

This also reveals another division in types of function, by adverting to the fact that the pigeon survives in an environment. Some of the below-conscious functions (such as blood circulation, hormone circulation, and TCA cycles) are *intra-organism* (and in the case of the TCA cycle, are *intra-cellular*). Other intra-organism below-conscious functions include cell repair and various *corrective schemes* that, for example, remove mutated cells, as well as compounds that have been metabolized but that are in fact inimical to the organism; there are also *defensive schemes*, where the organism chemically neutralizes, segregates or removes toxins and infectious entities that have not yet been metabolized but have penetrated membranes. And, the continued functioning of, for example, the below-conscious TCA cycle, depends not only on an adequate supply of carbohydrates, but also on the pigeon's capacity to capture and bind oxygen from the environment (likewise to remove CO_2 from the organism into the environment). The below-conscious functions of the pigeon therefore divide into (i) intra-organism functions; and (ii) functions that are intra-environment (capacities-to-perform relative to its environment). As we have been working out through several sections of this paper, this "division" is not a "separation" in the pigeon, but a functional distinction.

The *conscious functions* are primarily intra-environment, although respiration, for example, can be both. There are the pigeon's five senses: sight, touch, taste, smell and hearing. It is thought now that pigeons have a "sixth sense", through its *cere*,[19] by which it also is sensitive to the earth's magnetic field orientation (allowing for directional stability in distance flights). All of its conscious capacities-to-perform reveal flexible and dynamic coordination of senses, functional through special sense organs andspecialized parts of the brain-centered afferent and efferent central and peripheral nervous systems. A proper study of conscious functions of a pigeon, and in what sense *conscious functions* are "not merely" *below-conscious*, goes beyond the scope of this paper. It is, though, useful to have these descriptions for assembling our preliminary heuristic. At the same time, we also can make a first step toward the meaning of the *semi-colon* used in the title of this section. So, in Section 11, I invite closer attention to the fact that the pigeon is "chemical-but-not-merely chemical".

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[18] See the last paragraph of this section.

[19] Cordula V. Mora, Michael Davison, J. Martin Wild and Michael M. Walker, "Magnetoreception and its trigeminal mediation in the homing pigeon", Nature, Vol. 432, Nov. 25 (2004).

11. Reaching toward heuristics for pigeon *capacities-to-perform* which are "not merely chemical"

Respiration is a normal activity for a pigeon, whether sleeping or awake. Using our notation above, we can write $\textit{(respiration)} = \langle P(k){:}\ (pi;cj)_k, (pi;cj)_{(k,l)}, (pi;cj)_l \rangle \textit{(respiration)}$. As it happens, pigeons do not have sweat glands; and one of the ways a pigeon regulates body temperature is through opening its beak and "panting". So, breathing, lung function, a 'system' of air sacs, etc., all function in respiration, but at times also function as part of the pigeon's auto-thermoregulation. And as we have seen, these functions are, with respect to chemistry, merely coincidental, highly non-systematic, yet occur regularly in the pigeon *in vivo* and *in situ*. In the symbolism of our pre-heuristic we can write

$$(\textit{respiration}) = \langle P(k){:}\ (pi;cj)_k, (pi;cj)_{(k,l)}, (pi;cj)_l \rangle (\textit{respiration})$$
$$(\textit{auto-thermoregulation}) = \langle P(k){:}\ (pi;cj)_k, (pi;cj)_{(k,l)}, (pi;cj)_l \rangle (\textit{auto-thermoregulation})$$

Our empirically grounded pre-heuristic can now help focus our enquiry to include questions like the following: What are defining correlations and patterns of change for organism-wide metabolic profiles $(\textit{activity/function}) = \langle P(k){:}\ (pi;cj)_k, (pi;cj)_{(k,l)}, (pi;cj)_l \rangle (\text{activity/function})$? Are there perhaps "basic profiles", or "core functions", that combine in various ways to determine all other activities and capacities-to-perform? What are the various probabilities (ideal relative frequencies) of these organism-wide profiles? Note that these further kinds of questions need to be addressed. For, otherwise, there are patterned data that remain unexplained, and patterns of capacities-to-perform that remain undefined.

There also isa logic component to the problem. We push both the physics and chemistry for all they're worth, eventually discovering physical and chemical intricacies and limits of organism-wide metabolic (*physical and chemical*) profiles. But, patterns and regularities of change in those chemically nuanced metabolic profiles reveal the need of at least one further logical order beyond chemistry. If we go on to investigate relations between those profiles, we of course do not eliminate those profiles, but start with those profiles. Our understanding necessarily will directly involve not the (chemical) terms and (chemical) relations for (chemical) components of (chemical) metabolic profiles, but new terms and relations correlating and defining (organism-wide) metabolic profiles themselves. (What those terms and relations are, as well as corresponding probabilities, are questions for biologists studying pigeons.) Our higher order understanding, then, will be an understanding of to-be-discovered relations between to-be-determined classes of organism-wide chemical pathways and schemes. Notice that there is no contradiction here. In the living pigeon, two orders are verified together - "*chemistry-but-not-merely-chemistry*" *-deftly fitting like a dove.*

Because of the dynamic unity, we need some kind of symbolism that is both suggestive of the distinction between the verifiable orders and points to the dynamic unity. A symbol that can be useful for this is the semi-colon ';'. This also sheds some light on the semi-colon symbolism I used for "(pi;cj)" in sections above[20], and in the title of Section 10, "(below-conscious; conscious)".

It is true that in standard contemporary biology we do not yet find talk of "unity", of "not merely", or of "logical orders". But it *is* part of standard contemporary biology that for the pigeon there are below-conscious functions; and conscious functions. It may, therefore, not seem that we are talking about something new here in this section of this article. For, in addition to the already known multiple functionings of the Autonomic Nervous System of the pigeon, it is well known that there are networks of afferent and efferent neurons of the Central and Peripheral Nervous Systems that are the anatomical-cellular-chemical basis for the flexible, dynamic and diversely combined functionings of the various special sense organs of the living pigeon. And, in standard biology, these results are linked to the *psychology* of pigeons. What will be new, though, is a more exact foundational grasp of these results – and, in particular, a verifiable and increasingly precise heuristics for the "layers" of properties, "layerings" of capacities-to-perform. So now, for example, we could go on to ask a new kind of question: Are there classes of organism-wide *below-conscious-capacities-to-perform* that with respect to our understanding of below-

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[20] Other studies are needed to investigate in detail how, in chemistry, we have an analogous pairing: "physical-but-not-merely-physical". For discussion of the general need of ";-symbolism", see Philip McShane, Prehumous 2, Metagrams and Metaphysics, [http://www.philipmcshane.ca/prehumous-02.pdf].

conscious functions, are merely coincidental, non-systematic, yet occur regularly? In that case, there is data needing explanation, and we need to work out the higher order correlations and probabilities for, not just any chemical metabolic profiles <P(k): (pi;cj)$_k$, (pi;cj)$_{(k,l)}$, (pi;cj)$_l$>, but "below-conscious profiles", whatever they may be.

Expressed in the terms of our emerging pre-heuristic, and calling on standard biology, we can now say that for the pigeon there are four main orders: physical; chemical; below-conscious; conscious.[21] And while we have only looked at the pair "chemical; not merely chemical" in some detail, this now allows us to move closer toward getting a glimpse of a full heuristics for the whole living pigeon, *in vivo* and *in situ*. We also need symbolism to represent not only various metabolic profiles for the various pigeon activities, but the pigeon as a subject or center of its activities. For, it is the pigeon that has various capacities, functions, talents. But still more is true. Think of the pigeon *in situ*. There are the bird's visual and olfactory capacities; it'salmost instantaneous sensitivity to changes in wind speeds through feathers and skin nerves; its capacities to consume oxygen and release carbon dioxide; the functionalities of various neurotransmitter concentrations (e.g., serotonin, but there are others); the Autonomic and Central Nervous Systems; psychological affinities; and so on and so forth. In Section 10, we made a modest beginning toward a heuristics for how these can function together in the pigeon- flexibly so, within "activity ranges" of a "; -layered"organism-wide anatomical integral unity. But, not only do all functions function together flexibly and dynamically within normal activity ranges, but they obviously also do so with tremendous *mutual flexibility* -- both "within ;-layers", and "across ;-layers".

We find, then, intimations of "a day in the life of a pigeon" being a kind of "improvisational music". Moment by moment, pulse by pulse, sight by sight, sound by sound, breath by breath, mood by mood, ... , a virtuosic pigeon reveals not only that it is multi-talented, but that it is "*deftly integrally* multi-talented", able to smoothly, gradually or dramatically shift complexes of melodies, chordings and harmonies, phrasings, crescendos, decrescendos, and swiftly "*s-wing*" into entirely new movements - a holistic improvisational virtuosic integral music that is not limited to bass, tenor, alto and soprano, but instead is all of these at once. Biologically speaking, the aria-maestro (literally "air master") in its environment is all at once (physical; chemical; below-conscious; and conscious).

What helpful symbolism might we use to express this extraordinarily complex, flexible, integral, dynamic unity? Most certainly, whatever we go with here in this article will be a temporary device. Precise symbolisms will emerge from future foundational developments in avian science. For this article, I will keep symbolism as simple as possible, and so just use the boldface letter **C**. I give my rationale below. But, let me go directly to using this symbolism, to now point to a fuller and explanatory heuristic for a living pigeon *in situ*:

C (<P(k)>))[k, (k,l), l](pi;cj;below-conscious; conscious) (intra-organism, intra-environment).

Most of details of this symbolism we have already discussed. The <P(k)> refers to an anatomically based organism-wide dynamic capacity-to-perform. Instead of having a repeated cumbersome triple of parenthetic terms (pi;cj;below-conscious;conscious)$_k$, (pi;cj;below-conscious;conscious)$_{(k,l)}$, (pi;cj;below-conscious;conscious)$_l$, I write[k, (k,l), l] and use a single (now inclusive) heuristic term (pi;cj;below-conscious;conscious). This simplifies notation somewhat; still keeps the ";-layers" in view; andmaintains [k, (k,l), l] as a symbolic pointer to the anatomical basis of the various functionalities. Any real pigeon lives in an environment, so as discussed in Section 10, we also need a heuristic pointing both tointra-organism and intra-environment.

What though about my choice of the *bold-face* letter '**C**'? The pigeon is a **C**enter of **C**apacities-to-perform; I also find '**C**' visually suitable, for it is a symbol that **C**lasps in its unity, but also is *open*, leaving room for the bird to breathe, live and fly - a nice pointing then, to the pigeon's open and dynamic integral **C**lasp of its ";-layered" **C**apacities-to-perform, all "fitting like a dove". Indeed, the etymology of 'capacity' includes "room enough to fit". Bold-face is for two reasons: 1. In keeping with now standard symbolism in contemporary science, bold-face symbols indicate, vector-like, the presence of multi-dimensional terms; and 2. In

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[21] Note my use of semi-colons. See paragraph five of this section. Note also that the "not merely chemical and physical" functionings of an organism that also are "below-conscious" could also be called the *zoo-botanical* functionings of the organism. That kind of precision, though, goes beyond the context of this present introductory article.

this case, the pigeon is a dynamic **C**enter. Finally, for this article, '**C**' also works as an easy reminder of the pigeon's family name: ***Columbidae***, which comes from the Greek for "dive"[22], another one of the pigeon's hallmark Capacities-to-perform.

Part IV - Flexing our foundational *supracoracoideus*[23]

In Section 12, I'll list some of the key displacement experiences ("conversion experiences") pointed to within the paper. We have already worked through these somewhat. But further self-attention can help one complete a small shift toward a new explicit foundational orientation. I'll also mention "Further Issues" that will need to be sorted out in later work. Note that while this paper has been centered on the pigeon, our foundational results point to more general heuristics that would positively contribute to the present *acquis* in Lonergan Studies and beyond. So, in a short Section 13, I give a few comments toward further foundational development. Section 14 is just one paragraph: A realistic vision of flights of unity and community development.

12. Foundational reflections

Some Displacement Experiences:

Anatomy of a pigeon: unity grasped; descriptions: indefinitely aggregative, layered, extensive, intricate, complex, technological.

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[22] Greek: kólumboj (kolumbos), "a diver".

[23] Pigeons have approximately 175 different muscles, controlling wings, skin, legs, tail, neck and head. The largest muscles are the breast muscles, which control the wings and make up about 15 - 25% of a pigeon's body weight. These muscles provide the powerful wing stroke essential for lift and flight. The *supracoradoideus* is a different muscle, one that *raises* the wing *between* wing beats. These make up about 25 - 35% of the bird's full body weight. Our foundational work is analogous - we are *raising* ourselves up to new foundations, preparing for the functional wing stroke forward to doctrines and beyond. (Etymology:supracoracoideus < Latin: *supra*: above; + *cora*: before; + *coideus* ~ coacto - to force; coadunatio: a gathering together, a summing up, a uniting.)

Chemistry: understanding some non-organic and some organic chemistry.

Eventually some understanding of the TCA cycle *in vitro* and *in vivo*.

Discovery of organism-wide anatomically-based chemical pathways, cycles and schemes; and that the pigeon has vast range of chemical talents - the pigeon is *super-molecular*.

Grasping that the pigeon's verified capacities-to-perform are "chemical-but-not-merely-chemical".

Some progress with the verifiable significance of ";".

Some progress toward a heuristics for a pigeon being a "multiply;-layered" (physical;chemical;below-conscious;conscious) entity, and that understanding the pigeon is through a *fusion* of ";-layered" descriptions and explanatory correlations.

Reaching preliminary heuristics for the pigeon being a flexible integral dynamic unity, within and across ";-layers".

Further Issues:

My emphasis in this paper has been on our experience of, and understanding of, the pigeon, and attending to that experience and understanding. I have said nothing yet about metaphysics, metaphysical equivalence, central and conjugate potencies, forms and acts, primary relations, or secondary determinations. This is not because the need to address these issues is not emergent from the article, or not important, but these are further issues that depend on the kind of prior development invited in this article. Also, the article is long enough as it is[24]. However, even now, the results of this paper point us to progress that will be possiblein metaphysics.

Based on experimental results and self-attention, it is evident that there are in fact different kinds of conjugate form. For, in the pigeon, there are ";-layers" of "conjugate forms": physics; chemistry; below-conscious; conscious. But, while pigeons depend on the resources of their environments to survive, they function as relatively autonomous entities (intra-organism, and intra-environment). They are, in fact, said to be 'alive'! By contrast, the "algebras of elementary particles" of physics,

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[24] I will be working on these issues in subsequent papers. See *Insight*, Section 15.3.4, "The Significance of Metaphysical Equivalence". See, also, note 7 above.

along with the vast matrix-mesh of chemical entities, have what seems to be a relatively complete mutual dependence on other things, and are known only through "interactions" and "reactions" with other entities. So, in addition to the empirically verifiable result that there are different orders of conjugate form, there is also evidence for different kinds of central form: there are partially "self-regulated" *autonomic* central forms (biological and beyond); and the there are "mutually regulated" *synnomic* central forms (physical and chemical)[25]. (Note that, in this context, the word "*autonomic* form" is a metaphysical term referring to a type of central form – related to, but not equivalent to, the use of "Autonomic" in "Autonomic Nervous System", which is part of the anatomy of many multi-cellular organisms.) Note also that one of the hallmarks of multi-cellular organisms is that they *develop*. So, we will also need graduated ranges of detailed empirical studies that will provide data of sense and consciousness, needed for foundational developmentin the metaphysics of *development*. As densely pointed to in Chapter 15 of *Insight*, among other things to be included in an explanatory heuristics within emergent probability, there are "stages of growth", "developmental/genetic sequences", "integrator and development operators", "genera and species of organism", as well as the possibility of intra-organism, intra-species and inter-species explanatory comparisons.

13. A communiqué for functional doctrines

Here I give two heuristic partial pointings emergent from this article. They will, I think, be useful in future functional doctrinal reflection and analysis. Note that the second statement is about understanding ourselves, and points to the future possibility and need of explanatory results in philosophy, metaphysics and theology.

- *Explaining any biological entity requires that we include the lower levels of organism-wide anatomically based physics and chemistry.*

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[25] For some background on this terminology, see Philip McShane, Field Nocturnes 11, Horse Sense, [http://www.philipmcshane.ca/Field%20Nocturne-11.pdf].

This is not a reduction, as though the biological entity were "merely physical" or "merely chemical". It is, instead, because the biological entity is "not merely physical" and "not merely chemical". As we find through self-attention, without that lower level understanding, there is nothing to correlate within a higher order understanding needed to explain the flexible ;-integral dynamic unity of anatomical organism-wide capacities-to-performthat are "not merely physical", and "not merely chemical".

- *Understanding the "not merely biological" human entity similarly requires inclusion of organism-wide anatomically-based human-physics; human-chemistry; human-neurochemistry; human-psychology.*

Again, this is not reduction. Without the lower level anatomically based explanations, we will have nothing to correlate ina higher order understanding needed to *explain* the flexible ;-integral dynamic unity of "not merely biological" organism-wide capacities-to-perform such as: genera and species of 'dynamics of knowing' and 'dynamics of doing'; 'grasping unity-identity-whole'; 'naming'; 'description'; 'explanation'; 'correlation'; 'foundations'; 'displacement'; 'conversion'; 'human person'; 'collaboration'; 'functional collaboration'.

14. "which is (your) body, the fullness of (you) who fill(s) all in all".[26]

Within the community we have only begun talking about collaboration that could be *functional*, so for the time being, *our* foundational efforts and progress can only be fledgling. For the community quasi-organism, *Functional Foundational Explanatory Tower Flights* are for the distant future. In the meantime, though, if we even now look to normal intra-organism and normal intra-environment chemical schemes of recurrence, we find a non-imaginable but verifiable chemical connectivity of all things in the universe. In fact, a universe-wide chemical connectivityis intimately verifiable within our own consciousness. For, we too are part of the universe; and we too are chemical. Any time we inspect, describe and understand anything about anything, our organism-wide chemistry and brain-centered-neuroscience are functional in our "not merely

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[26] Adapted from Ephesians 1:23.

chemical" human capacities to inspect, describe and understand. Within a developing 'basic position' and *poise*-ition, we can begin to find that science already is revealing that "intra-organism" and "intra-environment" begin to subtly merge, as we increasingly chemo-neuro-span the whole universe. I suggest, therefore, that weincreasingly turn our efforts toward strategic self-luminous scientific understandings, as crucial and 'basic' components in our foundational development. In that way,we also can look forward to empirically verifiable and increasingly precise control of meaning for a doctrinal statement such as: "*When the baby laughs, the whole universe laughs*." And of course "baby" can be any person X, and "laugh" can be "cry" or "dance" or "sing" or "embrace", or any other human capacity-to-perform Y (past, present or future).

Hermenéutica y estudio de los clásicos en Filosofía