Indeterminism and Indeterminacy

(4)

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The Nature and Use of Symbols in Science

> . . . Nomen symboli similitudinem et collectionem importat.
>
> ST. THOMAS.[1]

Logic, mathematics, and several departments of natural science must resort to symbols as distinguished from names. In logic and mathematics, symbols are the signs of what is now called 'formalization;' and when Eddington, for instance, speaks of "the symbolic character of the world of physics," by symbols he means something quite different from the linguistic signs we use to express the objects of what he calls the "familiar world," or to talk about symbols.[2]

The origin of the word 'symbol' may help us to understand how it differs from a name. The Greek noun 'symbolon' comes from the verb 'symballein', meaning, literally, 'to throw together': *syn*, with, *ballein*, to throw. Hence the meaning of symbol as the result of throwing together: a heap, or collection.[3] The word was used to mean a sign of an agreement, like a wedding-ring, of membership in a group, such as a uniform, or a passport; or a sign of rank, as the insignia of office. Finally we have the general meaning of 'sign', in which sense even a word is a symbol. But when we employ arbitrary signs as logicians, mathematicians, and physicists understand them, 'symbol', with regard to a more general meaning of sign, is used as a synechdoche, such as the word 'animal' when restricted to mean 'irrational animal' as distinguished from 'man', though man is not less an animal.

I. NAMES REFER TO THINGS THAT ARE *PER SE* ONE

Our usual communicative signs are words or names. Now we should note that whenever we can give a name to something, it is because our mind grasps the thing, or the operation, as something one *per se*, such as 'man', 'Socrates', 'magnitude', 'circle', 'to run',

1. *In III Sent.*, dist.25, q.1, a.1.

2. *The Nature of the Physical World*, Cambridge, *passim*.

3. This meaning is retained in the term 'Symbol of Faith', such as 'The symbol of the Apostles', which means a 'collection' of propositions held by faith, assembled in response to the particular contingent needs of the time, as distinguished from an intrinsically ordered presentation of doctrine. Cf. ST. THOMAS, *IIa IIae.* q.1, a.9. — Apropos of the definition of number, Lord Russell says "it is clear that number is a way of bringing together certain collections, namely, those that have a given number of terms." He qualifies numbers as "logical fictions" and "symbolic constructions" (*Introduction to Mathematical Philosophy*, London, Allen and Unwin, 1930, p.14).

'to taste', 'to add up', etc. However, we do not, in fact, have a simple name for 'a pale house-building flutist'. The individual who goes by the name of 'Oscar' may be a person who is all these things; yet, in reality, is one *per se*. But whatever Oscar may be, his being in reality one *per se* does not make his being 'pale', 'flutist', and 'builder', one in notion; for there is no *per se* connection between any of these things: one can be a man without any or all of such notes, or be subject to one of them without the other — though there may be good enough reasons why this man is a flutist, (e.g. inclination, ability, choice, and practice), why he is pale (always indoors), and why he can build a house (sufficient income, etc.). Yet, all that cannot be named as one quality. All we could say is 'This same fellow is all those things together', or, 'he belongs to the class of people who are all those things together'.[1] Although we can devise no single name to signify the characteristic of such a class, we can assign to it a symbol, such as ψ.

Now the important thing to note is that the symbol ψ in the above-mentioned context, stands for 'the property of a class' whose every member is both 'pale', 'a flutist', and 'a housebuilder'. In other words, the symbol stands for a combination of notions. But the name 'triangle' also stands for something that implies many notions, viz. 'figure', 'plane', 'bounded', 'three', 'lines', 'straight'. The words 'figure', 'plane', etc., like the words 'pale', 'flutist', and 'housebuilder', have meanings independent one of the other: a 'figure' may be not plane, but solid, i.e. bounded by a surface; things may be 'three' without being 'lines', and 'lines' without being 'straight'. Nevertheless, these two sets of notions have a radical difference: the notions implied by the word 'triangle' do constitute, actually, a single notion; the notions referred to by the symbol ψ do not. No name has been or could be designed to signify the combination of 'pale', 'flutist', and 'housebuilder'.

One might object that this is irrelevant inasmuch as all those words could be strung together and form an uninterrupted sequence of syllabes — as some languages permit. However, it is not the oral or visual structure that constitutes the name. Since words signify by convention, a sign such as a name is not at all essential to what it is used to signify; on the other hand, what the name signifies is indeed essential to the name. A conventional sign is a name only when the signified is something one *per se*. If, in some language or other, 'pale, flutist, housebuilder' might be written as a single word, this fusion would involve nonetheless as many names as there are distinct, separable meanings conveyed.

1. In terms of the 'calculus of classes' Oscar belongs to the class which is the logical product of the three classes: 'things that are pale' [a], 'flutists' [b], 'housebuilders' [c] viz. $(a \times b)c$, or (ab)c, whose product may be represented by any, single, arbitrary sign such as ψ.

For the present, it is enough to realize that the mind can combine objects which do not form something one *per se*, and can nevertheless express their combination in the mode of something one *per se*, by means of a single, arbitrary sign that is not a name. We must take note of this ability of the mind to prescind from the difference between what is one *per se* and one *per accidens* — a distinction which remains vital to knowledge of 'what' things are in themselves.

II. NAMES, SYMBOLS, AND INFINITE NAMES

To grasp more exactly what this type of symbol is, it may prove helpful to oppose it not only to the name but also to the opposite extreme of a name, viz. the 'infinite name'; for the symbol lies between the two. Words, in general, whether nouns or verbs, are vocal sounds — and written words the signs of spoken words — that signify, by convention, things as we know them. When we name *things*, such as this particular kind of animal called a 'horse', we do so through the mediation of some conception of the thing we name. The name 'horse', or its equivalent in any other language, is not natural to the horse: it does not belong to the horse in the manner of a part of that animal, nor of 'what it is to be a horse'. Neither does the vocal sound agreed upon signify our conception of a horse as a conception; though the name may thereafter be used to signify the conception, and even to mean the name itself. While the thing is named only inasmuch as we know it, and named, therefore, by means of the conception we have of it, it is *this* particular kind of animal that we call 'horse', whereas *that* one we call 'hen.' [1]

1. Failing to make these distinctions we might easily stray into some classical examples of sophistry, such as: 'Horse is a name; and this animal is a horse; therefore this animal is a name'. ARISTOTLE pointed out that "the most prolific and usual domain of [apparent reasoning and refutation] is the argument that turns upon names only. It is impossible in a discussion to bring in the actual things discussed: we use their names as signs instead of them; and therefore we suppose that what follows in the names, follows in the things as well, just as people who calculate suppose in regard to their counters. But the two cases [names and things] are not alike. For names are finite and so is the sum total of sentences, while things are infinite in number. Inevitably, then, the same phrases and a single name, may relate to a number of things. Accordingly, just as, in counting, those who are not clever in manipulating their counters are taken in by the experts, in the same way in arguments too those who are not well acquainted with the force of names misreason both in their own discussions and when they listen to others. For this reason, then, and for others to be mentioned later, there exists both reasoning and refutation that is apparent but not real" (*De Sophisticis elenchis*, c.1, 165a-20). The confusion of 'conception' and 'thing' provides a similar opportunity; it constitutes the very basis of some new, so-called dialectical philosophies. HEGEL, for instance, finds fault with textbooks on logic, because they fail to observe that "the individual is the universal" (*Logic of the Encyclopaedia*, n.166). HEGEL would be on solid ground if he meant that in the enunciation 'Socrates is a man', the *copula* '*is*' implies an identity of particular and universal. 'Man' can be said of Socrates

Now, the contradictory of a given name such as ' man ', is called an infinite name, viz. ' not-man '. An infinite name may be predicated of anything whatsoever that is or is not (e.g. ' a carrot is not-man ', or ' the impossible is not-man ') [1] except of that which it negates. Since it represents an absolute negation, it merely removes a meaningful term, such as ' man ', and posits nothing in its stead.[2] Even

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because Socrates *is* a man, not because he is ' man ' that can be said of Plato as well. It is therefore not less relevant to note that while ' Socrates is a man ' is true, ' Man is Socrates ' is false; for Plato, too, is a man, and Plato is not Socrates. If HEGEL's statement is intended to impiy the " contradiction in the very essence of things " upon which LENIN founds his own ' dialectic ', it means that ' Socrates ' is identical with ' man *qua* pre licable of many ' ; viz., that Socrates is asserted to be the relation of universality formed by the mind in comparing the notion ' man ' with *this* man and *that* — a relation wholly of and within the mind.

In the fragment *On Dialectic* appended, by the publishers, to his *Materialism and Empiriocriticism*, LENIN points out how " the method of exposition or study of dialectic in general " ought to begin by revealing the contradiction, so basic to this new philosophy, in " a current proposition of the simplest type : the leaves of this tree are green ; John is a man ; Medor is a dog ; etc. HEGEL noted, in a flight of genius, that there is already dialectic even there : *What is particular is universal.* This [*Lenin* goes on to say] is what ARISTOTLE had already said in his *Metaphysics* : ' We cannot think house abstractly, *the* house, which would be none of those we can see.' " LENIN gives no exact reference. What ARISTOTLE did teach is that ' house ' as such is not a *this something*, which can be pointed out ; that the predicable universal does not really exist apart from the many of which it can be said ; that there can be no becoming of ' what a house is ', i.e. of the very notion, but only of *this* house or of *that*. (*Metaph.*, VII, c.15, 1039 b 25. Cf. ST. THOMAS, *De Ente et Essentia*, c.3.)

1. « . . . *Non homo* non est nomen. Omne enim nomen significat aliquam naturam determinatam, ut *homo* ; aut personam determinatam, ut pronomen ; aut utrumque determinatum, ut Sortes. Sed hoc quod dico *non homo*, neque determinatam naturam neque determinatam personam significat. Imponitur enim a negatione hominis, quae aequaliter dicitur de *ente*, et *non ente*. Unde *non homo* potest dici indifferenter, et de eo quod non est in rerum natura ; ut si dicamus, *chimaera est non homo*, et de eo quod est in rerum natura ; sicut cum dicitur, *equus est non homo*. Si autem imponeretur a privatione, requireret subiectum ad minus existens : sed quia imponitur a negatione, postest dici de ente et de non ente, ut Boethius et Ammonius dicunt. Quia tamen significat per modum nominis, quod potest subiici et praedicari, requiritur ad minus suppositum in apprehensione. Non autem erat nomen positum tempore Aristotelis sub quo huiusmodi dictiones concluderentur. Non enim est oratio, quia pars eius non significat aliquid separata, sicut nec in nominibus compositis ; similiter autem non est negatio, id est oratio negativa, quia huiusmodi oratio superaddit negationem affirmationi, quod non contingit hic. Et ideo novum nomen imponit huiusmodi dictioni, vocans eam nomen *infinitum* propter indeterminationem significationis, ut dictum est » (ST. THOMAS, *In I Periherm.*, lect.4, n.13).

2. « Negatio autem est duplex : quaedam simplex per quam absolute dicitur quod hoc non inest illi. Alia est negatio in genere, per quam aliquid non absolute negatur, sed infra metas alicujus generis ; sicut caecum dicitur non simpliciter, quod non habet visum, sed infra genus animalis quod natum est habere visum. Et haec adest differentia huic quod dico unum praeter « quod est in negatione, » idest per quam distat a negatione : quia negatio dicit tantum absentiam alicujus, scilicet quod removet, sine hoc quod determinet subjectum. Unde absoluta negatio potest verificari tam de non ente, quod est natum habere affirmationem, quam de ente, quod est natum habere et non habet. Non videns enim potest dici tam chimaera quam lapis quam etiam homo. Sed in privatione est quae-

'man' in 'not-man' is in no way what this term would be presumed to signify, although it must be had in mind if the import of the negation is to be understood. Now, inasmuch as 'not-man' does not signify any definite thing or nature, and is predicable of what is not as well as of what is in any way, it is not really a name at all. For want of a recognized expression Aristotle called such a negation an indefinite or infinite name.[1] Yet, inasmuch as the mind invests this negation with the relation of predicate, the infinite name is something one according to reason,[2] for it is true that the same infinite name can be said of anything, except of that which it negates.

The absolute negation expressed by the infinite name should not be confused with the negation that is confined to a given genus. E.g. the expression 'not-white' may be interpreted in two ways. [*a*] Either as an infinite name: and then it can be said of anything, such as number, angel, black, nothingness, etc.; it is in this sense that we may say 'Anything is either white or not-white'. [*b*] Or it may be understood as a negation within the genus 'colour'; then it may be said only of the 'colours' that are not white. In the genus triangle, not-equal-sided means 'either isosceles or scalene'; in the genus 'tree', 'not-oak' remains confined to all other kinds of tree. But if every negation of a name, such as 'not-man', were conceived as a negation in a given genus, that would imply that all things, as well as whatever is impossible, are of the same genus, as 'colours' are, or 'whole numbers' — unless 'not-man' were understood as a negation within the genus 'animal', which should then be interpreted 'any non-human animal'.[3]

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dam natura vel substantia determinata, de qua dicitur privatio : non enim omne non videns potest dici caecum, sed solum quod est natum habere visum. Et sic, cum negatio, quae in ratione unius includitur, sit negatio in subjecto (alias non ens, unum dici posset) : patet, quod unum differt a negatione simpliciter, et magis trahit se ad naturam privationis, ut infra decimo hujus habetur » (ST. THOMAS, *In IV Metaph.*, lect.3, n.565).

1. *Perihermenias*, c.1, 16 a 30 — Cf. ST. THOMAS, *Ibid.*, lect.4, nn.12-13 ; lect.5, nn.11, 18.

2. *Ibid.*, c.10, 19 b 5. « . . . *Non homo* non est nomen, sed est infinitum nomen, sicut, *non currit*, non est verbum, sed infinitum verbum. Interponit autem quoddam, quod valet ad dubitationis remotionem, videlicet quod nomen infinitum quodam modo significat unum. Non enim significat simpliciter unum, sicut nomen finitum, quod significat unam formam generis vel speciei aut etiam individui, sed in quantum significat negationem formae alicuius, in qua negatione multa conveniunt, sicut in quodam uno secundum rationem. *Unum* enim eodem modo dicitur aliquid, sicut et *ens* ; unde sicut ipsum *non ens* dicitur *ens*, non quidem simpliciter, sed secundum quid, idest secundum rationem, ut patet in IV *Metaphysicae*, ita etiam negatio est unum secundum quid, scilicet secundum rationem. Introducit autem hoc, ne aliquis dicat quod affirmatio, in qua subiicitur nomen infinitum, non significet unum de uno, quasi nomen infinitum non significet unum » (*In II Periherm.*, lect.1, n.3).

3. HEGEL, for instance, does not take note of this distinction and, owing to still another confusion about the nature of the relative negation (i.e., 'negatio in aliquo genere vel subjecto' (*In IV Metaph.*, lect.3, n.565) he accordingly reaches the statement that even

Now, since the mind can bring together objects which do not belong together in virtue of what they are, and which in themselves do not form something one *per se* ; since we can relate to one another things that are quite unrelated in themselves, making, e.g. a mentally ordered whole out of a heap, to such a whole, which has no proper name, the mind can assign an arbitrary sign in the mode of a name. Such a sign would be a symbol implying reference to the original meaning, viz., ' collection '. Only a symbol, in this sense, could be the substitute for a name, and used to signify what has no more than the unity of a collection or incidental whole. This, then, is one meaning of ' symbol ', to be distinguished over and against both ' name ' and ' infinite name '.

For instance, in the statement ' all the objects in this heap are, together, 25 ', viz. : a shoe, a cabbage, a sheet of newspaper, etc. ; concerning them we can distinguish a twofold unity : one which is theirs because they are here, heaped in the same place ; the other is due to the fact that each is an *object* and that together they are 25. In either case the reason why they form a whole is extrinsic to what these things are, namely the place they have in common, or the fact that each and all are invested with the intention of ' object ' and that the mind can group them in that respect as if they were a whole, viz. a totality of 25. No matter how different, things such as a horse, a point, a sneeze, and a relation of identity, can be brought together by the mind under the heading of ' objects ' and be set forth as an instance of 4, where ' 4 ' is the symbol of such a collection.

III. THE SYMBOLS OF LOGIC AND OF MATHEMATICS

Symbols are used in the logic of the syllogism considered as to form ; such as M for the middle term, P for the major extreme, and S

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contradictory terms have a middle (*op. cit.*, n.119). Actually, the opposition of the latter terms, such as ' white and not-white in the genus colour ' is also one of contradiction ; whereas the opposition ' white and black ' is not, though ' black ' is of course ' not-white '. Now, between ' white ' and ' black ' there are intermediate terms, such as ' grey ', ' red ', etc., each of which is not-white. Perhaps HEGEL — who seldom stops at such details to explain himself — implied that, since between ' white ' and ' not-white that is black ', there are intermediary terms, not every ' white ' and ' not-white ' (e.g. black) exclude a middle (e.g. green) ; therefore contradictories allow a middle. If that is what he had in mind, the error lies in failing to realize the difference between the opposition of contradiction (' white ' and ' not-white ') and the opposition of contrariety (' white ' and ' black ' which is of course ' not-white '). He appears to assume, therefore, that in the traditional understanding, ' to be not-white ' is commensurately the same as ' to be black '. But this assumption would be of no help to HEGEL, since ' black ' is a contrary, not a contradictory term. A similar indifference to the distinction between *contrary* and *contradictory* appears in the *Formal Logic* of AUGUSTUS DE MORGAN (London, Taylor and Walton, 1847) who states, quite plainly : " I intend to draw no distinction between these words ". The examples he gave were " tree and not-tree, man and not-man " (p.37). This neglect leads to some unnecessarily confusing statements on 'the universe of discourse', that are generally taken for granted.

for the minor extreme. These signs should not be understood as abbreviations of names : they are not succinct ways of writing Subject, Middle, and Predicate. In fact, these particular letters have a distinct drawback inasmuch as they appear to be substitutes for words. We may, with advantage, replace them by *A*, *B*, *C* — which correspond to the alphabetic order (from which Aristotle chose his symbols) — provided they stand for anything that may be invested with the logical intentions of extreme (*A*, *C*) or middle (*B*) terms. The symbols of formal logic are called ' transcendent terms ' because they signify ' *omnia et nihil* ' : everything and nothing.[1] B, for instance, would signify anything that can be invested with the logical relation of middle term, yet not any such thing in particular ; it stands for whatever may turn up as the middle of a syllogism, such as ' man ', ' triangle ', or ' impossible '. What these things have in common refers to an operation of the mind, whereas in reality they may be as incongruous as ' point ', ' sneeze ', or ' nothing '.

The operational symbols of formal logic have, in their proper context, the greatest generality and indetermination inasmuch as they transcend all categories, as well as whatever is conceived in the mode of a category. (We may syllogize about relations of reason.) Since they refer to whatever may be invested with the relation of a syllogistic term, we might call them ' transcendent variables '. These should not be confused with the symbols of mathematics. E. g., in demonstrating the proposition ' If from an even number an even number be subtracted, the remainder will be even ' (EUCLID, IX, 24), the actual subtraction of the even number BC from the even number AB is not by itself the demonstration, though essential to it ; and these symbols differ, in kind and in function, from the transcendent terms A B C. First, they stand for and are confined to even numbers ; second, they

1. In his exposition of the Organon, *Priora Analytica*, ST. ALBERT makes this point on the symbols of logic. " Et quia de syllogismo loquimur simplici, qui tantum formaliter syllogismus est, et in omni materia habet poni, et nullius materiae est proprius, ideo terminis utimur transcendentibus, nihil et omnia significantibus. *Nihil* dico, quia nullam determinant materiam. *Omnia* vero dico significantibus : quia omnibus materiis sunt applicabiles, sicut sunt A, B, C " (Lib.I, Tract.I, cap.9). " Pro terminis autem utimur terminis transcendentibus : eo quod haec ars communis est, et omni materiae aptabilis, et nullam sibi determinat materiam specialem : terminos autem transcendentes vocamus A, B, C, eo quod termini illi nihil secundum se significant : et ideo pro omnibus possunt poni. Nos enim non quaerimus hic nisi generationem syllogismi secundum formale esse suum secundum quod syllogismus est : et ideo oportet tales terminos ponere, in quibus non significetur nisi forma syllogismi : quia si aliquid significarent determinate, non denotaretur in eis forma omnibus applicabilis " (*Ibid.*, Tract.II, cap.1). — The Borgnet edition of ALBERTUS MAGNUS'S *Opera Omnia* (Paris, Ludovicus Vives, 1890) has long been out of print, but mimeograph copies, from this edition, of all the logical treatises can be obtained at the Presses Universitaires Laval, Québec, Canada. We know that the editors of the excellent critical edition of the *Opera Omnia* (.....) are aware of the timeliness of ST. ALBERT'S exposition of the Organon. The text is nearly ready, but may not appear for some time, unless funds are made available. This is an aside to the Foundations.

are used here for the sake of demonstrating a property revealed by the subtraction. Need we point out that the result of the calculation is not identical with the conclusion of the demonstration ? [1] The result of AB-BC is AC ; on the basis of which we conclude that ' if from an even number an even number be subtracted, the remainder will be even.' AB stand indeterminately for any even number, from which we may subtract any even number BC, part of AB. The difference is therefore not only one in scope : it is also defined by different operations. The symbols AB and BC stand for numbers which may be the subject of calculation. Specifically, the middle term in this proof is, as such, not a subject of calculation at all : it is none other than the definition of even number (viz., a number ' divisible into two equal parts '), which could hardly be symbolized in the subtraction itself ; while ' an even number ' — namely, any one of the series of even numbers — would be represented by a symbol of calculation, but not by ' even number ' as such.

IV. THE SYMBOLS OF ALGEBRA

Note that in the above example we were not seeking to identify any particular value of the variables AB and BC : the latter are not signs of unknown quantities to be determined by way of calculation. They are not algebraic symbols if by these we mean the signs representing the unknown values of an equation to be resolved. For a symbol, e.g. x, may stand for an unknown in two ways : [a] as in the algebraic rule : $x = -\frac{b}{a}$, where the values are indifferent, in the manner of logical symbols ; or [b] as in the particular equation $x + 2 = 5$, whose general form is $ax + b = 0$.

In the first instance, x stands for any value such that $x = -\frac{a}{b}$; the equation being no more than the expression of the general rule applied in solving equations with one unknown value, of the first degree, whose general form is $ax + b = 0$. Here, the values of $ax + b$ must be such that they equal 0. The symbolic expression of the rule raises no problem of determinate values.

In the second instance, x stands for an unknown yet wholly determined value, viz. the difference between 5 and 2, or $5 - 2$. We must note that this subtraction is not used to demonstrate a property, but merely to identify the value of x, viz. 3.

The same graphic sign may therefore be a very different kind of symbol. If we confine the sign of equality (=) to things that can be

1. Such a reduction is implied nonetheless when it is said that, considered in its *esse formale*, the syllogism can be reduced to the elementary calculus of propositions and the calculus of propositional functions. The symbols of calculus are meaningless in a sense in which those of the syllogism are not so.

equal inasmuch as they are of the same nature, the symbols of algebraic rules do not differ in kind from those employed in the arithmetical demonstration of a property of even numbers, inasmuch as neither stand for determinate values — the values, within a given context, remain completely indifferent — ; and both refer to calculation, in which they differ from the symbols of logic.

Both mathematical and logical symbols are operational. The former are terms in the operations of calculation ; the logical symbols are terms of the syllogism considered as to form.

To assume that the symbols of logic and those of mathematics have the same generality, (e.g.) that in the equation $y = m + x$, x can have a generality coextensive with B, the middle term, would imply either that the nature of the things to which mathematics applies is in itself perfectly indifferent — which is indeed the case from the view-point of calculation — or that all things are fundamentally of the same nature, inasmuch as equality proper can exist only between things of the same nature.[1]

We must now turn to the difference between ciphers and operationals variables ; and, finally, to the symbols of mathematical physics.

(To be concluded)

CHARLES DE KONINCK.

1. The science of arithmetic is not indifferent to the nature of its numbers. It is the art of arithmetic that is quite indifferent to the nature of whatever it is applied to, even to the numbers of the science. In applying the art, we make assumptions for which it cannot be held to account. E.g., when counting the number of persons in a given room, we assume what is meant by a room ; by ' this same room ' ; we also assume that each person is a unit. But whether each person is a unit in the sense in which a point (and even a single zero) is a unit, or in that in which a bundle is a unit, remains indifferent to the counting. If understood of the art, we must agree with what WHITEHEAD says in *An Introduction to Mathematics* : " Now the first noticeable fact about arithmetic is that it applies to everything, to tastes and to sounds, to apples and to angels, to the ideas of the mind and to the bones of the body. The nature of the things is perfectly indifferent, of all things it is true that two and two make four. Thus we write down as the leading characteristic of mathematics that it deals with properties and ideas which are applicable to things just because they are things, and apart from any particular feelings, or emotions, or sensations, in any way connected with them. This is what is meant by calling mathematics an abstract science » (p.9). The sense in which a person is a unit cannot be described in terms of the art. Attending to what it is that is being counted, LORD RUSSELL would have to reply that the number of persons in this room is a certain bundle of bundles of events. Assuming the unit of the art, in what sense the events themselves are they units? Is it so plain that a single event is not in its turn a bundle? Taking RUSSELL's view, could we know that anything in nature is *not* a bundle, no matter how atomic it appears? It seems that if whatever it is that we count had to match the indifference of the terms employed in counting, it would have to reduce to atomic units — like the atoms before they were complexe — or to bundles of such units.

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(To be concluded)

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1. The science of arithmetic is not indifferent to the nature of its numbers. It is the art of arithmetic that is quite indifferent to the nature of whatever it is applied to, even to the numbers of the science. In applying the art, we make assumptions for which it cannot be held to account. E.g., when counting the number of persons in a given room, we assume what is meant by a room ; by 'this same room' ; we also assume that each person is a unit. But whether each person is a unit in the sense in which a point (and even a single zero) is a unit, or in that in which a bundle is a unit, remains indifferent to the counting. If understood of the art, we must agree with what WHITEHEAD says in *An Introduction to Mathematics* : " Now the first noticeable fact about arithmetic is that it applies to everything, to tastes and to sounds, to apples and to angels, to the ideas of the mind and to the bones of the body. The nature of the things is perfectly indifferent, of all things it is true that two and two make four. Thus we write down as the leading characteristic of mathematics that it deals with properties and ideas which are applicable to things just because they are things, and apart from any particular feelings, or emotions, or sensations, in any way connected with them. This is what is meant by calling mathematics an abstract science » (p.9). The sense in which a person is a unit cannot be described in terms of the art. Attending to what it is that is being counted, LORD RUSSELL would have to reply that the number of persons in this room is a certain bundle of bundles of events. Assuming the unit of the art, in what sense the events themselves are they units? Is it so plain that a single event is not in its turn a bundle? Taking RUSSELL'S view, could we know that anything in nature is *not* a bundle, no matter how atomic it appears? It seems that if whatever it is that we count had to match the indifference of the terms employed in counting, it would have to reduce to atomic units — like the atoms before they were complexe — or to bundles of such units.

Existentialisme et nécessité de la mat. La matière pure n'existe pas. Principe d'absolue de l'une sur la forme.

Hasard Finalité

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Dans le dét. tte fin est réalisée par hasard. D'autre part, le hasard n'a pas de sens sans finalité. Dans la nature les choses arriveraient comme si....

L'"opus naturae" n'est pas l'œuvre de la seule intelligence : la nature proprement dite y a sa part. Du reste, l'intell. séparée, mais créée, ne saurait .... elle a besoin de la nature. Exinde.

C'est l'écart entre la fonction et la notion à disposer qui est la raison de cette contrainte. Secus on pourrait raisonner à rebours.

Pour donner cette contrainte il faudra
- ou bien nec. de la mat.
- ou les causes naturelles ou rationnelles causes.

Le mot d'altération (plus nec.
(tte au plus mot local)
(ni pas augmentation, car ordonnée à perf. de la substt.)

Predeterminism and Indeterminacy

Bertrand Russell has pointed out that in modern usage the word 'cause' enjoys one single meaning, akin to what Aristotle called the agent cause. It is true that we do speak about "what a thing is made of" and that we do use the words 'form', structure, etc., but we are not wont in English to talk of them as 'causes'. There are probably some very good reasons why that should happen; certainly, to equate 'causality' with 'agency' — as in " I made this" or "I did that" — seems quite natural and fitting (at first; just as it seems quite natural that we should usually resort to 'names' at first, e.g. 'table', 'man', etc., when elaborating upon the nature of 'words', although in this case, of course, hardly anyone would ever seriously claim that all words are therefore names. And no doubt it is simpler to have one name for one single kind of thing. It is none the less worth bearing in mind also that, as Da Costa Andrade puts it, not without humour, "the word represented by 'cause' has sixty-four meanings in Plato and forty-eight in Aristotle." It deserves our attention, I say, if only as a reminder that a discussion of causality need not necessarily enjoy the extraordinary simplicity which the Humean treatment lent it; and that it cannot, surely, be so confined, if the views of the above people mentioned are to be in fact met and criticized at all responsibly.

Be that as it may, the view put forth at some time by Russell, that 'causality' should mean that the future is predetermined in the past, -- much the way Laplace would have it, -- is plainly a very uncomplicated one. On such an understanding, 'causality' means utter determinism. Hence, if there are areas in the world of the physicist where such 'causality' does not prevail, it appears that in those areas things occur without a cause.

A good number of contemporary physicists are aware that the matter is not all that simple. I have in mind both the Copenhagen school on the one part, Prince Louis de Broglie and David Bohm on the other. Although they are at loggerheads in their interpretations of the relations of indeterminacy, they all reintroduce in the philosophy of physics the ancient distinction between necessity and contingency. Heisenberg, for one, in his Gifford Lectures, maintains that we must again distinguish in nature the possible from the actual, and he repeatedly refers to what he calls Aristotle's 'potentia' (cf. dunamis or dunaton or endechomenon). If Heisenberg's reference is to have meaning, we must understand what he intends and what particular meaning of 'potentia' in Aristotle corresponds to what Heisenberg expresses. On first sight, the distinction between possibility and actuality seems trivial: when something is actual it must have been possible before becoming actual, e.g. yesterday it must have been possible for the sun to rise to-day. That is not the kind of possibility

which Heisenberg attends to here; he is concerned rather with the kind of possibility which, to retain our example, we see when we consider that if it is possible for the sun to rise it must be simultaneously possible for the sun not to rise. This is what Aristotle meant by 'potentia' in his dunamis hama tès antiphaseôs, and it may be worth fastening upon this meaning awhile.

The 'potentia' in question refers, we said, to a simultaneous possibility of contradictories. Thus, since it is possible for me to stand, it must be possible for me not to stand. If there were (for me) no possibility of standing, so that the only possibility for me were not to stand, the latter 'possibility' would be the same as the 'possibility' first mentioned. In other words it would be false to say that it is possible for me not to stand if it were not also possible for me to stand. What forces itself upon us at this point is the distinct (to be drawn) between the term 'possible' as opposed to 'impossible' and the term 'possible' as opposed to 'necessary'. Now these two oppositions are not opposed one to the other, insofar as the 'possible' opposed to the 'necessary' is included in the 'possible' opposed to the 'impossible'. I mean that both the 'necessary' and the 'possible' opposed to it are opposed to the 'impossible'; were the 'necessary' not 'possible' as opposed to the 'impossible', it would plainly be 'impossible'.

If I understand him correctly, the 'possible' to which Heisenberg refers is the one opposed to the 'necessary', namely the said potentia simul contradictionis. There is no room for

such potency in determinism; ~~in fact~~, determinism might well be described, I think, as an implicit negation of the simultaneous possibility of contradictories.

However, it is important to be aware that the validity of this type of possibility as applied to the physical world is entirely independent from Heisenberg's own principle of indeterminacy. I am part of the physical world as much as any stone. I feel quite certain that it is possible for me to stand or not to stand — with all due qualifications. The absence in me of such possibility would mean that I could never stand or else could never not stand. When I in fact do stand it would not have been possible for me not to stand, or again when I in fact do not stand it would not have been possible for me to stand. Now, the same applies to the stone (let it not be too large a stone) with reference to me, inasmuch as it can be picked up by me or not. In other words, there must be in nature a potentia simul contradictionis. How far this goes, I do not know; but I insist that I am part of nature and that there are other things in nature which, whether alive or not, yet contain that type of possibility, within the range where they are open to my activity or inactivity about them. Such a possibility I know by an experience as certain as the one that informs me that there are stones — though I should beg you not to press me too hard on what stones are.

The mere fact of taking such an experience into acconnt apparently creates an uncomfortable situation in the world of mathematical physics. Potentia simul contradictionis is in mathematics quite irrelevant, but then, mthematical physics is not just mathematics. The examples I have given may serve as indications of the difference between the two realms. Physical things cannot be fully reduced to abstract quantity nor is it enough to 'reify' the mathematical to account for the physical. Curiously, this is implicitly acknowledged even in the context of the so-called principle of causality already described. For the notion of efficiency, of agent cause, is entirely foreign to mathematics as such; while the principle was in reality intended to subject nature to a rigour equal to that of mathematics itself. Now if what is prior in time necessitates what comes after, this necessity, to be valid, must be subject to experimental verification. Verification of a sort can be achieved under certain limited conditions together with innumerable provisos. These conditions and provis will show that the principle in question, when taken as universally necessary, is actually tautological. Thus we can say that a body of a given weight and size will fall to the earth in a straight line, at a given time, at a certain spot, provided nothing deflects it from its course. Which is but another way of saying that it shall fall to the ground in a straight line, (also.) provided it does. For the prediction to hold firm here and now, the requisite provisos are unaccountably infinite. This is in practice paralyzing and absurd, of course, but it does manifest that the principle

of causality' concerned cannot be verified in a universally valid way.

At any rate, the difference between the analytical rigour of mathematics and the unaccountable infinity of physical circumstance is not very difficult to see. Heisenberg's recourse to Aristotle's potentia — though this he applies in an entirely new context — could appear revolutionary only because of the extrapolation of Newtonian Mechanics to the universe as a whole. This extrapolation, as Max Born emphasizes, is contrary to everyday experience: it would in effect reduce us to helpless cogs in a vast machine.

Let us turn to another contemporary physicist, who has examined the question of indeterminism in great detail, and who does not believe that the Copenhagen interpretation of indeterminacy ought to be taken as definitive. David Bohm lays down the general principle that we must continue to probe, criticize and test every feature of every theory, no matter how fundamental that theory may seem to be. Which does not mean that Bohm considers the validity of our potentia simul contradictionis to be only or provisional temporary. On the contrary, he has, perhaps more than any other physicist writing about his science and about contemporary physical theory, brought out the important role of contingency in nature.

Bohm explains what he means by 'contingency' at considerable length in his Causality and Chance in Modern Physics. It is noteworthy that in doing so he should first deal, as Aristotle had, with the extreme kind of 'contingency' found in human affairs;

I refer to section 8 of chapter 1. His first instance of contingency is chance, in the sense of a purely accidental cause relative to man, which he chooses to explain by considering a "typical chance event", namely a particular automobile accident, where the slightest of an unlimited number of factors "might have prevented the accident altogether or might have changed its character completely, either for the better or for the worse". We see, then [he goes on to say], that relative to a context in which we consider, for example, the actions and precautions that can be taken by a particular motorist, each accident has an aspect that is fortuitous. By this we mean that what happens is contingent on what are, to a high degree of approximation, independent factors, existing outside the context in question, which have no essential relationship to the characteristic traits that define just what sort of a person this motorist is and how he will behave in a given situation. For this reason, we say that relative to such a context a particular collision is not a necessary or inevitable development, but rather that it is an accident and comes about by chance, from which it also follows that, within this context, the question of just where, when, and how such a collision will take place, as well as that of whether it will take place or not, is unpredictable. However, as the number of accidents under consideration increases, their ensemble acquires a new character, statistical regularities begin to appear. The individual accident remains unpredictable, but the fact that an approximate number of them should occur over a long week-end or in the course of a year, becomes likely and, accordingly, predictable up to a point.

Does this imply that where large numbers come into play, our simultaneous potency of contradictories tends to cancel out? Unless I misunderstand him, Bohm maintains that the individual accident is still truly contingent to the person to whom it happens, for better or for worse.

But why can an accident of the type described by Bohm take place? If the individual driver had everything under control, i.e. all the other drivers and himself as well, together with all possible circumstances, he should then be quite impervious to any accident of that type; yet no driver has such control, and obviously none could have. To be sure, the inexperienced driver is in some circumstances a more likely subject than the experienced one; but none is at all secure against every accident, whatever his experience and skill. [One might even, per impossibile, speculate here, although briefly, on what an 'omniscient driver' would do; certainly, he would not 'drive'. Not, I don't think, because he would with perfect lucidity see his 'future' driving in its 'past' predeterminations, in which case he could not 'drive' either, at least not at all in the sense you and I vaguely do, where there seems to be left on most occasions some prerogative of choice or other. Rather, he would not because, for one thing, there could hardly be to him any 'past' or 'future' in respect of 'driving' and driving, as, you will agree, submitted to time. I say this -- and have waived in the juxtaposition of 'omniscient' and of 'driver' a plain contradiction in terms -- lest the kind of knowledge and of ignorance (of predictability and unpredictability) involved in these examples be confused with the sort imagined by Laplace, or, for that matter, by propounders of the so-called 'principle of causality'.]

Like Aristotle, Bohm is concerned initially with the fortuitous, i. e. with chance in human actions. Aristotle had observed that we are exposed to fortune, good or bad, because our knowledge of the circumstances amidst which we act is limited. It is therefore only natural that there be fortuitous events. The root of fortune is ignorance and the inevitable limitations due to it in our practical actions. Consequently, the relative frequency of individually unpredictable events will be nothing but a function of our lack of knowledge in the practical order. The fact that the latter could never be wholly removed provides in the end the very basis of a measure of predictability. Our ignorance in our actions is just as much a constant as our knowledge is; little wonder that the effects of these correlative constants should acquire a numerical value. That is why, conversely, the approximate number of predictable accidents over a long week-end in these United States, say, does not at all suppress the indetermination on the part of whoever incurs the accident. It is necessary that there be fortuitous events; but that does not make any of these particular events necessary.

It is evident, then, that in using the word 'chance' apropos of an individual accident and in retaining thereafter the same word to signify 'laws of chance', we have, perhaps unwittingly, added a new meaning to that word. There is excellent reason to retain the same name in this way, but we must remain aware that meanings are distinct.

I have dwelt a little on Bohm's approach to the question of contingency in nature, for it is best in point of philosophical method to analyse first as he does the meaning of the kind of chance with which we are familiar, and then to move on to the less familiar meaning of chance as applied to nature outside human affairs. The transition is not an easy one.

Plainly, we, in our dealings, act for a purpose; if nature, too, acts for a purpose, there will be, to that extent, a proportion between human action and nature. Now we do easily see that those animals which are familiar to us seek pleasure and avoid pain. The animal trapped in a forest fire may well be said to have been the victim of chance. Similarly, to quote an example I have given elsewhere, chance can be recognized in the case of the lioness which, having lost her cubs during an elephant raid, finally gives up the search when she loses their scent at the stream they had fled across; then there appears an antilope which she pursues for the sake of food; the prey leaps across the stream, and the lioness in pursuit is suddenly faced with her cubs. Since this discovery can be called a good, it is a chance event in nature.

Yet if we confine ourselves to the so-called inanimate world and consider it in abstraction from any kind of life, especially from animal life, it is practically impossible for us to recognize concretely what is good in it, so that we could not then speak of chance in the senses so far [illegible] marked

If, further, we confine ourselves to the viewpoint of mathematical physics, we will, insofar as it is mathematical, perforce abstract from anything which can be called good, and will not, once again, be able to speak of chance without lending the word still a new meaning. The question then is whether this new meaning will be understandable without reference to the previous ones. It could be related to the first meaning of chance in respect of unpredictability, but if the unpredictability is due only to our ignorance we are again faced with the so-called 'principle of causality' indicated. The principle is one which, if it did hold good in nature, and unrestrictedly so, we could never verify. The question now is, can physical phenomena be sufficiently accounted for without the *a priori* necessity of that principle? If so, we imply that there is a measure of indetermination in nature but such that it is compatible with vast regularities sufficient to warrant predictability.

We must insist, however, that it is an indetermination quite foreigh to mathematics as such: We would attribute it to nature and accordingly to mathematical physics qua physical.

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Le déterminisme a la fois logiciste et matérialiste:
- le développement absolument rigoureux
- cette rigueur ne serait autre que la nécessité de la matière - que sa priori.

Cela découle de la négation de la finalité de la fin, et de l'intelligence. La rationalité que le doux déroulement du monde suppose, a été subjectée dans, et identifiée avec le monde lui-même. (Si cela était possible, on ne voit pas pourquoi le monde serait monde, il serait.)

Causa sufficiente posita, necesse sit effectum sequi.
Tout conséq. (pour!) contenu dans l'antécédent.
On passe du probable à l'existence.
Cela veut dire que l'on fait abstraction de ce qui réellement est: on attribue à ce qui est, ~~est~~ un caractère que seule l'intelligence peut concevoir.
Conception logiciste de la nature.
Ce qui suit logiquement dans un syllogisme probable ne suit pas pour cela réellement!

[La Nature est constituée de singuliers matériels. La vérité: "L'homme est animal ~~raisonnable~~ risible n'entraîne pas que Socrate existe, ni qu'il est entraîné de rire. Socrate n'est ni déplorable, ni principe de science.]

Puisque l'homme est mortel, Socrate mourra. Mais il ne s'ensuivra pas que l'homme est mort.

Épistémologie

Hasard & calcul

Résumé Achin Cash.

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Le même mot de hasard s'employe dans le contexte du calcul des probabilités

Le C. s'est appliqué à montrer les différents sens du mot hasard selon qu'il est employé d'une part à propos du calcul des probabilités, et selon qu'il est entendu d'autre part dans et dans le langage courant et en philosophie. Comme notion de fait il signifie en mathématique une valeur numérique exacte qui n'a aucun rapport avec l'action pour une fin, tandis que en philosophie au pdv pluto sophique il signifie cause indéterminée, [illegible] irrationnelle, de l'un événement qui possède la nature d'une fin mais qui n'était pas de l'intention de l'agent dans cette action particulière. Dès lors, quand on dit en cosmogonie que notre planète s'est formée par hasard, ou que la vie dans l'univers est à ce point improbable qu'il faut attribuer sa réalité au hasard, il faut s'entendre. Ce qui au pdv calcul des probabilités est d'une improbabilité qui avoisine l'impossible, voilà qui peut être pour [illegible] précisément le but visé par l'agent. Si, en tirant un coup de fusil sur un canard un seul petit plomb le descend, j'ai atteint le but et du coup que j'ai tiré et du grand nombre des petits plombs qu'il a dispersés.

Philo de la nature

causalité

hasard

(vers 1937)

De la causalité accidentelle dans la nature. Il n'y a de hasard que lorsqu'un événement déborde les limites mêmes de la nature, limites entre lesquelles il y avait déja un certain jeu. Il n'y a pas lieu de s'étonner de pareille éventualité. En effet, quelle que soit la perfection de la forme, il reste toujours une marge d'indétermination qui l'excède, et qui peut faire manquer, voire réussir,un effet nullement prédéterminé dans la nature, ni dans la nature particulière, ni dans la nature universelle. Il y a hasard lorsque la nature, déterminée ad unum, n'est pas cause de l'effet; lorsque cet effet n'a point de cause naturelle et per se; lorsque l'effet ne peut être attribué qu'à une cause indéterminée, et qui n'est en l'occurence autre chose que cette marge d'indétermination qui déborde la forme et la matière déterminée d'un composé. Le hasard n'est autre chose que cette marge d'indétermination en tant que cause d'un effet qui n'est aucunement dans l'intention primaire ou secondaire de la nature.

1) Le hasard,pris comme antonomase, est opposé à la fortune. "Omne quod est a fortuna est a casu....." Exemple de Malo 16/7/16. Et exemple d'Aristote: le eheval.Metaph. -

2) Il est opposé aussi à l'art, non seulement parce le principe est extrinsque, mais aussi parce qu'il comporte finalité, et c'est par là que l'art diffère de la fortune. (Ethic. 1159) Phil. 1185

3) Et enfin, le hasard s'oppose au violent,"quod est a principio extrinseco vim passo non conferente" et contre l'inclination d'une nature. Le violent peut

entrer dans un phénomène de hasard, mais ce n'est pas en tant que violent qu'il est cause de l'accident à titre de. Le violent est une cause déterminée et extrinsèque. Violoence et hasard sont faciles à confondre lorsqu'avec Vasquez, on refuse de voir dans la matière une nature, et d'autre part une cause indéterminée.

4 On confond souvent le hasard qui est une cause, et l'effet qui procède de cette cause: on ne distingue pas le casus et du casuale. Si le hasard était un effet, il nous resterait à déterminer de quelle cause il provient. Si cette cause était déterminée, l'effet ne serait plus casuel. "...ex quo non quodlibet, quod fit habet causam.....neque generationem" (Met.1201) Entre le hasard et le phénomène produit par hasard il y a toute la différence entre l'indétermination et la détermination.

5 Il est une cause per accidens qui s'oppose au nécessaire, puisqu'une cause n'est accidentelle que par son caractère indéfini et indéterminé. Cela est dit clairement dans la Ia 115,a6; où S.Thomas se rend parfaitement compte des difficultés qu'implique le hasard (opposé à la fortune) cause non-nécessaire: "...nihil prohibet....."

6 Id quod est ut in pluribus est causa entis per accidens. "Ens ut in pluribus, est causa et principium quod aliquid sit per accidens. In rebus enim quae sunt semper, non potest esse aliquid per accidens; quia solum quod est per se potest esse necessarium et sempiternum...Unde relinquitur, quod solum in contingentibus potest esse ens per accidens." (Cont. 1182)

"Causa per se est finita et indeterminata; causa autem per accidens est infinita et indeterminata, eo quod infinita uni possunt accidere."(Phys.II,lect 8,n.8) Un chien peut être tué par la chute d'un arbre, soit en poursuivant un chat, soit en enterrant un os etc. Et l'arbre peut tomber, soit parce qu'il est pourri, soit par la foudre, par le vent etc. Et il peut être pourri, soit par vieillesse, par des insectes etc...

Si le hasard est une cause intrinsèque, et si cette cause intrinsèque est indéterminée, l'effet du hasard est imprévisible. Car un phénomène n'est prévisible que dans la mesure ou il est déja déterminé dans sa cause. De sorte que dans la mesure où il y a prévisibilité, il n'y a point de hasard.

Est autem unumquodque contingens ex parte materiae.(I86,3) "...in quibus contingit esse....(Per.14/6)...Assignat... ad utrumque oppositorum.(ibid. n.8)

"Causae quae ordinantur in suos effectus ut in pluribus ...non deficiunt in minori parte nisi propter aliquam causam impedientem."(I,115,6) Cet empêchement peut être nécessaire et une cause per se. Mais alors l'effet est aussi nécessaire? C'est qu'il faut distinguer entre l'"impedimentum ex parte agentis" et "ex parte actionem recipientis" (II S.,d.7, a.2,c) - Cajetan ajoute d'ailleurs une distinction à faire entre l'empêchement actif, qui empêche l'action de l'agent de produire l'effet intentionné; et l'empêchement passif qui empêche l'action d'être reçu dans le sujet passif. Celui-ci est à distinguer à son tour: selon

Causa per accidens est infinita et indeterminata.

que cette condition du sujet est dûe à un autre agent; ou selon qu'elle est dûe simplement à l'indisposition de la matière, indisposition qui existe dans une certaine mesure en toute chose.

Une cause déterminée n'est dite empêchement que par sa relation à ce qui peut être déterminément empêché pour des raisons indéterminées. De sorte que "potentia defectiva quocunque defectu, ad potentiam passivam reducitur."(Caj.vii)

"Casus et fortuna reducuntur ad genus causae moventis. (II Phys.,lect 10,n.11).....eorum multitudo est indeterminata."
Pluralité de causes. Faut qu'elle comporte de l'indéfini.
Concursus.....reducitur ad materiam.

L'imprévisibilité et le hasard. - Si le hasrad dit furur contingent, il comporte imprévisibilité. Or, il parait qu'on peut citer des textes de S.Thomas dans lesquels il semble affirmer que les anges prévoyent des phénomènes de hasard.

Il y a trois positions devenues classiques en cette matière:

a. Il nous est impossible de savoir s'il y a du hasard. En effet pour pouvoir affirmer nettement qu'un phénomène déterminé est dû au hasard, il faudrait pouvoir démontrer qu'aucune constellation a pu entrer dans la détermination des facteurs qui entrent immédiatement en jeu. En d'autres termes,il faudrait connaître toutes les constellation avant de pouvoir affirmer que ce phénomène est au hasard. Car si.....(Perih.)

b. Le hasard est impossible. "...quia si omnes causae.....sed necessitatem".(Suarez 736). S.Thomas signale déja cette même opinion Ia 115 a 6: "...hihil prohibet per volunt.....ex necessitate contingent"

b. Il y a des phénomènes dûs au hasard, mais il est le plus souvent impossible de localiser cette cause. (d'indiquer déterminément cette cause)

Soit un chien tué par la chute d'un arbre. Ce phénomène est dû au hasard. Qu'est ce qui me permet de ce dire? L'arbre n'était-il pas pourri et déterminé à tomber sous un vent de telle vitesse? Et le chien ne poursuivait-il pas tel chat qui s'était réfudié dans cet arbre? N'est-il pas naturel que le chien poursuive le chat, et qu'il qu'il meure écrasé par ce poids, etc...L'arbre doit tomber et le chien doit mourrir. Donc tout cela était parfaitement prédéterminé et prévisible. Comment ~~xxxxxxxxx xxxxxxxxxxxxxxxxxxxx~~ aurait-on pu appeler ce phénomène un futur contingent?

Ce qui me permets de dire qu'il s'agit là d'un phénomène dû au hasard, c'est qu'il y a une infinité d'autres causes possibles qui pourrait entraîner le même résultat. L'arbre aurait pu tomber sous un coup de foudre, le chien aurait pu se diriger vel cet endroit pour enterrer un os. Evidemment qu'étant donné la constellation présente et déterminée, ce phénomène était nécessaire? Ce n'est pas par rapport à cette constellation déterminée que ce phénomène est dû au hasard. C'est la possibilité de cette constellation, de cette convergeance des différents facteurs, qui est cause ~~xxxxxxxxx~~ de ce phénomène de hasard. Cette constellation déterminée était-elle à son tour prédéterminée par une autre? Si oui, il faudra reculer la cause de ce phénomène. Faut-il reculer indéfiniment jusqu'à la première constellation du monde? Voilà toute la question. Si oui, le hasard est impossible.

Si l'on opte pour l'affirmative, on ~~xxxxxxxxxxxxxxxx~~ soutient une thèse à démontrer: on doit démontrer qu'étant donnée telle constellation initiale du monde, tous les effets naturels, ~~xxxxx~~ abstraction faite des agents

Faisons tout d'abord quelques distinctions classiques qui me paraissent être souvent négligées même par les thomistes contemporains.

On confond souvent le hasard qui est une cause, et l'effet qui procède de cette cause: on ne distingue pas le casus et le casuale. Si le hasard était un effet, il nous resterait à déterminer de quelle cause il provient, et puisqu'il ne peut avoir de cause per se, il doit avoir une cause accidentelle, c'est-à-dire, indéfinie. Si un phénomène attribué au hasard nous permettait de remonter à des causes déterminées, il ne serait plus phénomène de hasard. Entre le hasard et le phénomène produit par hasard, il y a toute la différence entre l'indétermination et la détermination. "Nec distingui débet, écrit Jean de S.Thomas, inter contingentiam, et indifferentiam seu indeterminationem, ut aliqui faciunt: quia contingens dicitur aliquid ex causa indifferenti ad utrumlibet in actu primo, et antequam de facto producat; ergo antequam effectus producatur, ex eadem parte, ex qua habet contingentiam, habet indeterminationem, scilicet ex causis: extra causas autem nondum aliquid habet, vel si aliquid habet determinate,ibi amittet contingentiam ubi habet determinationem."( )

Admettons pour un instant avec Suarez qu' "extrinsice dicitur effectus contingens, quando carentia necessitatis quae in illo est, solum est ab extrinsecis impedimentis". De sorte que le hasard se ramène à une pure rencontre. Il faudra bien admettre aussi: "..sicut naturalis causa

proxima .....non habet contingentiam, sed necessitatem".

C'est que pour Suarez,les causes naturelles sont des l'origine ordonnées à cette rencontre prédéterminée dans la constellation initiale. Il a donc parfaitement raison de dire que le casuel n'est contingent que secundum quid, et qu'il ne peut y avoir en ce domaine des futurs contingents.( ) Dès que nous connaissons la direction prise par deux lignes causales, nous pouvons évidemment prévoir leur intersection. Dès qu'il y a orientation déterminée, il n'y a plus de hasard. Lorsque nous voyons un ensemble de causes accidentellement convergeantes, avant qu'elles fassent intersection, nous nous trouvons déja dans un ordre déterminé, ou il n'y a plus de contingence proprement dite. La véritable contingence, et la cause, est antérieure à la direction qui se terminera dans l'intersection. Et à partir de cette convergeance, nous pouvons évidemment prévoir l'intersection: cette prévision ne se fait pas à partir de la cause du hasard, mais à partir d'un effet désormais déterminé qui se prolongera dans l'intersection.
Et à parler rigoureusement, il ne s'agirait pas ici d'une prévision,mais d'une vision de l'effet dans sa cause. Si l'effet du hasard est un futur contingent, il est imprévisible.