

## SYMPOSIUM: THE PRINCIPLE OF INDIVIDUATION

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### I.—By JAN LUKASIEWICZ

THE problem of the principle of individuation is a metaphysical one and is hardly intelligible without the background of the Aristotelian metaphysics. It is well known that the followers of the so called "Vienna Circle" reject metaphysical problems as senseless. The Warsaw School of Logic of which I was one of the members was from the beginning in touch with the Vienna Circle because of our common interest in mathematical logic, but we never shared in Warsaw the philosophical opinions of our Viennese colleagues.<sup>1</sup> In an article on "Logistic and Philosophy" published in 1936 in the *Polish Philosophical Review* I set forth my own opinion about metaphysics stating among others that not all metaphysical problems are senseless, but all require a careful revision on the basis of modern formal logic.<sup>2</sup> From this point of view I shall try to comment on the problem of the principle of individuation.

1. *Formulation of the problem.*—The problem of the principle of individuation was raised by Aristotle whose authority in metaphysics is until today prevailing. Aristotle indeed was a great logician, and his masterly theory of the assertoric syllogism will remain for ever.<sup>3</sup> But he did not see that the fundamental logical system is not the logic of terms of which his syllogistic is only a part, but the logic of

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<sup>1</sup> See K. Ajdukiewicz, *Der logistische Antiirrationalismus in Polen*, Erkenntnis Vol. 5, 1935, pp. 151–161.

<sup>2</sup> See J. Lukasiewicz, *Logistyka a filozofia*, Przegl. Filoz. Vol. 39, 1936, pp. 115–131.

<sup>3</sup> See J. Lukasiewicz, *Aristotle's Syllogistic from the Standpoint of Modern Formal Logic*, Oxford, Clarendon Press, 1951.

propositions created after him by the Stoics; he did not systematically include in his syllogistic singular propositions which are for his metaphysics of vital importance, and his errors and inconsistencies in modal logic, with which the metaphysically so weighty terms of necessity and possibility are connected, can scarcely be justified. If a great philosopher, like Aristotle or Kant, makes a mistake or produces obscure reasons, we are inclined not to blame him, but to look for an interpretation that could explain and save his thought. Hence the big commentaries to the works of all great philosophers. It is far better, in my opinion, to go straightforward and call mistakes and obscurities by their proper names.

I am not able to give a precise formulation of our problem in terms of the Aristotelian metaphysics because of the obscurity of his metaphysical terminology. As I understand it, the problem of the principle of individuation seems to be this:

Any individual (τόδε τι), for instance Socrates, is a whole (σύνολον) consisting of two components: matter (ὕλη) and form (εἶδος). Which of these components, matter or form, is the source of individuality?

Aristotle gives different answers to this question in different parts of his *Metaphysics*.<sup>4</sup> His answers are not always clear; the clearest passage runs thus: "The whole thing, such and such a form in this flesh and these bones, is Callias or Socrates; and they are different owing to their matter (for this is different), but the same in form (for the form is indivisible)."<sup>5</sup>

If we take "matter" as "material" or "stuff", and "form" as "shape", all seems to be clear, as if there were no problem at all. With this interpretation the difference

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<sup>4</sup> See Aristotle's *Metaphysics*, A Revised Text with Introduction and Commentary by W. D. Ross, Oxford, Clarendon Press, 1924, Vol. 1, pp. CXV—CXIX.

<sup>5</sup> Met. Z 8, 1034<sup>a</sup> 5 : τὸ δ'ἄπαν ἤδη, τὸ τοιόνδε εἶδος ἐν ταῖσδε ταῖς σαρκί καὶ ὀστοῖς, Καλλίας καὶ Σωκράτης· καὶ ἕτερον μὲν διὰ τὴν ὕλην (ἕτερα γάρ), ταῦτό δὲ τῷ εἶδει (ἄτομον γὰρ τὸ εἶδος). The translation is due to Sir David Ross, l.c. Vol. 1, p. CXVI, except that εἶδος is everywhere rendered by "form".

between matter and form is plain. We can make things of the same material having different shape, e.g., a statue (ἀνδριάς) or a ball (σφαῖρα), and things of different material having the same shape, e.g., a statue of stone (λίθινος) or of bronze (χαλκός). It seems to be evident that all these things are individuals owing to their matter, as every bit of matter has at any time its own proper place and is different from all the other material things in the world. But the Aristotelian "matter" and "form" are metaphysical terms, and have a metaphysical meaning which is very difficult to grasp. Let us begin with "matter".

2. *The Aristotelian matter.*—We read in *Metaphysics* the following definition of matter: "By matter I mean that which in itself is neither a thing, nor of any quantity, nor has any other predicate by which being is determined." This is repeated a few lines further: "The ultimate matter in itself is neither a thing, nor a *quantum*, nor anything else, nor the negations (of these), as the negations belong to it accidentally."<sup>6</sup>

As far as I understand this, no proposition with "matter" as subject can truly be asserted according to Aristotle. It is not true that "matter is a stone" (a thing), or that "matter is extended" (quantity), or that "matter is white" (quality) and so on. Not even the negations: "matter is not a stone", or "matter is not white" can truly be asserted of matter "in itself". I gather from this that the Aristotelian matter has no predicates at all. That this is not only my own impression, clearly results from the following statement of Sir David Ross who says commenting on the passage denying negations of matter: "This is difficult; one would suppose that it was just the essence of matter, as Aristotle conceives it, to be not τί, not ποσόν, &c. But he seems here to feel that to say even this of it is to assign it a character, while its character is to have no character."<sup>7</sup>

<sup>6</sup> Met. Z 3, 1029<sup>a</sup> 20 : λέγω δ' ὕλην ἢ καθ' αὐτὴν μήτε τι μήτε ποσόν μήτε ἄλλο μηδὲν λέγεται οἷς ὄρισται τὸ ὄν . . . 24 : τὸ ἔσχατον καθ' αὐτὸ οὔτε τι οὔτε ποσόν οὔτε ἄλλο οὐδὲν ἔστιν· οὐδὲ δὴ αἱ ἀποφάσεις, καὶ γὰρ αὐταὶ ὑπάρξουσιν κατὰ συμβεβηκός.

<sup>7</sup> l.c. Vol. 2, p. 165.

The somewhat obscure expression "in itself" (καθ' αὐτό; Aristotle assigns five meanings to it in his dictionary of philosophical terms)<sup>8</sup> reminds me of the famous Kantian "an sich", and I venture the opinion that the Aristotelian "matter in itself" is an ancestor of Kant's *Ding an sich*, and a relative of Heidegger's *Nichts*. According to Aristotle matter is unknowable in itself,<sup>9</sup> and so is also the *Ding an sich* according to Kant.

We shall see on the ground of a logical analysis that the Aristotelian idea of matter involves a contradiction. First, however, I should like to state that nothing can be explained by terms which have no predicates. Some Scholastic philosophers have tried to explain the so called "substantial change", i.e., the change of one substance into another as wine into vinegar or wood into ashes, by the Aristotelian idea of matter called by them "first matter".<sup>10</sup> Such a change implies according to them a substantial subject which changes, otherwise we should have annihilation and creation, not change. They argue further that, since this subject is to be common to two distinct substances, it must not of itself possess the character of either, and will therefore of itself be altogether undetermined and characterless. They suppose, however, that this characterless subject remains the same during the process of change, and this implies that it has at least the character of being and remaining identical with itself. Without this supposition which is inconsistent with the Aristotelian definition of matter, the explanation of substantial change would be impossible.

3. *The Aristotelian form.*—Let us turn to the second component of an individual, the form. The only passage of the *Metaphysics* which looks like a definition of this term reads: "I am calling 'form' the essence."<sup>11</sup> "Essence" is

<sup>8</sup> Met. Δ 18; cf. Ross l.c. Vol. 1, p. 333.

<sup>9</sup> Met. Z 10, 1036<sup>a</sup> 8 : ἡ δ' ὅλη ἀγνωστος καθ' αὐτήν.

<sup>10</sup> See R. P. Phillips, *Modern Thomistic Philosophy*, London 1934, Vol. 1, p. 42.—"First" means here the same as the Aristotelian "ultimate" (ἄσχαρον, cf. note <sup>8</sup>).

<sup>11</sup> Met. Z 10, 1035<sup>b</sup> 32: εἶδος δὲ λέγω τὸ τί ἦν εἶναι.

not a literal translation of the Greek τὸ τί ἦν εἶναι, its more exact meaning is given by Sir David Ross thus: "The answer to the question what was it to be so-and-so."<sup>12</sup> I must confess that I do not clearly understand the Greek original, or the English translation either. A hint how "essence" should be understood may be found in the following Aristotelian sentence: "only those things have an essence whose account (λόγος) is a definition (ὄρισμός)."<sup>13</sup> Form therefore has a connexion with definition.

This connexion goes back to Socrates. Aristotle says that "there are two things which we may fairly ascribe to Socrates, his inductive arguments and his universal definitions. These universals, however, Socrates did not make separately existent (χωριστά), nor his definitions. They (the Platonists) separated them and called such beings ideas."<sup>14</sup> This short but admirably clear account throws a light on the meaning of "form" (εἶδος, ἰδέα). Socrates was the first to inquire into ethical virtues<sup>15</sup> asking "What is piety" or "What is the just", and thought that by answering such questions he would be able to perceive the "essence" of those virtues. What he really did was to solve the problem "What is meant, in Greek of course, by the words 'piety' or 'the just'", and he tried to determine their meaning by inductive arguments in form of definitions. He seems to have regarded definitions of universal terms as a necessary condition in order to speak reasonably about things denoted by those terms.

His successor, Plato, was in his youth under the influence of the Heraclitean principle of the flux of sensible things, and realized that a science of such changeable objects is not

<sup>12</sup> See l.c. Vol. I, p. 127.

<sup>13</sup> Met. Z 4, 1030<sup>a</sup> 6: τὸ τί ἦν εἶναι ἔστιν ὅσων ὁ λόγος ἐστὶν ὄρισμός.

<sup>14</sup> Met. M 4, 1078<sup>b</sup> 27: δύο γὰρ ἐστὶν ἃ τις ἀποδοίη Σωκράτει δικαίως, τοὺς τ' ἐπακτικούς λόγους καὶ τὸ ὀρίζεσθαι καθόλου . . . ἀλλ' ὁ μὲν Σωκράτης τὰ καθόλου οὐ χωριστὰ ἐποίησε οὐδὲ τοὺς ὄρισμούς· οἱ δ' ἐχώρισαν, καὶ τὰ τοιαῦτα τῶν ὄντων ἰδέας προσηγόρευσαν.

<sup>15</sup> *ibid.* b17: Σωκράτους δὲ περὶ τὰς ἠθικὰς ἀρετὰς πραγματευομένου καὶ περὶ τούτων ὀρίζεσθαι καθόλου ζητοῦντος πρώτου . . .

possible. The universals defined by the Socratic method represented permanent objects which could give a solid basis for scientific research. He applied this method not only to ethical terms, but also to other universals, like "man". The origin of his doctrine of ideas, as I see it, seems to be this: A universal term, like "man", must somewhere have an objective correlative, as the singular term "Socrates" has an objective correlative in a living individual. But man, as a universal, does not exist in the real world; therefore there must be another world, a world of ideas, where the universal man is to be found. This was, of course, pure mythology (φιλόμυθος ὁ φιλόσοφος), and was rightly rejected by Aristotle who transferred the Platonic ideas as forms into the material world. If this explanation is right, form of an individual thing would be the objective correlative of a universal, and may be called according to a striking expression of Sir David Ross "the inner nature of a thing", which makes the thing what it is, and is unfolded in definition.<sup>16</sup>

4. *Critical remarks on Aristotle's ideas of definition and form.*—The Socratic method opened a royal road to the analytical knowledge *a priori*. Applied to the term "man" which was defined as a "two-footed animal" (ζῷον δίπουν) it became the source of such truths as "Every man is an animal". This is true not because it is the essence of man to be an animal, but because we understand by the term "man" an animal. All definitions are nominal and can give only analytical truths. In order to know what is the essence of man, we cannot rely on the meaning of words, but we must investigate the human individuals themselves, their anatomy, histology, physiology, psychology, and so on, and this is an endless task. It is not a paradox to say even today that man is an unknown being.

Nevertheless, the discovery of analytical propositions was of great philosophical importance, and was soon exaggerated as every big discovery. Aristotle says in his *Posterior Analytics*

<sup>16</sup> l.c. Vol. I, p. XCIV.

that the principles of demonstrative arguments are definitions.<sup>17</sup> This is certainly false. No science starts with definitions. Inductive sciences start with facts, deductive with primitive propositions accepted without proof, the so called "axioms", and with primitive undefined terms whose sense is determined by the axioms in which they occur. Aristotle saw the *regressus in infinitum* in the first case, but not in the second.

The modern view of definition is widely different from the Aristotelian conception of definition by genus and differentia which took its origin from the Platonic definition by division (διαίρεσις). We understand by a definition an equivalence, and consequently the two parts of a definition, the *definiendum* and the *definiens*, are not names, but propositional expressions. A sentence with a subject and predicate, e.g., "man is a two-footed animal", is not accepted as definition; we would say instead: "*a* is a man" means the same as, or is equivalent to "*a* is a two-footed animal". The *definiendum* contains the newly introduced term, the *definiens* should consist of primitive constants or of terms already defined by them, and any real variable occurring in the *definiendum* should occur in the *definiens* and vice-versa. Definitions which satisfy the above three conditions may be called "well-formed".

It is not necessary that a well-formed definition should refer to genus and differentia. The definition of the relation "less than" in the theory of natural numbers 1, 2, 3, . . . *in inf.* reads: "*a* is less than *b*" means the same as "for some *c*, *c* plus *a* equals *b*". This is a well-formed definition, if "plus" and "equals" are primitive terms, but does not proceed by genus and differentia. It only means that instead of the complex expression "for some *c*, *c* plus *a* equals *b*" we may everywhere use the simpler "*a* is less than *b*". Most modern logicians are treating definitions as mere abbreviations, and maintain the opinion that

<sup>17</sup> An. post. B 3, 90<sup>b</sup> 24 : αι αρχαι των αποδειξεων ορισμοι.

definitions are theoretically unnecessary.<sup>18</sup> From this point of view no definition can explain the "inner nature" of a thing.

I should like to add that there are many passages of the *Metaphysics* connected with our subject which are lacking in precision or are inconsistent with each other. Let us give two examples. Aristotle seems not to see the difference between the definition which is always a λόγος, i.e., a series of words, and its objective correlative, the form. So he says for instance: "Man and horse, and what is thus universally predicated of individuals, is not substance, but a compound (σύνολον) of this definition (λόγος) and this matter (ὕλη) taken universally."<sup>19</sup> An "intelligible matter" (ὕλη νοητή) is here introduced, and universals are said to consist of this matter and of definition as form. That this is not a *lapsus calami*, results from another passage where we read this somewhat ridiculous sentence: "Callias is the definition with matter."<sup>20</sup> A grave inconsistency arises, if we compare the following four sentences: Individuals consist of matter and form;<sup>21</sup> form is the essence;<sup>22</sup> only those things have an essence which are definable;<sup>23</sup> the individuals are undefinable.<sup>24</sup> If they are undefinable, they have no essence, and consequently no form, which is inconsistent with the statement that they consist of matter and form.

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<sup>18</sup> See A. N. Whitehead and B. Russell, *Principia Mathematica*, Cambridge 1910, Vol. 1, p. 12.

<sup>19</sup> Met. Z 10, 1035<sup>b</sup> 27 : ὁ δ' ἄνθρωπος καὶ ὁ ἵππος καὶ τὰ οὕτως ἐπὶ τῶν καθ' ἕκαστά, καθόλου δέ, οὐκ ἔστιν οὐσία ἀλλὰ σύνολον τι ἐκ τουδὶ τοῦ λόγου καὶ τησδὶ τῆς ὕλης ὡς καθόλου.

<sup>20</sup> Met. I 9, 1058<sup>b</sup> 10 : ὁ δὲ Καλλίας ἐστὶν ὁ λόγος μετὰ τῆς ὕλης.

<sup>21</sup> See note 5.

<sup>22</sup> See note 11.

<sup>23</sup> See note 13.

<sup>24</sup> Met. Z 10, 1036<sup>a</sup> 2 : τοῦ δὲ συνόλου ἤδη, οἷον κύκλου τουδὶ καὶ τῶν καθ' ἕκαστά τινος ἢ αἰσθητοῦ ἢ νοητοῦ — λέγω δὲ νοητοὺς μὲν οἷον τοὺς μαθηματικούς, αἰσθητοὺς δὲ οἷον τοὺς χαλκοῦς καὶ τοὺς ξυλίνοὺς — τούτων δὲ οὐκ ἔστιν ὄρισμός.



As far as I see, the Aristotelian idea of form does not imply a contradiction like his idea of matter, but owing to its vagueness does not explain anything.

5. *Lesniewski's Ontology*.— I think that the problem of the principle of individuation cannot be solved on the ground of the Aristotelian metaphysics, because on this ground it is not intelligible enough. It requires, like many other metaphysical problems, a more solid basis which may be only got by a reconstruction of the whole "first philosophy".

Is such a reconstruction possible? I think that it is, and that outstanding work has already been done in this matter. I am referring to a logical system created by my colleague Lesniewski and called by him "Ontology".<sup>25</sup> This system is little known in this country, because neither the author himself has ever given a full account of it, nor are the respective papers easily accessible.<sup>26</sup> It is an extremely rich system and built up with the utmost care and precision, so that it deserves our highest attention. I shall give a short description of it.

First, a personal reminiscence. It was in 1921. I was dissatisfied with the inexact description of the copula "is" given by Peano, and with the vague symbol  $\epsilon$  of the theory of sets. In the course of a logical discussion I asked Lesniewski what he meant by the expression " $a$  is  $b$ ". He replied that he was using it in the sense of everyday life. I was still dissatisfied, for I thought that the copula "is"

<sup>25</sup> Stanislaw Lesniewski, born 1886, was from 1919 till his death in May 1939 professor of philosophy of mathematics at the University of Warsaw.

<sup>26</sup> A general description of Ontology is to be found in S. Lesniewski, *Ueber die Grundlagen der Ontologie*, Comptes Rendus de séances de la Société des Sciences et des Lettres de Varsovie, Vol. 23, 1930, Cl. III. — See also: Z. Jordan, *The Development of Mathematical Logic and of Logical Positivism in Poland between the two Wars*, Polish Science and Learning, No. 6, Oxford 1945. B. Sobocinski, *L'Analyse de l'antinomie Russellienne par Lesniewski*, Methodos Vol. 1-2, Milano 1949-50. K. Ajdukiewicz, *On the Notion of Existence*, Studia Philosophica, Vol. IV, Posnaniae 1951.

should either be defined, or described by axioms, if taken as primitive term. Some time later Lesniewski told me that he had found the required axioms sitting on a bench in the Warsaw Saxon Park.

The only new primitive term occurring in Lesniewski's Ontology is the copula "is" ( $\epsilon\sigma\tau\acute{\iota}\nu$ ). The other constants belong either to the propositional calculus, as "if-then", "not", "and", or to the theory of quantifiers, as "for all" and "for some". The letters  $a, b, c, \dots$ , are terminal variables having as values names of any kind, singular, universal and empty. The system was originally based on a single axiom stated in form of an equivalence and consisting of the following four expressions:

- (1)  $a$  is  $b$ .
- (2) For all  $c$ , if  $c$  is  $a$ , then  $c$  is  $b$ .
- (3) For some  $c$ ,  $c$  is  $a$ .
- (4) For all  $c$  and  $d$ , if  $c$  is  $a$  and  $d$  is  $a$ , then  $c$  is  $d$ .

The axiom has the scheme:

- (A) (1)—if and only if—(2) and (3) and (4).

That means: " $(a$  is  $b$ )—if and only if—(for all  $c$ , if  $c$  is  $a$ , then  $c$  is  $b$ ) and (for some  $c$ ,  $c$  is  $a$ ) and (for all  $c$  and  $d$ , if  $c$  is  $a$  and  $d$  is  $a$ , then  $c$  is  $d$ )."

Example: "(Socrates is a man)—if and only if—(for all  $c$ , if  $c$  is Socrates,  $c$  is a man), and (for some  $c$ ,  $c$  is Socrates), and (for all  $c$  and  $d$ , if  $c$  is Socrates and  $d$  is Socrates, then  $c$  is  $d$ )."

The rules of inference comprise, besides the usual rules of substitution and detachment, carefully elaborated rules of definitions, in particular of the so called "ontological definitions" which I am calling "quasi-definitions", as they include some properties of the primitive term not deducible from the axiom.

6. *Ontological implications of Lesniewski's Ontology.*—  
Ontology, or the theory of being (τὸ ὄν), is a part of metaphysics, and ontological ideas are of great metaphysical importance. Let us explain some ideas of this kind on the ground of Lesniewski's Ontology.

It results from the axiom (A) that a sentence of the form " *a* is *b* " can truly be asserted only when *a* is a singular term. Sentences with a universal term as subject, like " man is mortal " or " man is man ", are false, because they imply the false consequence: " If *c* (Socrates) is a man and *d* (Callias) is a man, then *c* is *d* (Socrates is Callias)." The would-be truths : " *a* is *a* ", without a specified *a*, or " being is being ", are no truths at all. We may only say : " All *a* is *a* " and " All being is being ", as the Aristotelian premiss " All *a* is *b* " is definable by " *a* is *b* ", and his whole Syllogistic is a subpart of Lesniewski's Ontology.

From the axiom (A) we can get the thesis: " If *a* is *b* and *b* is *c*, then *a* is *b* and *b* is *a*." Now, " *a* is *b* and *b* is *a* " means clearly the same as " *a* is identical with *b* ". If therefore the premisses " *a* is *b* " and " *b* is *c* " are true, both *a* and *b* must be singular terms, and we see that a singular term can be predicate in a true proposition only if it is identical with its subject. Singular terms are thus the ultimate subjects of everything, and we get a clear idea of the Aristotelian *substratum* (ὑποκείμενον).<sup>27</sup>

Two other important ideas can be defined in Lesniewski's Ontology by the copula " is ": " existence " and " being ". " *a* exists (ἔστιν) " means according to him: " For some *c*, *c* is *a* ". Black swans exist, if some individual is a black swan. " *a* is a being (*ens*, ὄν) " means: " For some *c*, *a* is *c* ". Atlantis is an *ens*, if something can be truly predicated of it.<sup>28</sup> *Non entis nulla attributa*. As it can be proved in the

<sup>27</sup> Met. Z 3, 1028<sup>b</sup> 36 : τὸ δ' ὑποκείμενον ἐστὶ καθ' οὗ τὰ ἄλλα λέγεται, ἐκεῖνο δὲ αὐτὸ μηκέτι κατ' ἄλλου.

<sup>28</sup> Both examples I owe to Ajdukiewicz, see his paper quoted in note <sup>28</sup>.

system that the expressions "For some  $c$ ,  $a$  is  $c$ " and " $a$  is  $a$ " are equivalent, " $a$  is a being" may be also defined by " $a$  is  $a$ ".

We can now show that the Aristotelian idea of matter involves a contradiction. The Aristotelian matter has no predicates at all, it is a *non ens*. It can be defined thus:

(B)  $a$  is matter—if and only if— $a$  is  $a$  and for all  $b$ ,  $a$  is not  $b$ .

From the *definiens* on the right there follows almost immediately the contradiction: " $a$  is  $a$  and  $a$  is not  $a$ ". The definition (B) is an "ontological" definition of the type " $a$  is  $X$ ", where " $X$ " is the newly introduced term, and according to Lesniewski all correct definitions of this type must contain in the *definiens* the factor " $a$  is  $a$ ", i.e., " $a$  is a being". If we omit this factor, we get a contradiction in the system itself. Russell's definition of the class  $w$  of all those classes which are not members of themselves: " $x$  is a  $w$ —if and only if— $x$  is not an  $x$ ", is incorrect, and leads consequently to an antinomy.<sup>29</sup>

## I

7. *Hints at the solution of the problem of individuation.*—Terms singular, universal and empty of Lesniewski's Ontology are all of the same semantical category. The copula "is", like the propositional constants "if-then" or "and", belong to a different semantical category, called "functors". These two categories have much in common with the Aristotelian matter and form.

Discussing metaphysical problems Aristotle does not only consider real individuals, as Socrates or Callias, but also intelligible things like numbers. According to him numbers also consist of matter and form. Matter of the number 2 are the two units, but what he says to be its form is for me unintelligible.<sup>30</sup> He does not see that the form of the

<sup>29</sup> See *Principia Mathematica*, l.c. p. 63, and Sobocinski l.c. *Methodos* Vol.2, p. 248.

<sup>30</sup> Met. M 8, 1084<sup>b</sup> 5: ἐκάστη γὰρ τῶν μονάδων μέρος τοῦ ἀριθμοῦ ὡς ὕλη, ὁ (Scil. ὁ ἀριθμὸς) δ' ὡς εἶδος.

number 2 is represented by the functor "plus". The number 2 which is equal to  $1 + 1$ , is a whole which consists of the two units as matter and addition as form. Another abstract example is the Aristotelian syllogism. Aristotle does not use the word  $\delta\lambda\eta$  in his *Analytics*, but his commentator Alexander calls by this word the terms of the syllogism, i.e., the subjects and the predicates of the premisses and the conclusion, being perfectly aware that besides the terms there must be taken into account their disposition and form ( $\sigma\chi\eta\mu\alpha$ ).<sup>81</sup> The mood *Barbara*, for instance: "If all  $a$  is  $b$  and all  $b$  is  $c$ , then all  $a$  is  $c$ ", is a whole which consists of the terms  $a$ ,  $b$  and  $c$  as matter, and of the functors "all-is" "if-then" and "and" suitably disposed as form.

Let us apply these ideas to a real individual. Socrates, like any other individual, is a whole, i.e., a unity which is also numerically one ( $\acute{\epsilon}\nu$ ) being different from all the other things in the world. We cannot say that matter is the principle of his individuality; this would only account for his numerical oneness, but does not explain his unity from his birth till his death. The matter of Socrates, his flesh and his bones, are changeable, and drinking the hemlock he was not materially the same when born by Phenarete. But he always was the same Socrates, son of Sophroniscus and Phenarete. The principle of his unity and oneness cannot be a materialistic one.

The unity of any composite thing requires, in my opinion, a non-materialistic principle, a form or a functor. The number 2 is a unity not because of its matter, but of its form. The number-forming functor "plus" is the source of its unity. The syllogistic mood *Barbara* is a unity not because of its matter, the terms  $a$ ,  $b$  and  $c$ , but because of the principal functor "if-then" which being a proposition-forming functor gives together with the other functors to this mood its unity in form of an implication. The human body consists of an innumerable quantity of small material

<sup>81</sup> See my book on Aristotle's Syllogistic, p. 8, note 2.

particles, whether of atoms, electrons or something else, this must be left to the physicists, but man is a unity and it is impossible to explain his unity by material things. Any individual man has an inner structure, like any number or syllogistic mood, and this structure is built up by means of relations denoted by functors. Among these relations there must be a principal one which accounts for the unity and oneness of an individual man and remains the same throughout his whole life.

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## II.—By MISS G. E. M. ANSCOMBE.

(1) I wish to express grateful admiration for the extreme clarity with which Professor Lukasiewicz has written.

He follows Aristotle in first taking :—

matter = material or stuff (e.g. bronze)

form = shape,

but his example of the same shape in different matter is a statue of bronze and a statue of stone. For Aristotle two bronze statues would also, and in just the same sense, be the same shape in different matter, and Professor Lukasiewicz's example is misleading because it naturally suggests that in calling bronze matter Aristotle is saying : "At this stage think of 'matter' as if it meant 'kind of stuff'". Aristotle says "This . . . individual, Callias or Socrates, is like *this* bronze ball, while 'man' and 'animal' are like 'bronze ball' in general",<sup>1</sup> and soon after comes the passage that Professor Lukasiewicz quotes : "The whole thing, such-and-such a form in this flesh and these bones, is Callias or Socrates ; and they are different owing to their matter (for this is different), but the same in form (for the form is indivisible)." These passages shew that two bronze balls would be a suitable example of the same shape in different material. Of course, both the concept of 'material' suggested by Professor Lukasiewicz's example, and the concept that Aristotle is here concerned with, are familiar ones ; both occur in Aristotle.

(2) *The absurdity of the idea of matter.*—The hypothesis that things contain something which isn't anything and has no properties is certainly a senseless one, which, as Professor Lukasiewicz says, could not serve to explain anything. A book on logic by a philosopher Joseph, who used to be well-known, expounds an argument that there must be an

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<sup>1</sup> Met. Z. 1033b24 : τὸ δὲ ἅπαν τὸδε Καλλίας ἢ Σωκράτης ἐστὶν ὡσπερ ἡ σφαῖρα ἡ χαλκῆ ἢ δὲ, ὁ δ' ἄνθρωπος καὶ τὸ ζῶον ὡσπερ σφαῖρα χαλκῆ ὄλως.

ultimate subject of predication which itself has no predicates. This parallels the Neo-Scholastics! The idea that what changes must be something that doesn't change precisely because it is what changes, is very like the idea that what has predicates must be something without predicates just because it is what has the predicates: both being based on inadequate reading of Aristotle.

(3) I am always uncertain what it means to call a concept "metaphysical". But the concept of matter which Aristotle works on is at least an everyday one. If you shew me a lump of stuff and tell me that it can be moulded into various shapes, that if you heat it it will turn into a gas, and if you electrify it it will turn into something else, I understand very well what you mean. Let me suppose that you shew me a bottle of wine; you heat it, and it expands; you leave it, and after a while it has turned into vinegar. Now someone asks "But what is it *all* the time?" Some Greek philosophers would have wanted to say it was water or air or fire or something in between. "(They think that) there *must* be some nature, whether one or more than one, out of which the rest come to be while it remains constant."<sup>2</sup> Aristotle however wants to say: "There isn't anything which it is all the time. It *was* wine, and *is* vinegar, and there isn't some third thing that it is all the time." He says in the *Physics*, in the course of arguing against such philosophers: "Water and air aren't, and don't come, out of one another in the same way as bricks out of a house and a house out of bricks."<sup>3</sup> (One gets the point of this only by assuming with him that water and air (mist?) do in fact turn into one another.)

(It may be that we have a theory of chemical elements, so that if—to make the case simple—we identify something as a pure sample of an element, we go on saying that it is

<sup>2</sup> Met. A. 983 b 19: δεῖ γὰρ εἶναι τινα φύσιν ἢ μίαν ἢ πλείους μιᾶς, ἐξ ᾧ γίνεται τὰλλα σωζομένης ἐκείνης.

<sup>3</sup> Phys. I iv. 188 a 15: οὐχ ὁ αὐτὸς τρόπος ὡς πλίνθι ἐξ οἰκίας καὶ οἰκία ἐκ πλίνθων, οὕτω δὲ καὶ ὕδωρ καὶ ἀήρ ἐξ ἀλλήλων καὶ εἶσι καὶ γίνονται.



that element whatever happens to it. But any such theory—whatever its validity—is beside the point in our discussion, for it is necessarily based on the possibility of identifying the same bit of matter in our initial experiments : on our having the idea of ‘nothing added and nothing taken away’.)

(4) We can see now why this matter (e.g. the stuff I have got in this bottle) is not as such a given kind of stuff ( $\tau\iota$ ) : for the same stuff was wine and is vinegar. Nor can we say that it is as such *not* a certain kind of stuff—for that would mean that it could not be e.g. wine, and of course, when it is wine, it *is* wine. Similarly there are not any properties, either qualities or dimensions, which you can say it has—or lacks—*qua* this bit of matter. E.g. if you told me that the process of change from wine to vinegar involved expansion or contraction, I should understand you. Just as I understand the information I have about the expansion and contraction of water at different temperatures. So that not even the volume determines the bit of water we are talking about. This is what I understand Aristotle to be referring to when he says that matter is not as such ( $\kappa\alpha\theta' \alpha\upsilon\tau\eta\nu$ ) *so* much ( $\pi\omicron\sigma\sigma\acute{o}\nu$ <sup>4</sup>). Not that matter is : not even extended !—but that I cannot define the stuff (the bit of water, e.g., that I am talking about) as e.g. “a pint hereabouts”. It will perhaps be more than a pint if I cool it or less if I heat it. And the point about negation is clear here too : I cannot say that this stuff is as such *not* a pint ; for perhaps it is a pint, or I can make it a pint without addition or subtraction of matter.

That last word was being used in a completely familiar sense ; and it is what Aristotle means by “ $\epsilon\lambda\eta$ ”. (Only he tries to use it by analogy in all sorts of contexts, to extend its application away from where it is so to speak indigenous. I do not know or understand enough to have a general

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<sup>4</sup> To be precise : not characterised by a particular answer to the question “How much ?”

opinion whether the concept, in these extended applications, is so useful an instrument as Aristotle clearly thought it was. Certainly I feel only impatient when he considers calling units the matter of numbers. Nor, for instance, can I make anything of such an idea as 'place-matter'.)

I have approached Aristotle's idea of matter by way of 'this matter'. He himself approaches it, in the first book of the *Physics*, in the context of discussions which are not alive for us and of most of which it would not be possible to give more than an external account. 'This matter' is, however, Aristotelian.—Aristotle says that matter cannot very well be substance (οὐσία), because what specially belongs to substance is being separate and being a 'this something' (τόδε τι)<sup>5</sup>: e.g. 'this man', 'this cabbage'. Now 'this matter' is τόδε, but not τι: that is, it is designatable, identifiable, but is not as such of any specific kind or necessarily possessed of this or that property or dimensions, as I have explained. And it is of course not separable: that is, you could not entertain producing a specimen of it, which contrived to be of no kind (to be not τι). It is important to understand that this is a *conceptual* statement. That is, if I tell you that the stuff in this apparatus has changed from being water to being hydrogen and oxygen, you show that you are quite at sea about the sense I am using the word "stuff" in, if you ask me to show you the stuff itself as it really is itself, apart from being the various things it can be.

(5) I feel doubtful about Professor Lukasiewicz's comments on "matter in itself". For "matter in itself" does not seem to be used as a name or description by Aristotle, as I gather that "Ding an sich" may have been by Kant. You have to take the whole sentence in which "ἕλη καθ' αὐτήν" occurs. Professor Lukasiewicz's comments strike me a little as if I were to say "A chair as such isn't upholstered or not upholstered", and were to be laughed at, not for the pedantic style, but for inventing such a strange object

<sup>5</sup> Met. α 1029 a 26–30.

as 'a chair as such', with such extraordinary properties, whereby it defeated the law of excluded middle.

(6) Thus I do not think it reasonable to take exception to such statements as that matter is in itself indefinite and unknowable : it "has to be understood in what changes."<sup>6</sup> The change in question is substantial change : "For the rest (of the predicates) are predicated of the substance, while *it* is predicated of the matter."<sup>7</sup> That is, we say that milk e.g. is white and liquid, and this stuff is milk. But this stuff may be changed from milk into junket ; nor apart from such changes should we have any such concept as 'this stuff', as *opposed to* 'this milk'. "In all changes between opposed characteristics the subject of change is something : e.g. with change of place it is what is now here now there, with change of size what is now so much, now bigger or smaller, with change of quality what is now healthy, now sickly. Similarly with substantial change it is what is now in process of generation, now in process of destruction, now the subject as a 'this something' and now the subject in the way of privation."<sup>8</sup>

The last phrase is obscure. In order to explain what I think Aristotle means by it, I will consider a passage in Professor Lukasiewicz's paper. "It seems to be evident that all these things (bronze statues, stone balls etc.) are individuals owing to their matter, as every bit of matter has at any time its own proper place and is different from all the other material things in the world." This leaves it open whether a given bit of matter, which at a given time has its own proper place and is different from all the other material things in the world, must be supposed always to have had,

<sup>6</sup> Met. α 994 b 26 : τὴν ὕλην ἐν κινουμένῳ νοεῖν ἀνάγκη.

<sup>7</sup> Met. Z 1029 a 22 : τὰ μὲν γὰρ ἄλλα τῆς οὐσίας κατηγορεῖται αὐτῆ δὲ τῆς ὕλης.

<sup>8</sup> Met. H. 1042 a 33 : ἐν πάσαις γὰρ ταῖς ἀντικειμέναις μεταβολαῖς ἐστὶ τι τὸ ὑποκειμένον ταῖς μεταβολαῖς, ὅσον κατὰ τόπον τὸ νῦν μὲν ἐνταῦθα πάλιν δ' ἄλλοθι, καὶ κατ' αὔξησιν ὃ νῦν μὲν τηλικόνδε πάλιν δ' ἔλαττον ἢ μείζον, καὶ κατ' ἀλλοίωσιν ὃ νῦν μὲν ὑγιὲς πάλιν δὲ κάμνον· δμοίως δὲ καὶ κατ' οὐσίαν ὃ νῦν μὲν ἐν γενέσει πάλιν δ' ἐν φθορᾷ, καὶ νῦν μὲν ὑποκειμένον ὡς τότε τι πάλιν δ' ὑποκειμένον ὡς κατὰ στέρησιν.

and always to be going to have, its own proper place and distinctness. If, that is, a given bit of matter is mixed and fused with, or absorbed by, another mass of matter, must we *a priori* suppose it to consist of particles retaining their identity? Aristotle's view of matter is a rejection and criticism of any such belief. Matter only has identity in so far as it is designate, earmarked; in itself it is indefinite (ἄόριστος). Suppose I throw a cupful of milk into the sea. It is no longer this milk; and if I ask where and what the stuff that I threw into the sea is, there is no need for there to be an answer beyond that it became part of the sea. And if in such cases there is an answer, this is because the particles continue to be identified by some property. For, if they are not marked out by anything, we cannot mark them out: if we do, they *are* marked out. And yet no one wishes to say that the stuff itself has been destroyed. We know no application for the idea of annihilation: by which I mean, not that we do not know of any case of it, but that we have—even side by side with a strong feeling of meaning for the word—hardly the vaguest notion what we should call a case of it. (Perhaps the total disappearance of a solid object, without a ripple in the surroundings except the inrush of air to take its place.)

Matter only exists as *somehow* designate; but that is not enough to secure the permanent identifiability of a once designate bit of it. And 'this matter' is matter *thus* designate. (The usual criteria for speaking of the same stuff.) But when this matter loses its identity we do not speak of its being destroyed; and we say that *it* has lost its identity. This is what I take Aristotle to mean when he calls matter "now the subject as a 'this something', now the subject in the way of privation."

It is always, and especially here, important to notice that Aristotle's 'matter' is not a *hypothesis*.

(7) One may easily be puzzled by the expression "this matter, taken universally", which occurs for example in one of the passages quoted by Professor Lukasiewicz. What could be the point of, say, "this spot of light, taken uni-

versally"? The "this" seems to war with the "universally".

"This matter" contrasts with undesignate matter, not with a general notion under which it falls as an instance. Hence when Aristotle wishes to generalize it, he says "this matter, taken universally".

(8) *On the analogy between bronze and its shape, and matter and form.* Aristotle's prime examples of 'substance' are: a man ( $\delta$  τις ἄνθρωπος<sup>9</sup>), a horse, or, I might add, a cabbage. There is a contrast between a concept like 'cabbage' and a concept like 'gold'. Cabbage is not just a kind of stuff, but a cabbage is a particular thing; whereas the concept 'gold' does not determine an individual thing in this way. Had Aristotle written in English he would certainly have seized on certain peculiarities of English to make his point: we do speak of bronzes, marbles, irons, steels, woods (in bowls e.g.), glasses etc. Bronze is to a bronze as flesh and bones etc. are to a man.

(9) "In a way, matter is obvious."<sup>10</sup>

(10) "Matter is in a way obvious, but . . . (form) is frightfully difficult."<sup>11</sup> Ross, for whom matter is most difficult, thinks that it is a concept reached by mentally stripping away all forms until you get to a characterless substrate. Aristotle regarded it rather the other way round: "by form I mean substance without matter":<sup>12</sup> that is, you get at it if you succeed in thinking matter away from substance. And he fell into frightful difficulties here, because he thought that form was the 'what' of substances:

<sup>9</sup> Cat. 2a 13.

<sup>10</sup> Met. Z 1029 a 32: φανερά δέ πως καὶ ἡ ὕλη.

<sup>11</sup> Met. Z 1029 a 32: φανερά δέ πως καὶ ἡ ὕλη· περὶ δὲ τῆς τρίτης (sc. τῆς μορφῆς) σκεπτέον, αὕτη γὰρ ἀπορωτάτη.

<sup>12</sup> Met. Z 1032 b 15: λέγω δὲ οὐσίαν ἕνευ ὕλης τὸ τί ἦν εἶναι — cfr. supra 1032 b 2: εἶδος δὲ λέγω τὸ τί ἦν εἶναι ἐκάστου καὶ τὴν πρώτην οὐσίαν.

but of course the names of sensible substances and their definitions (e.g. "man", "two-footed animal") carry a reference to matter in their sense.

I do not understand Aristotle's 'form', and I do not yet know whether he got clear about it himself. Luckily I need not present my half-formed ideas about it here. (I wish Greek grammarians could determine something about the expressions "τὸ τί ἦν εἶναι", "τὸ τί ἦν εἶναι A", "τὸ εἶναι A", "τὸ A εἶναι" (A being a *dative*!), with which the *Metaphysics* is strewn. These queer constructions have escaped their notice.)

The difficulties that Aristotle gets into come out most clearly if we consider the following :

(1) a thing and its τὸ τί ἦν εἶναι are the same<sup>13</sup> (Anti-Platonic).

(2) τὸ τί ἦν εἶναι ἀνθρώπων and τὸ ἀνθρώπων εἶναι are clearly equivalent expressions.<sup>13</sup>

(3) ἀνθρωπος and ἀνθρώπων εἶναι are *not* the same unless you make ἀνθρωπος = ψυχή; which is right in one way, wrong in another.<sup>14</sup> It is clearly something special about 'soul' and 'circle' that they are the *same* as ψυχῆ εἶναι and κύκλων εἶναι.<sup>15</sup>

All this is supposed to be resolved<sup>16</sup> by the consideration that the form and the matter are the same, but one δυνάμει and the other ἐνεργείᾳ. But this is still Greek to me.

To translate "τὸ τί ἦν εἶναι": "the essence" produces gibberish—e.g. "Callias is of himself Callias and the

<sup>13</sup> Met. Z 1031 a 17 : ἕκαστόν τε γὰρ οὐκ ἄλλο δοκεῖ εἶναι τῆς ἑαυτοῦ οὐσίας, καὶ τὸ τί ἦν εἶναι λέγεται εἶναι ἢ ἐκάστου οὐσία. ἐπὶ μὲν δὴ τῶν λεγομένων κατὰ συμβεβηκὸς δόξειεν ἂν ἕτερον εἶναι, οἷον λευκὸς ἀνθρώπος ἕτερον καὶ τὸ λευκῶ ἀνθρώπων εἶναι.

<sup>14</sup> Met. H 1043 b 2 : ψυχὴ μὲν γὰρ καὶ ψυχῆ εἶναι ταῦτόν, ἀνθρώπων δὲ καὶ ἀνθρώπων οὐ ταῦτόν, εἰ μὴ καὶ ἡ ψυχὴ ἀνθρώπων λεχθήσεται· οὕτω δὲ τινὶ μὲν τινὶ δ' οὐ.

<sup>15</sup> Met. Z 1036 a 1 : τὸ γὰρ κύκλων εἶναι καὶ κύκλος καὶ ψυχῆ εἶναι καὶ ψυχὴ ταῦτό.

<sup>16</sup> Met. H ad fin.

essence of Callias.”<sup>17</sup> It is clear that the correct gloss on τὸ τί ἦν εἶναι Καλλίᾳ in this passage is “man”: “Callias is of himself Callias and a man”. I.e. Callias is of himself that, to be which *is* being for Callias. Proper names do not, as some philosophers have said, ‘have denotation but no connotation’; the criterion of identity for Callias is the criterion for there being the *same man*.

I have mentioned so much about form, only because I want to consider the “grave inconsistency” which Professor Lukasiewicz ascribes to Aristotle. The inconsistency was this: Aristotle says that individuals are indefinable, but he also says that they consist of matter and form and that whatever has form has a definition. I do not think that Aristotle is in fact at all inconsistent at this point. The individual—say Callias—is indefinable, in the sense that there is no definition of him as opposed to another individual of the same species; his definition is the definition of the form. “Of the concrete substance in one sense there is an explanation (λόγος), in another not. For together with the matter there is none (for it is indefinite), but there is one according to first substance: e.g. the explanation (λόγος) of man is that of the soul.”<sup>18</sup> But this passage and its context are thick with the difficulty that I have described, of which I do not understand the resolution. Hence the defence against Professor Lukasiewicz’s particular charge is not worth much.

(11) I have the impression that Professor Lukasiewicz equates “this matter, taken universally”, and “intelligible matter”. This seems to be a mistake. “Intelligible matter” has to do merely with mathematical objects: on the analogy of sensible matter Aristotle invents ‘intelligible

<sup>17</sup> Met. Δ 1022 a 26 : ὁ Καλλίας καθ’ αὐτὸν Καλλίας καὶ τὸ τί ἦν εἶναι Καλλίᾳ.

<sup>18</sup> Met. Z 1037 a 26 : ταύτης δὲ γ’ (sc. τῆς συνόλου οὐσίας) ἔστι πως λόγος καὶ οὐκ ἔστιν· μετὰ μὲν γάρ τῆς ὕλης οὐκ ἔστιν (ἀοριστον γάρ), κατὰ τὴν πρώτην δ’ οὐσίαν ἔστιν, οἷον ἀνθρώπου ὁ τῆς ψυχῆς λόγος.

matter' to account for the plurality of geometers' circles (e.g.) ; for when a geometer speaks of two intersecting circles he is not talking about, say, wooden rings. "Intelligible matter" is an absurd and useless device, of no importance for Aristotle's account of material substance ; and it is not 'intelligible matter' but 'this matter taken universally' that is said, together with the definition, to form universals like 'man' and 'horse'.

(12) Luckily it is possible to understand what is meant by calling matter the principle of individuation, without understanding about form.

It is not off-hand clear that there has to be a principle of individuation. If X and Y are different, the difference may be made clear by appropriate elucidation of the meaning of "X" and "Y".

Consider :

- (a) "X and Y are numbers."—"Which numbers?"
- (b) "X and Y are men."—"Which men?"

Both might be answered by giving a 'definite description'. E.g. "the even prime" ; "the smallest integer, greater than one, that is both a square and a cube" ; "the philosopher who drank hemlock" ; "the philosopher who wrote the Republic." Before we accept the definite description we have to be satisfied that it applies, and in only one case. But for (a), what satisfies us shews that a man will be contradicting himself, or talking nonsense, if he says "but still there might be another . . .". For (b) this is not so.

But isn't there pointing?—if, at least, the man is there to be pointed to? But pointing does not define unless you can say what you are pointing at. If I point, and say "That is X", and point again saying "That is Y", nothing in this situation shows that X and Y are not the same. It is of no use to say "But suppose I point to some-



thing different?"—for that is just what is in question : what is something different ?

It is also of no use to appeal to definition by means of place and time ; for this you require points of origin and for points of origin you have to mention actual objects and events : individuals. No individual is pre-eminent. If I define an individual X by describing its spatial and temporal relation to another individual Y, and Y has no definition, then my definition of X is infected by the lack of definition of Y.

An individual can be defined by pointing and saying what (e.g. a man) you are pointing at. But this means that there is no difference between the definition of two individuals of the same species. You cannot say it lies in the difference between two acts of pointing, for nothing prevents one from pointing twice at the same thing ; and you cannot say : but the difference is that you were pointing at *different* things ; the different is not first merely a different *thing*, and then, in virtue of this, a different X.

Thus there is no definition of individuals except the definition of their kind. What, then, is the difference between two individuals of the same kind ? It is difference of matter ; and if I am asked to explain that, all I can do is, e.g., to cut something up and shew you the bits. That is what is called material difference. This is what is meant by calling matter the principle of individuation. To me its truth seems clear and evident.

(13) The statement that matter is the principle of individuation does not mean that the identity of an individual consists in the identity of its matter. Thus it is not an objection against it that the matter of a man's body changes in the course of his life.<sup>19</sup>

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<sup>19</sup> This paper originally ended here. Professor Popper asked me to elaborate this section ; but what follows reached him after he had completed his paper.

I don't think that "principle of individuation" is an expression any counterpart of which is in Aristotle. So far as I know, the statement that according to Aristotle matter is the principle of individuation is based only on his saying that Callias and Socrates are "different in matter, for it is different" (sc. in each of them).

Clearly what is in question here is contemporaries. There is no question of saying that Professor Popper and Socrates differ materially. But Professor Popper and I, for example, differ in matter.

If I say this, I am not saying that Professor Popper is who he is because of *the* matter of which he is composed; so it is not a difficulty for me that he is materially in a state of flux. But of course if by "What is the principle of individuation?" you mean, or include, the question "What makes a man the same man at different times?"—then the answer "matter" is an absurd one. But as we are talking about Aristotle we have no right to take the question in that second sense at all. And I should say there were two quite different questions here which we ought not to mix up.

Aristotle writes very interestingly about nourishment and growth in the *De Generatione et Corruptione* I 5. "Someone may wonder what it is that grows? Is it that to which something is added? E.g., if someone grows in the leg, this gets bigger, but not that by means of which he grows, i.e. the food. Well, why don't *both* grow?"<sup>20</sup>

He goes on to say, isn't it because the substance of the one remains, and of the other not?<sup>21</sup> I.e. the food turns into the man. Further: "... flesh and bone and the rest are twofold, as is everything that has form in matter. For both

<sup>20</sup> De Gen. et Corr. I 5. 321 a 29 : ἀπορήσειε δ' ἂν τις καὶ τί ἐστὶ τὸ αὐξανόμενον, πότερον ᾧ προστίθεται τι, ὅσον εἰ τὴν κνήμην αὐξάνει, αὐτὴ μείζων, ᾧ δὲ αὐξάνει, ἡ τροφή, οὐ. διὰ τί δὴ οὖν οὐκ ἄμφω ἡύξεται;

<sup>21</sup> Ibid 34 : ἢ ὅτι τοῦ μὲν μένει ἡ οὐσία, τοῦ δ' οὐ, ὅσον τῆς τροφῆς;

the matter and the form are called flesh and bone. Thus it can be taken that every part grows—and grows by the accession of something—in respect of its form, but not in respect of its matter.”<sup>22</sup> That is, we say that the *hand* grows, or the *flesh* or the *bone*. (Think of the ambiguity of the question “Is this the clay you were using last week?”—Aristotle would say that when we speak of ‘this (bit of) clay’ the word “clay” refers both to the form and to the matter.) Now matter can be added or taken away, but cannot be said to grow, for growth is *by* addition of matter. Thus it is that we use the term designating the *kind* of thing, to stand for the subject of growth. And then he adds: “It should be thought of like measuring water by the same measure. For something else keeps on becoming (the thing)”.<sup>23</sup> That is, Aristotle compares the form to, say, the mile that we speak of when we say “This mile of river”,<sup>24</sup> into which and out of which different water is constantly flowing. I find this a very illuminating comparison. It suggests the following picture to me: let us suppose that we could tag (as medical researchers speak of tagging) every particle of matter that went into Professor Popper—say by making everything that might go into him radio-active. After a few years had gone by wouldn’t he be a reach of a stream of radio-active particles? I think of it literally quite pictorially: a stream of silvery particles with Professor Popper’s outline drawn somewhere in the middle of it.—Of course we mark ‘this mile of river’ by landmarks, as water does not change on entering and leaving it. But food and so on change substantially when they get into

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<sup>22</sup> Ibid b 19 : σὰρξ καὶ ὀστοῦν καὶ ἕκαστον τῶν τοιοῦτων μορίων ἐστὶ διττόν, ὡσπερ καὶ τῶν ἄλλων τῶν ἐν ὕλῃ εἶδος ἔχόντων· καὶ γὰρ ἡ ὕλη λέγεται καὶ τὸ εἶδος σὰρξ καὶ ὀστοῦν. τὸ οὖν ὅτι οὖν μέρος αὐξάνεσθαι καὶ προσιόντος τινὸς κατὰ μὲν τὸ εἶδος ἐστὶν ἐνδεχόμενον, κατὰ δὲ τὴν ὕλην οὐκ ἐστὶν.

<sup>23</sup> Ibid 24 : δεῖ γὰρ νοῆσαι ὡσπερ εἰ τις μετροῖται τῷ αὐτῷ μέτρῳ ὕδωρ· οἶε γὰρ ἄλλο καὶ ἄλλο τὸ γινόμενον.

<sup>24</sup> I am indebted for this interpretation to Mr. P. Geach, who threw it out almost as a joke in casual conversation: but I think it is obviously correct. I am grateful to him also for other help in preparing this paper.

Professor Popper, so his form (the flesh and bone of a living man, to put it roughly) does the marking off ; and corresponds to the mile of river.

I think this demonstrates quite clearly that if you mean anything Aristotelian by calling matter the principle of individuation, you do not mean that the identity of a person is the identity of the matter of which he is composed.

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### III.—By KARL R. POPPER.

#### 1.

MISS ANSCOMBE has followed Professor Lukasiewicz's lead in treating our problem very largely as one of Aristotelian exegesis. Both devote a small part of their space to a discussion of the problem itself. I do not propose to follow them in this.<sup>1</sup>

As to the problem of the Principle of Individuation, Professor Lukasiewicz offers some "hints", as he puts it. He says that "the unity of any composite thing requires . . . a non-materialistic principle, a form, or a functor". And he hints that the principle of individuation is not matter, as with Aristotle, but form. He says that "man is a unity", and hints that the unity of the individual man can only be explained by a formal principle, by an "inner structure . . . built up by means of relations denoted by functors. Among these relations must be a principal one which accounts for the unity and oneness of an individual man, and remains the same throughout his whole life."

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<sup>1</sup> My views (for what they are worth) on the exegetic issues raised are as follows. (1) I do not see why our topic should be treated as one exclusive to Aristotle. The problem can be traced back to Plato (esp. *Parmenides*, 129c-d; cp. Euclid, *Elements*, vii, Def. 1, and Duns Scotus), and perhaps even to Anaximander; and the term "principle of individuation" occurs first (as far as I can ascertain) not in Aristotle but in Avicenna, Albertus Magnus, and St. Thomas Aquinas (*S. Contra G.*, book ii, ch. xlix, "principle of distinction between individuals of the same species"; *S. Theol.*, part i, qu. 3, art. 2, obj. 3, and *passim*) who admittedly denotes by it the Aristotelian solution of the problems discussed mainly by Miss Anscombe. (2) Professor Lukasiewicz's main contention—that there are grave mistakes and obscurities in Aristotle—cannot be denied. (3) But his special points, such as his proof (in his section 6) that Aristotle's conception of matter is contradictory, leave me quite unconvinced. *Met.* 1029a20, quoted by Professor Lukasiewicz (in his section 2) does not furnish a basis for this proof; it does *not* imply that "no proposition with 'matter' as subject can be truly asserted"; for the passage, as quoted by him, clearly implies that such propositions may be true even though their (negative) predicates belong to the subject only *accidentally*. (See also the contrasting passage 1028b36.) (4) Again—although admittedly there is some obscurity here—I remain unconvinced that there is "a grave inconsistency" (see Professor Lukasiewicz's section 4) in Aristotle's remark that individuals are indefinable, and consist of matter, and of form (or essence) which is definable. For the individual's essence can be defined, but the definition is one of the species to which the individual belongs, rather than of the single individual as such. (See also the penultimate paragraph of my section 9, and (c) in my section 11, below.) (5) I have no criticism to offer to Miss Anscombe's exegetic comments.

Miss Anscombe, on the other hand, appears to follow Aristotle. She says first that, luckily, it is "possible to understand what is meant by calling matter the principle of individuation"; and having explained its meaning, she herself adopts Aristotle's principle. "To me its truth seems clear and evident", writes Miss Anscombe.

Thus we seem to have here two neatly opposed views. If, with Aristotle, one sees the individual as composed of form and matter, and then raises the question "which of these two is the principle, or source, of the individual's individuality?", then, it seems, Professor Lukasiewicz and Miss Anscombe have each given one of the two possible answers, "form", and "matter"; Professor Lukasiewicz following the Scotists, and Miss Anscombe the Thomists, of the scholastic debate.

But this appearance of neatness, I fear, is misleading. The truth is, I believe, that Professor Lukasiewicz and Miss Anscombe, far from giving two different replies to the same problem, are dealing with two entirely different problems.

It took me some time before I realized this fact. I am no more inclined than Professor Lukasiewicz to hold that all metaphysical problems are meaningless or senseless, as my friends of the "Viennese Circle" once did (against my protests); but I found it very difficult to discover what we are arguing about, in the present instance.

In what follows, I shall sometimes call Professor Lukasiewicz's problem, or rather what I believe it to be, the "first problem" and Miss Anscombe's problem, or what I believe it to be, the "second problem". There also will emerge a "third problem" from Miss Anscombe's paper.

## 2.

I begin with the *second problem* (the one I believe to be Miss Anscombe's) because I do not find any difficulty in understanding what I take to be the problem she intends to answer. It appears to be this.

However similar two material bodies are, and even if they happen to be completely indistinguishable in kind—in shape, quality, and structure—they are clearly *two* bodies, and therefore not identically the same. *Wherein lies their difference?*

I believe that Miss Anscombe is right when she claims that this is Aristotle's question (or at least one of his questions), and that her answer is Aristotle's answer; and I think that I can understand this question, although I am slightly less confident when I look at Miss Anscombe's, and Aristotle's, reply. For if I have understood the question properly, then the answer, although certainly true, is glaringly unsatisfactory. For it is this.

The difference of the two material bodies, assuming (as we did) that it is not one of kind or form (shape, structure, etc.), consists in their being different bits of matter.

I say that this answer is glaringly unsatisfactory because the best that can be said about it is that it shifts the problem just a little—and even this only on the assumption that the phrases "different material bodies" and "different bits of matter" are not synonymous in this context. Assuming this, the problem, as revised or shifted, becomes:

*Wherein lies the difference of two different bits of matter (considered to be qualitatively indistinguishable<sup>2</sup>)?*

This revised problem, clearly, is hardly more than a re-statement of the original problem. To me it seems therefore obvious that, even though the problem may not be a pseudo-problem, the answer, although true, is a pseudo answer.

It will be said, perhaps, that I have not understood Miss Anscombe's problem; that while I have formulated the problem in terms of material bodies, she formulates it in terms of individuals. I reply that, if there are individuals other than material bodies—individual numbers, for

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<sup>2</sup> The sole function of the clause in brackets, as of the corresponding conditions or assumptions in earlier and later formulations, is, of course, to exclude as irrelevant any answer which appeals to differences of form, structure, shape, etc.

example, or angels<sup>3</sup>—the answer offered is simply not true for them. Moreover, Miss Anscombe took care to exclude such things as numbers.

I cannot, of course, be sure that I have understood Miss Anscombe's problem properly, but in what follows I shall take it that her problem in its revised form—our "second problem"—can roughly be formulated as follows :

Given two or more qualitatively indistinguishable bits of matter, we may be able to count them, or to say how many they are, which presupposes that they are not identical. Wherein lies their difference or non-identity ?

I shall propose a solution in section 7 below.

### 3.

I now turn to compare this problem with our "first problem", the problem which I take to be that of Professor Lukasiewicz. As indicated here in section 1, fourth paragraph ("which of the two—form or matter—is the principle of the individual's individuality?"), it is possible, by giving a sufficiently vague formulation of our two problems, to make them look like one problem. But even the following somewhat sharper formulation is still vague enough to cover both : "In what lies the numerical oneness, or unity, of any one individual?"<sup>4</sup>

Using this last formulation as a common background, as it were, to both problems, we can now show their difference by giving them the following forms.

*1st problem* (Professor Lukasiewicz's) : "How is it that

<sup>3</sup> The problems of Angelology are among those most intensively discussed in connection with the principle of individuation. Leibniz summarizes this discussion (*Disputatio Metaphysica De Principio Individui*, Lipsiae, 1663, § 3) : "Sunt autem duo genera optimorum ; alii hypotheses habuere ad omnia individua applicabiles, ut Scotus ; alii secus, ut Thomas, qui in corporibus materiam signatam, in Angelis eorum entitatem principium posuit." (Cp. St. Thomas, S. Th. part i, qu. 75, art. 7 ; and Duns Scotus's *Op omnia*, London 1639, vol. 6). In this *Disputatio*, Leibniz criticizes Scotus's *haecceitas* (see vol. 6, p. 365 ; 408 ; etc.), although his own position does not appear to be so very different from Scotus's. In later writings (cp. Gerhardt's edition, of the *Philosophischen Schriften*, vol. iv, p. 432 f.), Leibniz himself speaks of the "individual notion or *haecceitas*." (See also vol. ii, 43 ; v, 268 = *New Essays*, ed. Langley, book iii, ch. 3, sect. 6, p. 309 ; vii 311.)

<sup>4</sup> I should have written "of one individual material body", were it not that Professor Lukasiewicz may intend to admit what he calls "abstract examples", such as numbers, among the individuals under discussion. See also the next footnote.



any one individual, although 'composite', i.e. consisting of many parts, is a unity rather than a plurality?"

2nd problem (Miss Anscombe's): "How is it that two or more individuals (even if qualitatively indistinguishable) can be counted—each counting exactly as one—and therefore be distinguished?"

These two problems, in spite of a superficial similarity, have little in common. For the first asks *how a whole is related to its parts*, or how a whole can unite its parts, or what constitutes the unity of a complex (where "unity" is taken in the sense of a *structural unity* of the constituent parts of a "composite thing").<sup>5</sup> The second, on the other hand, asks for something like a *sufficient condition, i.e. a criterion, of difference or non-identity of material bodies, or of bits of matter.*

#### 4.

That Professor Lukasiewicz asks for an explanation of wholeness or of structural unity can be seen, I believe, from his examples as well as from his suggestions concerning the solution of his problem (although one formulation suggests that he has both problems in mind, and proposes a solution to cover them both<sup>6</sup>), and especially from his

<sup>5</sup> It is clear, I think, from this formulation that only individuals which are complex (*i.e.*, contain parts, or are systems of elements, etc.) are covered by this problem; It does not appear that Professor Lukasiewicz's suggestions cover an *individual simplex* (say, an individual point, such as the point of gravity of an individual body, or the number 1, as opposed to the number 2 which he interprets as a complex, or as a structure, of units). From this, it looks as if Professor Lukasiewicz does not intend to cover "abstract" individuals, such as numbers (see the preceding footnote); for although there are no material bodies which have no parts, there are "abstract examples" which are not complex.

<sup>6</sup> I mean the passage (*italics mine*): "Socrates, like any other individual, is a whole, [1st problem], i.e. a unity which is also numerically one . . . being different from all the other things in the world [2nd problem]. We cannot say that matter is the principle of his individuality; *this would only* account for his numerical oneness, but does not explain his unity [structural unity?] from his birth till his death." I am not sure whether the term "numerically one" is here to be interpreted in the sense of the 1st or of the 2nd question; both interpretations seem possible and appropriate. Since it might be thought that, by pointing out that Miss Anscombe's problem is different from Professor Lukasiewicz's, I am accusing the second symposiast for failing to take up the issue discussed by the first symposiast, I may perhaps say that such an accusation would be completely unjust. In Professor Lukasiewicz's passage, quoted in this note, her problem is clearly indicated; and, no doubt, she is right to insist that it is this problem to which Aristotle replied "the principle is matter".

remark: "The unity of any composite thing requires, . . . a non-materialistic principle, a form, or a functor." This statement which incorporates Professor Lukasiewicz's suggestion for a solution is, I believe, true. If we replace in this statement—and I believe we may do so—the word "functor" (against which there are in any case serious objections in this context<sup>7</sup>) by the word "structure", then it becomes, again, only too true. For then, the question "Why is the individual a unity, that is to say, a structural whole of its parts?" is to be answered: "Because of its structure."

This last remark, I should be the first to emphasize, does not present an entirely fair picture; for the words "a structural whole of its parts" are my own insertion. On the other hand, we have seen that the insertion of some such specifying clause is imperative because we must distinguish between two entirely different questions concerning units—questions which are in great danger (as shown by the passage quoted in the footnote before the last) of being confused. I do not, however, wish to suggest that every appropriate specifying clause, or that every precise way of expressing the very vague question-and-answer, "Why is a whole of parts a whole?"—"Because of its structure", would make the answer tautological. I only wish to make it clear why I have serious reasons for being dissatisfied with the formulation of the problem, as I find it in Professor Lukasiewicz's paper.

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<sup>7</sup> These objections are, briefly, that Professor Lukasiewicz introduces (as it is customary) the word "functor" as referring to a certain kind of *linguistic expressions*, such as the words "is", "if . . . then", "plus", etc., which agrees with the penultimate statement of his paper in which he speaks of a "structure . . . built up by means of relations denoted by functors". But in the statement quoted in the text, the word "functor" appears to denote the denotatum of some functor, i.e., something like a structure or relation. I may perhaps mention here that the assumption, implicit in Lukasiewicz's penultimate statement, that a functor *denotes an entity*, such as a relation (which may be one-termed, i.e., a property) appears to me indistinguishable from the Platonic assumption (criticized by Professor Lukasiewicz in the last paragraph of his section 3) that a "universal term" has, like a singular term, "an objective correlative"—with all those Platonic consequences which Professor Lukasiewicz rejects as "pure mythology".

## 5.

The reason why I do not think that the above question should be interpreted as tautological is that I can easily give an empirical version of it. Consider first, in place of "Socrates . . . from his birth till his death", a simpler case—say, an ordinary individual brick, from the day it leaves the kiln where it was baked to the day the bricklayer splits it in two. No doubt it is a composite thing, a unity which has parts. When it is broken in two, its physical unity is lost. No doubt this unity is a structural unity. But by saying this, we have said very little, in comparison with all the details which chemists and physicists have found out about this structural unity, that is to say, about the physical forces owing to which the whole can resist other physical forces tending to deform it, to split it, etc.

To the critical philosopher, the reference to forces may seem unsatisfactory, smacking of *ad hoc* faculties. But forces are, in this context, a useful and a harmless device—harmless because they are not *ad hoc* but derivable from universal laws, from theories which can be tested in many different fields.

No doubt, functors play a most important part in the formulation of all physical laws, of all the theories by which we can explain the wholeness, the unitary behaviour of bricks and of other material bodies (and which also allow us to explain the behaviour of very different systems such as gases). For this and for other reasons, *theories*, or more precisely what they describe, may be said to be somewhat nearer, or much nearer, to Aristotle's *form* than to his *matter*. Yet, clearly, they do not really fit well into his form-matter scheme.

The most important point about these theories, in the light of our problem, is that their success could not be foreseen. Intellectually, they are the direct heirs of an old philosophic tradition, of speculations about the structure of material things, and of matter itself—a tradition in which Aristotle plays a certain part, alongside Democritus, Plato, Descartes, Locke, Leibniz, and many others. But what

these philosophers hardly dared to think of has happened : many speculations have been knocked out by experiments, and others have stood up to severe and subtle tests. They give the best answer we have to the problem of the structural unity of physical bodies, a better and fuller one than these philosophers ever hoped for.

Does this mean that our problem ceases to be a philosophical one? This question is, largely, a verbal one—one that concerns the use of the word “philosophical”. I personally am inclined to say of my own comments on the empirical aspects of our first problem that they have a philosophical character, and are relevant to the appreciation of an old philosophical problem.<sup>8</sup> They certainly do not belong to physics.

## 6.

Turning from bricks to living organisms, I find that the situation looks similar, especially for the lower ones. But for higher organisms, such as Socrates, new problems enter. There appears to be a sense of the word “individual” in which only organisms, or only higher organisms, are individuals. While an individual brick *may* be said to have lost its unity, or its self-identity, if a considerable piece has been knocked off, Socrates’ unity or self-identity as an individual appears to remain the same after an amputation—to say nothing of bodily changes due to his growth, or resulting from his slimming.

It is apparently of this unity that Professor Lukasiewicz writes : “Any individual man has an inner structure built up by means of relations. . . . Among these . . . there must be a principal one which accounts for the unity and oneness of an individual man and remains the same throughout his whole life.”

I found it very hard to understand this. At first (misled, I suppose, by the reference to *the one principal* relation), I tried to give it a spiritualistic interpretation.

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<sup>8</sup> Cp. my paper “The Nature of Philosophical Problems and their Roots in Science”, *The British Journal for the Philosophy of Science*, iii, pp. 124 ff.

Imagine a world in which ordinary experience supports what may be called the "hypothesis of radical spiritualism": in which every child of, say, eight would begin to remember experiences from his previous two or three incarnations; in which any two souls (while retaining their memory) could at will, with the help of some ritual, exchange their bodies; in which the health of the human body would depend upon some mental discipline, and in which a body would die if its soul gave it up, and could be rescued by some other soul entering it; in which, again by some ritual, the living may at will establish quasi-telephonic communication with disembodied spirits of their dead friends, etc. I think we can easily describe the kind of experience which would make practically everybody believe that we live in such a world; and I therefore hold that the question whether or not we live in such a world, or to what degree our world resembles it, is an empirical question (and not a linguistic one).

Were our world clearly spiritualistic in the sense described then we might be inclined to say that the structural unity of higher organisms is "due to" their souls (in a similar sense as being tipsy is due to having imbibed some spirits); or, if you like, that the structural principle of individuation is a mental or spiritual one. And people will be inclined to say so, according to the degree to which they think that our actual world approximates to a radically spiritualistic world. But they should also say that this spiritual principle, although not material in the usual sense, is not formal but material in the Aristotelian sense. I therefore think that Professor Lukasiewicz's remark about a form—a relation which "accounts for the unity and oneness of an individual man and remains the same throughout his life" cannot be meant in any spiritualistic sense.

But if not, how can it be meant? What makes Socrates *one* seems to be, on the one side, the oneness of his body (which he shares with every brick), or his physical continuity. On the other side it is the oneness of his memory, especially of his own past states, and of his "personality",

i.e. the coherence of his attitudes or of his behaviour or of his beliefs; all this may be called, summarily, his "mnemonic continuity". Now it seems to me that this mnemonic continuity is more interesting and more important than the physical continuity (although, no doubt, it is somehow associated with it, and perhaps even dependent on it). It may be that those who believe in a spiritualist hypothesis mainly wish to stress the specific interest and importance of the mnemonic as compared with the physical continuity.

Now the word "continuity" is only a metaphor here. But it is not a baseless metaphor. There is, obviously, a relation between mnemonic states which is in some formal respects similar to those numerical or spatial relations which create what we call continua. And since these can be formally analysed, this may be possible with the mnemonic continuum.<sup>9</sup> Perhaps this is what Professor Lukasiewicz only has in mind.

## 7.

I now turn to the discussion of our second problem: Wherein consists the difference between two or more qualitatively undistinguishable bits of matter?

Our problem is, as I said before, to find a criterion (i.e. a sufficient condition) of non-identity. I shall tackle it from its logical or ontological side, rather than from its epistemological or operational side (as, I think, Miss Anscombe is inclined to do when she cuts up some piece of matter). And I shall propose, as a solution, a variant of a

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<sup>9</sup> The queer thing is that this continuity has degrees; that it varies, among higher organisms, not only from species to species, but also from individual to individual, and from instant to instant (an indication of the empirical component of a problem which seems to be at least partly non-empirical, and closely connected with Kant's problem of the transcendental unity of perception).

very old answer to the problem, (going back at least<sup>10</sup> to Locke<sup>11</sup>, and to be found in Hume<sup>12</sup>, and—in the spirit of Kant—in Schopenhauer<sup>13</sup>: that the principle of individuation, as far as material bodies are concerned, is to be found in their *spacio-temporal differentiation*.

Miss Anscombe has given us an interesting and challenging criticism of this view, and a criticism which may be able to destroy some of its versions which operate, explicitly or implicitly, with co-ordinate systems. I shall therefore avoid, at first, any reference to co-ordinates.

The idea which is to be made workable may be formulated tentatively in the form of the following criterion (C).

(C) Two qualitatively undistinguishable material bodies or bits of matter differ if they occupy at the same time different regions of space.

The *prima facie* objection to this criterion is, of course, that it again only shifts the problem, by replacing the problem of the *difference of bits of matter* by that of the *difference of special regions*. In order to invalidate this

<sup>10</sup> One might even say that it goes back to Plato; for in the *Timæus*, physical bodies are produced by form out of space in a manner similar to Aristotele's composition of them but of form and matter. Aristotle himself must be mentioned, for he writes (*Met.* 1092, 18–19): "Place is peculiar to the individual things, and hence they are separate in place." (Cp. Aquinas, *S. Th.*, part I, qu. 3, art. 1, obj. 5.) Also, his intelligible matter can be identified with space. (Cp. also 1050b, "matter which makes it capable of movement in various directions"). Descartes, clearly, should also be mentioned. As to Leibniz, the situation is a little intricate, since spatio-temporal differences are for him necessarily linked with qualitative differences, so that all individuals are intrinsically different in kind; thus it appears that our (second) problem cannot arise for him in exactly the form we have given to it. (Cp. *New Essays*, ed. Langley, book III, ch. 3, sect. 6, p. 309, = Gerhardt vol. V, p. 268: "Place and time, far from determining the things themselves, need to be determined by the things they contain".)

<sup>11</sup> *Essay*, book II, ch. 27, § 3 (italics mine): "... the principium *individuationis* . . . is existence itself which determines a being . . . to a particular time and place, incommunicable to two beings of the same kind . . ." See also sect. 1: "For we never finding, nor conceiving it possible, that two things of the same kind should exist in the same place at the same time . . ." etc.; "... it being impossible for two things of the same kind to be . . . in the same instant, in the very same place, or one and the same thing in different places."

<sup>12</sup> *Treatise*, book I, part IV, section 2 (italics mine) "Thus the principle of individuation is nothing but . . . the uninterruptedness of any object, through a . . . variation of time, by which the mind can trace it in the different periods of its existence . . ." (cp. section 10, below).

<sup>13</sup> *The World as Will and Idea*, vol. I, book 2, § 25, etc.

kind of criticism, it is essential to obtain a criterion which no longer operates with any special concept of difference—with a *difference of* (such and such a kind)—but which operates, instead, with the general logical idea of non-identity, i.e. the negation of identity in the sense of, say, Russell's definition of identity, or the two Hilbert-Bernays axioms of identity. (All we need is the second axiom: If  $a = b$ , then, if  $F(a)$  then  $F(b)$ .) But in order to do this, we have to formulate a criterion which is logically *demonstrable*, i.e., which follows from the definition (or the axioms) of identity.

How this can be done may be seen from the following tentative reasoning (1) to (3) which will later be replaced by two improved versions, (1') to (3') and (1'') to (3'').

The letters "x," "y," "z," "w" will be used to denote *points* (or perhaps marks) on the surface or within physical bodies or spatial regions; "A", "B", to denote *physical bodies*; and "P", "Q", to denote *spacial regions*.<sup>14</sup>

I begin with a definition which allows for the possibility of expansion or contraction of the body  $A$ :

(1) The greatest length of the body  $A$  at the time  $t_0$  is a distance  $(z, w)$  at the time  $t_0$  such that (a)  $z$  is in  $A$  and  $w$  is in  $A$  and (b) for any points  $x$  and  $y$ :—if  $x$  is in  $A$  and  $y$  is in  $A$ , then the distance  $(x, y)$  at  $t_0$  does not exceed the distance  $(z, w)$  at  $t_0$ .

We obtain, from (1), using identity:

(2) If  $A = B$ , and if  $x$  is in  $A$  and  $y$  is in  $B$ , then the distance  $(x, y)$  at  $t_0$  exceeds neither the greatest length of  $A$  at  $t_0$  nor that of  $B$  at  $t_0$ .

<sup>14</sup> The term "region" is here used for an *open nucleus of a connected set of points* ("Gebiet", or "offener Kern einer zusammenhängenden Menge"; cp. Hausdorff, *Mengenlehre*<sup>2</sup>, 1927, p. 150 ff., and p. 96, note 2). Hausdorff proves (VIII on p. 154) for a region  $P$  in Euclidian space that any two points  $x$  and  $y$  of  $P$  can be connected by a *train of straight lines* in  $P$ , or, as we shall say here, by a *path lying entirely within P*. (This is a necessary and sufficient condition for  $P$  to be a region.) I distinguish between a body  $A$ , and  $R(A)$ , i.e., the region occupied by  $A$ ;  $R(A)$  may be defined as the open nucleus of the connected closed hull containing  $A$ , so that such question as whether or not  $A$  itself is dense, or open, etc., need not be considered. It will be implicitly assumed, in the text, that all regions mentioned are non-empty.—I have tried to formulate my arguments in the text in such a way that their set-theoretical aspect referred to in this note may be completely ignored.



From this follows by transposition :

(3) If  $x$  is in  $A$  and  $y$  is in  $B$ , and if the distance  $(x, y)$  at  $t_0$  exceeds at  $t_0$  the greatest length both of  $A$  and of  $B$ , then  $A \neq B$ .

Now (3) can be used as providing a sufficient (although not a necessary) condition, or a criterion, of non-identity ; and although it is not very elegant, it is very useful. For it is clearly always satisfied by any two *bodies which can move* (or which can be moved) independently, since in this case their distance can increase (or be increased) to exceed their greatest length.

Note that the method of introducing difference or non-identity is free from any circularity : (2) does not assume difference, but utilizes identity. We clearly have here a method which can be used very generally.

The criterion (3) is clumsy ; it is not only sharper than one could wish, but it also introduces a metrical element. This can be avoided in various ways. I shall mention two (leaving out, for simplicity's sake, all references to the time  $t_0$ ) :

(1') If  $x$  is in the region occupied by  $A$  and  $y$  is in the region occupied by  $A$ , then there exists a path connecting  $x$  and  $y$  and lying entirely within the region occupied by  $A$ .<sup>15</sup>

Using identity as before, we obtain :

(2') If  $A = B$ , and  $x$  is in the region occupied by  $A$  and  $y$  is in the region occupied by  $B$ , then there exists a path connecting  $x$  and  $y$  and lying entirely within the region or regions occupied by  $A$  or by  $B$ .

This yields, as before :

(3') If  $x$  is in the region occupied by  $A$  and  $y$  is in the region occupied by  $B$ , and if no path connecting  $x$  and  $y$  lies entirely within the region or regions occupied by  $A$  or by  $B$ , then  $A \neq B$ .

Here we have a criterion, (3'), which amounts to saying that  $A$  and  $B$  are different bodies if they are separated by a complete gap, however, small. And we have not only avoided any reference to a system of co-ordinates, but also to any measurement.

<sup>15</sup> This is a demonstrable statement ; cp. the last footnote (Hausdorff VIII on p. 154).

The second of the improved versions starts with a definition:

(1'') The regions  $P$  and  $Q$  are called "connected" or "overlapping" if and only if they have at least one sub-region (consisting of one point at least) in common; otherwise they are called "disconnected" or "separated by a gap".

(2'') If  $A = B$ , and  $A$  lies within the region  $P$ , and  $B$  lies within the region  $Q$ , then  $P$  and  $Q$  are connected.<sup>16</sup>

(3'') If the body  $A$  lies within the region  $P$ , and the body  $B$  lies within the region  $Q$ , and if  $P$  and  $Q$  are separated by a gap, then  $A \neq B$ .

Any of the two criteria (3') or (3'') may be used to replace the tentative criterion (C) which was mentioned near the beginning of this section. They may be claimed to be *formulations of the principle of individuation*.

We now can even introduce a distinction between material bodies and bits of matter, such that all material bodies are bits of matter while the opposite is not the case: a bit of matter may be any *part* of a material body (where the word "part" means what is ordinarily meant by "part or whole"). Note that, according to this new convention, two different bits of matter may partly overlap, even if we adopt the Cartesian principle (which we need not do) that this is not possible for material bodies.<sup>17</sup>

<sup>16</sup> Cp. the footnote before the last, and especially the remark according to which it is assumed implicitly that the regions occupied by  $A$  and  $B$  are not empty.

<sup>17</sup> If we adopt the Cartesian principle of non-penetration—which, in the light of modern physics, can hardly be upheld—then the criteria (3') and (3'') may be said to be not only sufficient but also necessary conditions. As it is, they are sufficient to cover even cases of penetration of matter by moving particles, because they *imply* the criterion of independent movability.—It is so obvious that it hardly needs mentioning that modern physics has unsettled our linguistic usage concerning physical bodies. No serious philosophical difficulty arises from this. But an interesting confirmation of the spacio-temporal principle of individuation arises from the fact, predicted by Einstein, that matter may be destroyed, i.e. transformed into energy. In spite of this fact we do not generally consider energy as possessing individuality—clearly, because it does not, in general, possess spacio-temporal location (as does matter); and in those cases in which we consider it as consisting of individual bits (of quanta or photons), we also attribute spacio-temporal locations (within the limits of the uncertainty relation) to these bits. It may be mentioned, in this context, that Berkeley (*De Motu*, 68) rightly rejected the question whether "the motion" (or momentum) transferred from a pushing body to a pushed one is "numerically the same individual" ("*idem numero*") before and after the push. (For the meaning of "*idem numero*" = "the same individual", cp. Leibniz, *New Essays*, Gerhardt, vol. v., p. 214.)

By the same method as before, we can now prove the following criterion for bits of matter:

Any two bits of matter (even if otherwise indistinguishable) are non-identical (at the time  $t_0$ ) if they occupy (at the time  $t_0$ ) non-identical regions of space.

On the basis of this spacio-temporal criterion, we may, of course, fall back upon Aristotle's or Miss Anscombe's materialistic principle of individuation; not only for material bodies, but also for their parts.<sup>18</sup>

All our criteria are not only analytic, but trivial, as was to be expected.

Now let us look at Miss Anscombe's criticism. She writes (in the fourth paragraph before the end of her section 12): "It is also of no use to appeal to definition by means of place and time; for this you require points of origin and for points of origin you have to mention actual objects and events: individuals. . . . If I define an individual X by describing its spacial and temporal relation to another individual Y, and Y has no definition, then my definition of X is infected by the lack of definition of Y."

This passage is worthy of a close analysis.

(a) Our second problem, and Miss Anscombe's problem (as her solution shows) have nothing to do with the problem of *defining* an individual.

(b) Even if we operate with co-ordinate systems (which we need not do), we may avoid, *as far as our problem is concerned*, any reference to an individual origin; for the spacio-temporal distinctness of two or more regions is a relation which is invariant to transformations from one system to another.

<sup>18</sup> It looks to me, however, as if Miss Anscombe herself, unconsciously, was operating with something like our spacio-temporal criterion. For she writes (in the last paragraph of her section 12): "What, then, is the difference between two individuals of the same kind? It is difference of matter; and if I am asked to explain that, all I can do is, e.g., *to cut something up and show you the bits.*" Why, I ask, does Miss Anscombe cut something up? She does so, I suggest, in order to appeal to what we all know—that the bits can then be *independently moved*, so that we can make their distances sufficiently large for being quite sure that they occupy, at one time, separate regions of space.

(c) If I say something about "an individual by X describing its spatial and temporal relation to another individual Y" (as Miss Anscombe writes), then this, we have seen, may serve amply to establish that X and Y are different—whether it does or does not establish a definition of X in terms of Y.

(d) If I succeed, in this way, in establishing a definition of X in terms of Y, then it is most misleading to say that "my definition of X is infected by the lack of definition of Y". For the occurrence of an undefined term in a definiens is perfectly healthy and the fear of an infection arises solely from an implied demand that the terms of the definiens ought in their turn be always defined terms. But this demand leads, immediately, to an infinite regress. *Definitions must ultimately go back to undefined terms.*

It so happens that I have used, many years ago, an *argument*<sup>19</sup> which is nearly identical with Miss Anscombe's argument here quoted. But my argument was designed to show that it is *impossible to define an individual name by purely universal (property) words*—although it is possible to define it in terms of universal words *and (at least) one other individual name*. This, I believe, is what Miss Anscombe's argument establishes.

## 9.

I think that this result is of considerable interest to us ; for it provides a full answer to a *third problem* coming under the heading of "the principle of individuation". This third problem may, indeed, be described as (an immediate generalization of) Aristotle's central problem of individuation, for it may be put in this way : "Can we give a definition of an individual in terms of its purely qualitative properties, i.e. of its form ?" The answer is, "No". Any such definition can only define *a kind*, however many specifying differences may be used. In order to give a unique characterization (*a description* in Russell's sense) of an

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<sup>19</sup> Mainly against Carnap ; cp. my *Logik der Forschung* (1935), section 14.

individual, something else must be used (such as its spacio-temporal relations to at least one other individual).

This problem is very much like Aristotle's, except that Aristotle believed in *infimae species*<sup>20</sup> so that definitions, for him, come to an end long before we even begin to approach individuals. Not even what we should call a sub-species of his *infima species* man (such as, say, snub-nosed man) can be defined, according to him, because he does not consider a property such as snub-nosedness as *essential* i.e. as a *species-forming* (a specifying) difference.

It has been suggested<sup>21</sup> that it is only this doctrine of *infimae species* which makes Aristotle say that individuals cannot be defined, or that there is no essence corresponding to single individuals, but only one corresponding to the *infima species* to which they belong. But this suggestion is, surely, mistaken. Even if the doctrine of *infima species* is given up, individuals cannot be fully defined in universal terms. And since an essence is, in Aristotle's philosophy, something which can be described by a definition, and since a definition must not even use accidental universals (and therefore *a fortiori* not individual terms),<sup>22</sup> it follows that even without the doctrine of *infimae species* the individuals themselves cannot be defined—only the *kinds* to which they belong.

Aristotle was therefore right when he gave a negative reply to our third problem, and this reply remains correct even if we give up his doctrine of *infimae species*, and even if we give up his distinction between essential and accidental properties.

<sup>20</sup> For a general analysis of the tendency underlying this and related beliefs, see Evert W. Beth, "The Prehistory of Research into Foundations", *The British Journal for the Philosophy of Science*, iii (1952), p. 58 ff., esp. p. 66.

<sup>21</sup> Cp. Sir David Ross' edition of *Aristotle's Metaphysics* (1924), vol. i, p. cxv.

<sup>22</sup> All this may be clearly seen from *Met.* 2, 15, 1039b20–1940a7, where it is emphasized that definition is knowledge, which cannot be of perishable things such as individuals.

## 10.

Some remarks must be added here about the connections between our first and our second problem.

Our second problem can be solved (or so I believe) with the help of criteria, i.e. of sufficient conditions, which imply in their turn the important criterion that, if *A* and *B* are independently movable, they are different. Now the idea of the motion of a body clearly involves that we can speak of *one* body at different moments of time, and therefore of the relation holding between any two momentary states of one body *A*.

This relation which has been termed "genetic identity" or "genidentity"<sup>23</sup> can be introduced by a definition on the following lines :

*a* is genidentical with *b* if and only if *a* and *b* are both temporal states of the same body *A*.

Here *a* and *b* may be temporal states lasting for some finite time ("time-stretches of *A*") or they may be momentary ("time-slices of *A*"); and the momentary states or time-slices may be considered as limiting cases of the time-stretches, i.e. as time-stretches whose beginning and end coincide.<sup>24</sup>

It may now be asked whether the "principal relation" of which Professor Lukasiewicz speaks, "which accounts for the unity and wholeness of an individual", for its "unity from . . . birth till . . . death", may not perhaps be the relation of genidentity which holds between its various temporal states, and which is implied in the criterion of independent movability.

I have no doubt that the answer to this question is negative, for the following reasons.

<sup>23</sup> The term was introduced by Kurt Lewin; see his *Begriff der Genese* (1922). Cp. also, for example, J. H. Woodger, *The Axiomatic Method in Biology* (1937), and the passage from Hume quoted in my note 12, above.

<sup>24</sup> The terms "time-stretch" and "time-slice" are due to Professor J. H. Woodger; cp. his "Science Without Properties". *Brit. Journal for the Philos. of Science*, ii, p. 193ff., esp. p. 202.

(a) We may say that the relation of genidentity (together with that of temporal precedence) gives rise to the continuum of the time-slices of  $A$ . But this continuum must be clearly distinguished from the body  $A$ . What is true of the body  $A$  is, in general, not true of the continuum of the time-slices of  $A$  which we may denote by  $C(A)$ . For example,  $A$  can move; this is not true of  $C(A)$ . And although the statement " $A$  moves (relative to  $B$ )", may be "translated" into one about  $C(A)$  and  $C(B)$ , such as "some slices of  $C(A)$  are spatially further away from the corresponding slices of  $C(B)$  than others", it remains a fact that the first statement is about a movable body while the second is about time-stretches of which movement cannot be predicated.<sup>25</sup>

(b) The relation of genidentity presupposes the unity or oneness of individual bodies, since it holds between the various states of *one* individual body.

This last remark indicates that there is, indeed, a link between our first and our second problem: provided we permit ourselves to discuss movement, or movability, in connection with the second problem, a durable unity or wholeness or self-identity of the moving thing, which constitutes our first problem, is presupposed. But this, I wish to re-assert, must be largely empirical; for the (durable) existence of solid physical bodies, as we know them, depends upon conditions such as sufficiently low temperature. In regions as vast as the inside of stars, what

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<sup>25</sup> This has the most interesting ontological implications. Take a language like Woodger's *WL* in which (1) the cardinal number of a name  $N$  is the number of individual objects named by  $N$  (*op. cit.* p. 196) so that (2) individual names are names of cardinal 1, and in which (3) only names of time-stretches (and their cup and sigma composites, i.e. names of joins of time-stretches) are of cardinal 1. The user of such a language commits himself to the following ontology: (a) A name which translates the English property words "moving" (or "movable") must be an empty name. (b) Movable objects don't exist. (c) Physical bodies don't exist. (d) Changing objects don't exist. (All this holds of a language into which we can "translate" all statements which are descriptive of physical objects and their movements.) *WL* was constructed to avoid a Platonic ontology. One is tempted to ask: is a Parmenidean ontology preferable?

we know as individual physical bodies cannot (durably) exist.<sup>26</sup>

Before concluding this paper, I wish at least to indicate a number of further problems which are connected with our topic.

(a) Empiricists (such as Occam or Locke) are inclined to assert that only individuals *exist*. This is an ontological view which is, clearly, in direct opposition to Plato, and which can be found, approximately, in Aristotle and Aquinas. I suggest that what is behind this ontology is a decision *a priori* to consider questions of existence as legitimate only if they have an *empirical character*.<sup>27</sup> Or in other words, a decision *to use the word* "exists" only as referring to entities with a spatio-temporal location, and only to such as are subject to generation<sup>28</sup> and decay, as Aristotle would have said,<sup>29</sup> or to such as may or may not exist for a span of time ("durably" as we just said). Although this question has therefore a linguistic aspect, I do not think that this is its only aspect, or that we can determine, or influence, what exists in the world by linguistic conventions—although the wording or our reply will, of course, depend on linguistic conventions.

(b) This problem is closely connected with the question of our intentions in using the word "individual". Are there individuals other than physical bodies? I do not see why we should not speak, for example, of individual processes, such as the burning of a candle (is there any

<sup>26</sup> This statement is, clearly, empirical (since it may have to be given up if our physical theories change); at the same time, it is part of a philosophical argument. This illustrates what I have said in "On the Nature of Philosophical Problems and their Roots in Science", *British Journal for the Philos. of Science*, iii, pp. 124ff.

<sup>27</sup> Cp. Locke, *Essay*, book iv, ch. xi, sect. 1.

<sup>28</sup> Cp. Locke, *Essay*, book ii, ch. xxvii, sect. 1., "... one thing cannot have two beginnings of existence ...".

<sup>29</sup> *Met. Z*, 15, 1939b20–1940a7.



fundamental difference between a physical body such as an organism and a process such as a flame ?); or of individual events—events of a certain kind taking place in a certain spacio-temporal region ; for example, a certain performance of Beethoven's Eighth Symphony.

This is simple enough. But what about the Eighth Symphony itself? Compared with an individual performance, it has decidedly the character of a Platonic idea—of a timeless model or paradigm. If, however, we consider that it has a beginning in time, that it was created by Beethoven, an activity in many ways analogous to the painting, by Rembrandt, of the "Night Watch" (which clearly is an individual), then we may feel inclined to call it an individual too, and to say that its individual performances are like copies, not of a Platonic original, but of an empirical one. But if this is so, then our anti-Platonism wears pretty thin. For why should we not then speak of a certain effect, say, a contrast of red and yellow, first used in the Night Watch, or even of a certain shade of red, as an individual? It is easy to say that Platonism is "sheer mythology"; it is also comparatively easy to draw a line between physical bodies and everything else; but it is not easy to draw a line which in a really convincing way separates individual things from Platonic ideas.

(c) Least of all will it be convincing if this line is drawn between certain linguistic expressions or usages. In this field, we have gone round in a strange circle since Russell first pointed out<sup>30</sup> the dangers of being misled by grammatical habits, such as the subject-predicate form of statements. The present tendency seems to be to rely on the wisdom of these linguistic habits, and to explain individuals as the denotata of terms which are essentially, or perhaps habitually, subjects rather than predicates.

A suggestion of this kind seems to me to be implied in Professor Lukasiewicz's paper as well as in a recent paper, "Names and Universals," by Professor D. L. O'Connor.

<sup>30</sup> The *locus classicus* is, I think, *The Philosophy of Leibniz*, pp. 4ff. and esp. Ch. ii, sect. 10.

I may misunderstand both of them, but it seems necessary to discuss these theories since others too may have misunderstood the passages in question.

Professor O'Connor criticizes<sup>31</sup> his opponents, the Platonists or realists, as follows: "Thus the realists' proposal amounts at bottom to claiming that proper names can serve as logical predicates and general names can serve as logical subjects and that these are their *primary* functions. . . ." Now this seems to me to suggest that there is a sense in which we can say that, primarily, proper names serve, or perhaps ought to serve, as subjects, and general words as predicates, and that it is this usage by which they are distinguished. This suggestion appears to me not only to be false, but to overlook the cardinal difficulty of our problem which arises precisely from the fact that we can, and do, use universal names as subjects just as if they were proper names. If I say, for example, "this shade of blue is exactly like the one I drew your attention to yesterday", or if I say "His friendliness is disarming" or "The validity of this argument is questionable," then clearly I am using universal words as subjects; and it is in this way that our difficulties have arisen.

I now come to Professor Lukasiewicz's account<sup>32</sup> of Leśniewski's Ontology in which, he suggests, the copula "is" is used as in every day life. This has, as he suggests, the two consequences that, in a true statement of the form "a is b", (1) "a" must be a singular term, and (2) if "b" is a singular term too, then "a" and "b" must designate the same thing. I do not know whether he (or Leśniewski) means by "singular term" an individual name such as "Socrates", although his examples (see also the last paragraph of his section 3) seem to suggest this. But if he means this, to the exclusion of universal terms (of the kind mentioned before), then, I assert, special stipulations

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<sup>31</sup> Proceedings of the Arist. Soc. 1952-1953, p. 188.

<sup>32</sup> I must apologize for my lack of familiarity with Leśniewski's Ontology. My criticism is confined to certain suggestions which seem to be contained in Professor Lukasiewicz's account.

and explanations would be needed to achieve this. For while "being is being" or even "man is man" may be excluded in the way he suggests, the exclusion of statements such as "truthfulness is a virtue" or "average velocity is distance divided by time" does not follow from his remarks (although it is, of course, easy to translate all these statements into innocuous ones).

But what we should remember in this context is that the most important of the Platonic universals were numbers.<sup>33</sup> And number-words may behave, in ordinary usage, very much like proper names.

Take the following set of four statements:

- (1) Plato is a man
- (2) Every man has a father who is also a man
- (3) Every man has exactly *one* father; that is to say, if the man *a* is identical with the man *b*, then any man who is a father of *a* is identical with any man who is a father of *b*
- (4) Plato is not a father of any man.

This corresponds exactly to the following statements of the theory of numbers:

- (1') 0 is a number
- (2') Every number has a successor which is also a number
- (3') Every number has exactly *one* successor; that is to say, if the number *a* is identical with the number *b*, then any number which is a successor of *a* is identical with any number which is a successor of *b*.
- (4') 0 is not a successor of any number.

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<sup>33</sup> The problem, of course, is not whether the number 3 exists in space and time—Plato says that it does not—but whether 3 is an entity (call it one which does not exist but subsists, or what you like) or a non-entity. According to Professor Łukasiewicz's account of Leśniewski's ontology, 3 must be an *ens*, because the statements "3 is a number" or "3 is odd" are true; for, he says, something "is an *ens* if something can be truly predicted of it" (cp. his section 6). According to the same passage, it even appears that "3 exists" is true; for it appears permissible to say "The number of books in my library is 3", and therefore, "For some *x*, *x* is 3"; and this, we hear, means according to Leśniewski the same as "3 exists".

The complete analogy between these two sets of statements shows why it is impossible to base the distinction between individuals and universals simply upon the ordinary grammatical usage of terms as subjects and predicates, and why it is so difficult to avoid the Platonic mythology, even if one wishes to do so.<sup>34</sup>

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<sup>34</sup> I am greatly indebted to Dr. Julius Fried for giving me the opportunity to discuss this paper with him.

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