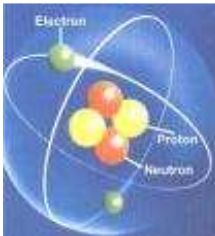


ACTIVITY AND PASSIVITY OF THE ELEMENTS AND THE WEYL ALGEBRA (Part I)

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1. Introduction: For many centuries there has been a common understanding from the side of thomists that *prime matter* or *próte hylé* is but a pure potential principle of natural beings, being complemented by his doublet, *substantial form*, in such a way as to provide the primary dual plex of natural beings, that is, the types of beings subjected to quantity and, of course, having their place in the space-time realm. We will not

be discussing here neither the inherent difficulties of such a concept (from this point on, *matter*), nor Aristotle's own commitment to its existence. As far as it concerns to us, Saint Thomas has adjudicated it as a real principle, created by God together with the infusion of extensionality and mutability since its very beginning. In effect, mutability and duration, the real fundamental principles that enables the sort of measurement according to a *before* and to an *afterwards*, issuing a quantity we call *time*, were altogether within the various parts of matter, simultaneously with its creation¹. The main point to be discussed here shall be the ontological status of matter, in such a manner that it will allow us to propose and algebraic representation of its metaphysical structure. The discussion will not be extensive as long as it has been carried out elsewhere², but it aims at providing the metaphysical elements that shall be used by the algebraic approach to matter.

2. Analysis: From the start, we shall make use of the analysis that was proposed by Friedrich Solmsen³, that takes Aristotle's use of the concepts of "acting" (activity) and "suffering" (passivity) in order that he (Aristotle) would be able to select the qualities whose suitable combination constituted the nature of the sublunary elements (fire, air, water and earth). In effect,

¹ For a detailed discussion of this subject matter, see FAITANIN, P. *Ontología de la materia en Tomás de Aquino*, Pamplona: Cuadernos de Anuario Filosófico/Universidad de Navarra, n. 135, 2001; and also PETRONIO, R. *Philosophy of Nature and Science: a new approach and complementarity*, DSc thesis, Rio de Janeiro: PUC-Rio, 2008; available at http://www2.dbd.puc-rio.br/pergamum/biblioteca/php/mostrateses.php?open=1&arqtese=0511075_08_Indice.html.

² See previous footnote.

³ SOLMSEN, F. *Aristotle's System of the Physical World*, Ithaca: Cornell University Press, 1960, p. 336-367.

according to Solmsen, Aristotle was convinced that, in order to give account of the coming to be and passing away of natural beings, it demanded that the ultimate substratum (protomatter) could be actuated by the contrary qualities (hot-cold and moist-dry) that inform it and mold it into the elements⁴. For this sake, Aristotle chooses one pair of qualities, hot and cold, as *active*, and other, moist and dry, as *passive*. These acting and suffering of the qualities within the substratum cause the mutual transformation of the elements, so that they are constitutive factors of these latter⁵. Furthermore, Aristotle “bears in mind the two fundamental processes, intermutation and mixture, for which the constituents [qualities] must be able to account”.⁶ But these operations, intermutation and mixture of the elements, have also been supported by Saint Thomas in his opuscle, *De Mixtione Elementorum*, according to which he affirms that “we should consider that the active and passive qualities of the elements are contrary to each other and susceptible of plus and minus”.⁷ Furthermore, “the substantial forms are not given from the outside, but they are extracted from the potency of matter by means of a proper transmutation”⁸.

Based upon several texts on Saint Thomas about the elemental combination and intermutation, we can add some relevant points: firstly, that the qualities reside into the essence of matter; secondly, that there are operations among the elements through their mixing (combining) and intermutation (self-transformation), resulting from the active and passive mixing of qualities within matter. Let us then present an algebraic model that help us to understand what may be going on within the essence of protomatter, from an epistemological point of view.

Let us name q_h the hot quality, q_c the cold quality, q_y the dry quality and q_m the moist quality. The pair $\{q_h, q_c\}$ is active, and the pair $\{q_y, q_m\}$ passive, according to Aristotle’s own proposal. Well, let us suppose we can associate a number to some quality that entitles us to say that it (the specified quality) varies according to plus and minus, as claimed by Saint Thomas. So, let us represent such intensity by q_a , where q is the symbol to represent any quality

⁴ SOLMSEN, F. op. cit., p. 350.

⁵ Ibid., p. 351.

⁶ Ibid., p. 365.

⁷ THOMAS AQUINAS, S. *De Mixtione Elementorum*, n. 21 apud *Aquinas on Matter and Form and the Elements*. Translation Joseph Bobik. Notre Dame: University of Notre Dame Press, 1998.

⁸ THOMAS AQUINAS, S. *Sobre la naturaleza de la materia*. Introduction and translation by Dr. Paulo Faitanin, Pamplona: Cuadernos de Anuário Filosófico/ Universidad de Navarra, 2000, n. 115, p. 68-69.

and q_a is the kind of quality (passive, for instance) to which a certain intensity a is associated. We can also suppose that some amount of intensity can enable the passage from one edge to the other; if, for instance, a is positive, then we get dry, and if a is negative, we get moist. In effect, the pair dry-moist might then be represented by one single element q_a in so far as the range on which a varies enables a full definition of the quality and its intensity. The same applies to the pair hot-cold, which might be represented by the single element q^b . The reason why the intensity b is represented by an upper index is that it represents activity, as the lower index in the previous element represents passivity. Well, if one considers a generic quality where one has activity and passivity altogether in one element, then we may represent this general fact by q_a^b . In so far as one allows the existence of upper and lower indexes to represent the simultaneous existence of activity and passivity in one element, then the fundamental pure active quality might be expressed by q_0^1 , as well as the fundamental pure passive quality might be expressed by q_1^0 .

What then have we achieved so far? A kind of representation for the fundamental active-passive character of matter, expressed by the basic qualities residing within the substratum. The fundamental pair of constitutive components $\{q_1^0, q_0^1\}$ shall work as a kind of “basis” from which the other primitive components can be spanned by appropriate operations, once they have been defined accordingly. The primitive components of the basis are called *primitive idempotents*. In the next section of this series of communications we will develop a quite simple but effective model of the substratum, and we will show that this substratum is not an absolute pure potentiality, but it is “pregnant” with the fundamental elements that allow us to properly call it the *ens in potentia*.