

THE PRINCIPLE OF THRIFT

The standpoint of this article is, first and foremost, a historical one, giving an introductory outline of a general theory of thrift. More specifically, it aims at comparing the principle (or: principles) of economy of thought and the principle of "natural economy," to coin a short term.

By way of a prologue, a historical and interpretative summary of events shows the consequences of a cultural fact which hallmarks the 14th century and, in itself, restores the first frank expression of a principle of thrift, at once theoretical and practical, to its essential context, thus countering the inflation of abstract entities. Nevertheless, it would not appear, three centuries later, that the nosology of the Diafoirus, at which Moliere poked so much fun, had already adopted this precious standard for itself.

Without prejudicing the lessons of a detailed investigation, the history of the principle of economy of thought is presented here in a three-phase plan. The development of the principle of natural economy is then studied on its own account, as far as this is possible: from Maupertuis' law to Hamilton's law the extension of the concept of least action is achieved without any conspicuous shock.

But one is still faced with the question of the unity, or, if you like, the merits, of the general idea of thrift. The route which

Translated by Simon Pleasance.

The Principle of Thrift

leads from so-called natural economy to the economy of thought is recommended. The key to this unification lies in the bond, contrived by psychic economy (reduction of the volume of excitation, phase of counter-balancing...), between the kind of economy which applies to the biological mechanisms (neguentropie) and the economic virtues of deductive thought.

A kind of counter-system plays a field-for-field part in the system so sketched. Within it there is correspondence—and there should be articulation—between entropy, the (possible) pulsations of death, and the abundant squanderings of research, not to mention, lamentably, those other varieties of consumption* or those disorderly manifestations of the game instinct which Roger Caillois embraces with the term *paidia***.

More often than not we take the terms “economy” and “thrift” to be interchangeable. The only advantage which the former holds over the latter involves a better pluri-disciplinary neutrality. In the following discussion the distinction between “law” and “principle” is accessory.

A succinct description, under four headings, of the considerable effects of the Ockhamian critique¹ will provide us with the close context of the first formulation of the principle of economy of thought, in a distinct sense.

1) The association of the critique of this analogy, which one can call “vertical,” with the critique of abstract entities² well and truly unsettles—this in the 14th century—the calm assurance

* Georges Bataille, *La part maudite, Essai d'économie générale*, Paris, Editions de Minuit, 1949. The term “consumption,” coined by the author, applies to unproductive expenditures (such as sacrifices, and so on).

** Roger Caillois, *Les jeux et les hommes*, Paris, Gallimard, 1958, pp. 52 ff. The *paidia* opposes the *ludus*. The two forms, which are both a little unstable and hollow, tend to define themselves in competitive activities, games of chance, imitative games, feats of height: whence the double entry classification (*op. cit.*, p. 66). The “*ludus*” form combines the gratuitous expenditure which is inherent in all games and sports with the economy of rules.

¹ We shall not try to put into perspective the various aspects of these effects which can be ascribed to Roscellinus, Pierre Abelard and Duns Scotus.

² In more Ockhamian terminology: “there is no reason to admit the existence of the universal beyond the soul.” “Universale est vox” Roscellinus said at an earlier date (quoted by J. Largeault, *Enquête sur le nominalisme*, Paris-Louvain, Nauwelaerts, 1971, p. 79).

of the advances of theology, and gives credit to the idea of a dual language: the language of faith and the language of reason, which, henceforth, will only be dissociated with some difficulty. At times this quasi-theory meets the theory of double truth.

2) The critique of abstract entities contributes, by elimination, to the development of the concept of the individual,³ to start with in a highly metaphysical form, later called very "slight" by Descartes, but a form given previous anthropological ballast by Luther. From this viewpoint the history of modern culture would be written like a history of individualistic styles.

3) According to the Ockhamists—in our view it would seem to be more hazardous to associate their 11th and 12th century predecessors with them on this point—individual reality is, essentially, something akin to the gold bullion of the currency argument.⁴ However, the sign-words in circulation become all the more worthy of interest as they enhance themselves with power (*nomen-numen*), with universality abstracted from reality-species, reality-types etc. . . . The new interest in words closely resembles the interest in the fiduciary: both are the result of an economic *shift* which in the end brings the signs into being.⁵

4) Finally and most important (*hic et nunc*) the Ockhamian critique of abstract entities sets in motion a principle which is certainly an ancient one but which, from what we know, William of Ockham was the first to render explicit by two frank formulae; the first appears in the *Summa totius Logicae*, the other in the commentary *Super libros IV Sententiarum*: "Frustra fit per plura quod potest fieri per pauciora," "Pluralitas non est ponenda sine necessitate."⁶

As far as the better known prescription is concerned: "Entia

³ One might just as well say that it *records* the cultural ascendance of individuality.

⁴ It is admissible to see in the nominalism put forward by Ockham and his disciples an ideology corresponding to the period in which capitalism was founded ("primitive accumulation," separation of capital and labour, liberation of capital). But such an interpretation would have to be confirmed by putting the history of capitalism on a parallel with the history of nominalism.

⁵ A whole aspect of the Renaissance (above all its second half) seems to rest on the feeling of a *word-kingdom*, just as one talks about the "mineral kingdom" or the "animal kingdom."

⁶ Detached from its context, near (rejection of the entity "relation," *I Sent.*, 30) or far, this second formula is not exempt from being equivocal: does it counsel non-exclusive unification or suppression of the superfluous?

The Principle of Thrift

non sunt multiplicanda praeter necessitatem,” we know by now that this is no longer attributable to Ockham, but that it occurs in the *Logica vetus et nova* (1654) of Clauberg, a disciple of Descartes, and furthermore agrees with the Cartesian critique of scholasticism and animism. As a historical counter-truth, its attribution to Ockham is therefore no more than a misconstruction. The first of the Ockhamian precepts is above all methodological, the second rather epistemological. But if it is possible to make thought or discussion (*vox*) about the real more economical, this is because the real makes it possible. In other words, the Ockhamian prescriptions imply or presuppose negative descriptions of reality: *there is no such thing* as “dog-ness,” which is why there is no cause to discuss “dog-ness;” it is futile to refer to “dog-ness” in order to talk about dogs; it is futile to set up the relation in terms of entities because only individual objects exist, provided with qualities such as thought and discourse which are established to link them to one another.

* * *

For the time being let us forget about the essentially ontological implication of the principle of thrift of thought, so as to map out its history with emphasis on its three highlights.

A principle of thrift is silently at work in any theoretical construction. This is true of Euclid’s *Elements*, Aristotle’s *Analytics* and even of the *Treatise on Stones* by Theophrastus; likewise it is as true of Ptolemy’s *Almagest* (though economy is less conscious in it) as it is of Copernicus’ *Treatise on Revolutions*. Perhaps one should register some surprise that this period of pre-thematic and pre-systematic usage of the principle only came to a close (probably) in the 14th century.

Whatever the case may be, Ockham inaugurated the period of the clear-cut thematisation and deliberate application of the principle. Included here are: the concern evidenced by Copernicus not to let his mind stray off into “the multitude of circles and orbits of geocentric astronomy”,⁷ Newton’s famous “hypotheses non fingo,” the current recommendation not to multiply the primitive terms of formalised theories and to exclude dependent

⁷ A. Koyre, *La Révolution astronomique*, Paris, Hermann, 1961, p. 45.

axioms from them, the choice of the simplest theory,⁸ the use of “Ockham’s razor” in the second edition of the *Principia* by Russell and Whitehead, the theory of the reduction of non-observed objects to constructions, the nominalist justification of the suppression of suppositions, and so on...⁹

Lastly, in the case of the empirio-criticists, R. Avenarius and Ernst Mach, the principle gives rise to an explicative theory which provides sufficient basis for it. There is no reason to multiply entities, rules, and principles, state Ockham and all those who subsequently resort to the “razor;” there is a good reason for not multiplying them, stress the empirio-criticists, which is biology.

In the 1876 work, according to which philosophy—which maximises the subjection of the individual to the universal—is “an approach to the world which is in tune with the principle of the least possible expenditure of energy.” Avenarius maintains that “the modification which transmits the mind to its representations each time that new impressions appear is the most limited possible.”

In the name of this organic demand for the least possible modification, it is quite natural that economy in fact extends to an economic rule, prescribing for example the reduction of the real to a complex of sensations and movements and, to take Hume’s example, to eliminate from these the causality, the necessity and the substance.¹⁰

Mach approves: completing experience, concepts and laws and hypotheses thus render it easy to handle; through the oblique quality of memory, they economise, within our thought (cf. *Denkökonomie*) the futile effort of an infinite number of individual observations and experiences. It would therefore be a contradiction to multiply concepts, laws and theories, when not necessary. It is enough, for example, to give a correct definition to bodies of the same density as “bodies which, inter-

⁸ We are deliberately omitting the difficult problem of simplicity and its objective criteria.

⁹ This list is not exhaustive. We have omitted, what is more, the numerous and various methodological “applications” which, frankly, do not stem from any Ockhamist principle.

¹⁰ *Philosophie als Denken der Welt gemäss dem Prinzip des kleinsten Kraftmasses* ... quoted from 2 ed., Berlin, Guttentag, pp. 3-28, 52f. 65, 67.

The Principle of Thrift

acting, transmit to one another equal and directly opposed accelerations,"¹¹ to render Mechanics unaffected by the concept of the volume of matter, the principle of the equality of action and reaction, and indeed any similar *theory*.¹² The most scientific thoughts, those which are most widely applicable, are at once the most economic. Science, as a whole, "can be considered as a minimal problem which consists in revealing the facts as perfectly as possible, with the least intellectual effort".¹³

A more modern idiom—that of the theory of games and information—sheds light on the theory of economy of thought: apprenticeship, research and experimentation form, in the words of B. Mandelbrot, "a complex of strategies aimed at maximising the gains and minimising the losses of information."¹⁴ The word "aimed" should be underlined here, because, differing from the concepts, principles and theories (apart from prevention) which surmount them, the groping efforts of apprenticeship, or research, do not primarily strive towards thrift.

* * *

Mach's rules are expressly concerned with nothing else but the functioning of thought. But if they tell us nothing of the ways of nature, the idea of their biological basis, on the contrary, results in something other than pure conventions or aesthetic recommendations. Nevertheless let us leave aside all considerations of natural bases—for the time being and for the same reason as the earlier question of the ontological bearing of the Ockhamian precepts. In other words, from the principle of economy of thought we shall start by clearly singling out a principle which governs the actions of nature: in a word, it affirms that nature acts economically.

¹¹ Mach, it is true, calls into play the "principle of symmetry" according to which "given two absolutely identical bodies ... we expect the accelerations which are transmittable between them to be directed along the straight line which joins them, both equal and opposite" (*La Mécanique*, 1903, trans. E. Bertrand), Paris, Hermann, p. 211.

¹² *Op. cit.*, p. 212.

¹³ *Op. cit.*, p. 457.

¹⁴ Benoit Mandelbrot, *Sur l'épistémologie du hasard dans les sciences sociales* (in *Logique et connaissance scientifique*, ed. Piaget), Paris, Gallimard, 1967, p. 1128.

In history this principle of natural economy first appears in the form of various theological and metaphysical formulations, as a regulative idea of the first great modern cosmologies: God, the Architect, acts geometrically, or, if one finds geometry too rigid, it can be made more supple by harmony: but a geometrician for sure, Kepler's God is also a musician.¹⁵ Seventy five years later, Melabranche's God, resting from his individual wishes, henceforth acts only on general wishes, and in the "simplest ways possible."

The properly physical version of the principle of natural economy is present, essentially, in the mechanical principle of least action, the idea of which was conceived of by Fermat, then Leibniz, before Maupertuis gave it its first strict definition in 1844: "When some change takes place in Nature, the volume of action necessary for this change is the smallest possible."¹⁶ As a result of this remarkable formula, it is not certain whether one should say that it offers a fine example of a scientific principle discovered as a result of metaphysical considerations, or if one should be astonished at its success despite its origins. The principle of least action was in effect the lucky object of successive developments which, in the absence of contradictions, promised everlastingness. Euler confirms it, and from a material viewpoint extends it to a system of points. The *Mécanique analytique* of Lagrange applies it to a system of objects. Lastly, using an integral of Lagrange's functions, Hamilton—on the basis of the fundamental law of the movement of mechanical systems—arrives at the most general form of the principle of least action¹⁷. The principle of Maupertuis is not suppressed however: it represents the simplified form of Hamilton's statement—simplified to the extreme.¹⁸

¹⁵ A. Koyre, *La révolution astronomique*, pp. 329-330.

¹⁶ On Maupertuis, see Dugas, *Histoire de la mécanique*, Neuchâtel, Griffon, 1950, pp. 250 ff. The *volume of action* is defined by the product of mass, speed and space travelled (*mss*).

¹⁷ Between two given positions, defined by corresponding complexes of coordinate values, one can say that a system moves in such a way that the integral of Lagrange functions (expressing the action of the system) has the smallest possible value (see Landau-Lifschitz, *Physique théorique, I, Mécanique*, Moscow, 1960, pp. 8-12).

¹⁸ The authors quoted called the "Maupertuis principle" a reduced form of

The Principle of Thrift

Without discussing the application (or the history of the application) of the principle of least action to luminous phenomena, the principle of natural economy has other and numerous aspects: thus Gauss's law according to which equilibrium achieves the least constraint in relation to free movement; thus, again, the principle of inertia and the various laws of retaining the same; lastly, types of conservation laws in the second degree, the laws of symmetry which affirm the conservation of other laws through some change in coordinates, for example the conservation of the laws of pendular movement for a system of linear movement at a uniform speed.¹⁹

* * *

For reasons of clarity should one stick fast to the distinction between principle(s) of economy of thought and principle(s) of natural economy, and, thereby, condemn any research in respect of a unitary principle of economy, or in respect of the one forming the basis of the other? Whatever else, one cannot do so without having tried to compare them.

In fact the non-thematic association of the two (groups of) principles is a current phenomenon. They are associated by Ockham; and by Copernicus and Kepler; they are very explicitly associated by Newton: "One should not admit more causes of the natural realities than those which are at once true and sufficient to explain the appearances (. . .). Nature does nothing in vain (. . .) she loves simplicity and regards the pomp of superfluous causes with disdain."²⁰ But for those who would precisely *establish* the distinction of two types of principles

Hamilton's principle, always applied to a mechanical *system* but conspicuously overlooking the *time* factor (*op. cit.*, pp. 196 ff.).

¹⁹ One may well ask about the statute of the ancient principle of continuity: "Natura non fecit saltus," as a famous metaphor of Leibniz runs. Formally speaking it appears to be diametrically opposed to economy: Nature *does not fashion the economy of intermediary states*, to which, moreover, corresponds the idea of differential equations. But physically speaking continuity may imply a relative economy of energy. In the view of Leibniz, there is not sufficient reason to admit any "leap" in nature; in other words, to admit leaps would lead to a multiplication of adequate reasons.

²⁰ Newton, *Mathematical Principles of Natural Philosophy...*, trans. A. Motte, ed. Cajori, University of California Press, 1947, p. 398.

of economy, *the fact*—advanced in full as an authoritative argument—of their collusion (more or less made thematic) with notorious authors certainly does not constitute a sufficient argument. It is therefore necessary to look elsewhere, for some *law* or other, that is to say, for some explanatory theory.

Theoretically there is a choice here between three solutions: parallelism (or pre-established harmony), “basic” movement going from the principle of economy of thought to the principle of natural economy, and basic movement going in the opposite direction.

There would be parallelism or—to complete one of Hume’s Leibnizian ideas²¹—harmony pre-established between the economic course of nature and the naturally economic course of our thoughts. Still following Hume, the principle of this harmony might well be simple familiarization. But by following, on this occasion, the Gestalt-ists, one may find a unique principle of equilibrium governing the isomorphism of the field preferable; the perceptive field, the psychic field in general, the neurological field, and the physical field. In both cases, the solution has the disadvantage of being short-term; above all it does not dispense with examining the others.

What would be the basic movement which, starting from the principle of economy of thought, would claim to reach a principle of natural economy? Does one imagine it making the former, stripped of all real and admitted content, into a *constituent* principle or a regulative principle? By constituent principle one is more or less saying the following: “It is a matter of economising concepts, rules and principles, and therefore, in the last analysis, the ways of nature are really simple!” The ineptitude disappears if one makes something regulative of it²²: a type of second degree principle, it then states a formal, insufficient and possibly unnecessary condition, architectonic and

²¹ *Enquête sur l’entendement humain*, trans. A. Leroy, Paris, Aubier, 1947, p. 101.

²² Cf. Kant, *Critique de la raison pure*, trans. Trémesaygues-Pacaud, Paris, PUF, 1944, p. 458: “But the fact that this harmony is also found in nature is the general supposition of philosophers of the school which recognises that one should not multiply principles when not necessary (...) One can therefore see that the very nature of things offers a substance with a rational unity (...) Although this unity is a simple idea...”.

illogical, of the system of the other principles, rules and concepts. One thus finds oneself referred back to the empirical content of the "first degree" principles, rules and concepts, among others to the main principles and concepts of natural economy (for example, the laws of conservation, the Maupertuis principle, the concept of the least volume of action, etc. . .).

This reference recommends attempting the opposite movement: starting from the economic aspects of reality as recognised (or filtered) by the natural sciences and trying to reach the economic aspect of thought, despite recognising that it is in the end thought which elaborates the theory of natural economy (physical and biological),²³ that thought can organise it economically and that it is still thought which elaborates the theory of the economy of thought.

If the universe of physics obeys certain laws of thrift (those to which we referred earlier), and if life is, almost by definition, a creation of order, a conquest of disorder and of the squandering of haphazard distributions, in short, if life is entropically economical, it is not prohibited *a priori* to extend this "conservative, feminine and nutritive virtue" to physical life.²⁴ Once justified, this extension would provide a vital link to the chain of a general theory of thrift. Let us therefore attempt such a justification.

What is missing is the fact that the idea of economy is alien to the theories of psychism. Some time ago Pierre Janet²⁵ found in the elementary feelings—joy and sadness, effort and fatigue—forces which economically regulated action. But in this respect Freudian economic theory is evoked, the over-riding idea of which is that of a regulated distribution of propulsive energy, considered as quantifiable. That psychism is really thought of by Freud as a system which functions in accordance with some grand law of economy is sufficiently indicated by the place

²³ F. Dagognet, recently said: "Nature is an ill-written text which needs re-writing in a rational idiom." *Recherches hégéliennes, Bulletin d'information no. 7*, University of Poitiers, 1973, p. 17 (summary of statement published from notes).

²⁴ V. Jankélévitch, *L'Alternative*, Paris, Alcan, 1938, p. 71.

²⁵ *De l'angoisse à l'extase* (1928) quoted from *Les débuts de l'intelligence*, Paris, Flammarion, 1935 p. 105 ff.

accorded concepts such as those of investment and “output expenditure,”²⁶ evidently economic procedures such as those of movement and condensation, common to unrealised dreams and deeds, the recourse to the principle of inertia of the early works,²⁷ the principle of constancy and, at least as initially devised, the principle of pleasure: all activity tends towards the quest for pleasure, that is, towards reducing the volume of excitation.²⁸

Objections will be raised if more certain concepts are not involved here, imported from physics, and if it is simply a matter of principles formulated on the basis of principles of physics and at times, of economics itself. Furthermore it has been possible to note the close resemblance between the statement of Avenarius’ thesis and the principle of Maupertuis. But science has always used them in this way: the extension of models and the importation of concepts (*grandeur*, *force*, *equilibrium*, *mechanism* etc. . .), regardless of whether they set a principle of economy in motion, are not in themselves forbidden operations. One hopes above all that they will succeed, which is something which does not come about in any event without adaptations and corrections.

We shall therefore insist on the fact that certain general physical *mechanisms*, themselves conceived in accordance with physical models, are not dimmed when faced with the sanctuary of thought, not even of logical thought. In his considerations about the relations between *Denkökonomie* and logic Husserl concedes that “the principle of economy (. . .) produces something like representations, judgements and other experiences felt by thought, and also, in association with these, feelings which,

²⁶ Freud, *Deuil et mélancolie*, in *Métapsychologie*, coll. “Idées” Paris, Gallimard, 1969, p. 167.

²⁷ *Projet de psychologie scientifique* (1895) quoted here from Laplanche-Pontalis, *Vocabulaire de la psychanalyse*, Paris, PUF, 1967, pp. 339-341.

²⁸ Later Freud issues certain doubts on the definition of pleasure by the reduction of the volume of excitation (see for example *Pulsion et destin des pulsions* (1915) in *Métapsychologie*, p. 17) But the economical viewpoint is in no way removed and the economic function of psychism remains guaranteed in any event by the principle of constancy according to which psychism tends to keep the energy of investment constant, if not at a low pitch. We know that Freud did not coin the term *Lustprinzip* because it can be found in Fechner (1848). Avenarius (*op. cit.*, p. 13) talks of the “reactions of displeasure ... due to inappropriate expenditure of energy.” (“Unlustreaktionen ... bei unzuweckmässigen Kraftverwendungen”).

in the form of pleasure, favour certain directions of development. . ."; and there is no need whatsoever to explain this to understand the relationship of the idea of economy of thought "with logic, in the practical sense of a technology of scientific knowledge." On the other hand the economy of thought would be without meaning for pure logic and the theory of knowledge, for to base the latter on the former would be the same as basing them on psychology.²⁹ And Husserl would refer back to his critique of psychologism. Throughout this period of the ebb of psychologism which follows the work of Frege, it would have been out of the question to extend to the major logical principles the jurisdiction *sui generis* of a physico-bio-psychological principle, in the circumstances: the principle of economy. This is not the place to reconsider the ambiguities and other weaknesses of anti-psychologism, except to underline that they do to a considerable extent lead back to an ambiguity about the notion of basis: it is one thing, which is hard to admit, to claim that a physico-bio-psychological mechanism is enough to realise the *validity* of the principles of logic and reasoning; it is quite another thing—justifiable, this one—to look through some economic-type regulation for one of the elements of the genetic *constitution* of the logical structures, and at the same time a *functioning* constant of deductive thought. In this respect and on several occasions Jean Piaget has singled out and explained the role of a proper factor of equilibration.³⁰ One or more specific forms of equilibrium correspond to every variety of mental structure, and it is likewise a form of equilibrium which presides over the succession of these structures, whose strictly reversible operations of logic in no way represent superadditions, but rather definitions. The typically economic character of the mechanisms of logico-genetic equilibration can in fact be seen in the progressive conquest of reversibility, the opposite of which means squandering.

The first model of equilibration is mechanical, but Piaget stresses that he only takes into account the most general properties

²⁹ Husserl, *Recherches logiques, I, Prolégomènes à la logique pure*, trans. H. Elie, Paris, PUF, 1959, pp. 219-222.

³⁰ See e.g. *Logique et équilibre, Etudes d'épistémologie génétique II*, Paris, PUF, 1957, especially pp. 27-117.

of the stable equilibrium of the physicist: "the compensation of virtual transformations" (the transformation, for example, of an addition by the possibility of a subtraction which cancels it out) and the "minimum of action," referring to "transformations of the simplest kind which lead to a fixed result."³¹

At this stage, then, our attempt to relate the two kinds of principles of economy gives a glimpse of the general hypothesis of a system of economy (thrift) which is analagous and governs both psychism and nature, that of the physicist and the biologist, and also governs the genesis and the functioning of logical thought.

* * *

But there is no lack of objections here and the corrections which they impose may well, in turn, form a kind of counter-system or, rather, a complementary system. We shall take three corrections into consideration, one for each of the levels referred to just now under economy.³²

1) The system of natural economy, which is both physical and even biological, is tainted by or subordinate to (the alternative is important) the reality described by the famous second law of thermodynamics: energy, if conserved, also partly dissipates, in a thermally closed system. To be more specific, a part of the heat produced in the course of mechanical processes, or electrical or thermic processes, is no longer convertible as something functional. And this production of irreversibility, which is called entropy, is simultaneously the production of disorder, and relative wastage. The growth of entropy, which supplies the degree of this relative wastage, means that a closed system—i.e. one with no relation to a middle point—tends towards a poor state of equilibrium, of the opposite type to the type in which Piaget analyses the varying degrees.³³

³¹ Piaget, *ibid.*, pp. 41-42.

³² But we are not trying to be exhaustive. Thus we shall not mention a certain imperfection in the system of the laws of symmetry (cf. in this respect Feynman, *La nature des lois physiques*, trans. into Fr., Paris, R. Laffont, 1970, pp. 117 ff) nor the mathematical fact of the indissociability of minimum and maximum.

³³ Piaget, *op. cit.*, pp. 36-37, insists on the radical difference between the state of rest, which closed systems tend towards, and psychic equilibrium:

The Principle of Thrift

Of course, the assimilation of biological economy to physical economy is not without obstacles: the organism is not a closed system. On the other hand, the organism-food system becomes one. One can even say that the sum of the negative entropy of the cell and of the negative entropy of a virus is equivalent to the positive entropy of the cell. In short, "considered on the universal scale, the living system cannot contradict the second principle" of thermodynamics.³⁴

2) It would be surprising if this wastage, as recognised by physics and biology, remained without any psychic respondent, without an echo in the theories of profound psychism. According to the last Freudian theory of pulsions, the principle of pleasure clearly seems, in the last analysis, to put itself "at the service of the pulsions of death," and these, which are fundamentally regressive, could constitute something like the matrix or the essence of pulsions. The *Todestriebe* would in fact be the unconscious psychic expression of a tendency of the organism to return to the anorganic state. However, should one talk of wastage with regard to them? is the image adequate? No, not if one envisages the anorganic state under the aspect of rest or energetic economy. From this same viewpoint, the pulsions of life appear conversely like so much "troubled peace (...), inexhaustible source of incessant tensions, the *resolution* of which is accompanied by a sensation of pleasure."³⁵ Schopenhauer had already said that "the complete halt of the vital functions should

"The best balanced states (...) correspond to the maximum of activity and openness in exchanges." This proposition, which smacks a little of Spinoza (see *Ethique*, pt. V prop. XL) seems at first sight to contradict the definition of equilibrium by least action. The problem disappears if one realises that the states of equilibrium, e.g. those consisting of logical systems, presuppose considerable intellectual activity and guarantee a "maximum of associations," although the reasoning or the calculations which they admit are made economically, by a "minimum of changes" (*op. cit.*, pp. 42-3). The question is one of knowing if, and to what extent, the known world should be assimilated to a closed system (cf. E. Hutten, *Les concepts de la physique*, Paris, Dunod, 1969, p. 126).

³⁴ André Lwoff, *L'ordre biologique*, Paris, R. Laffont, 1969, p. 173.

³⁵ Freud, *Au-delà du principe de plaisir*, (1920) in *Essais de Psychanalyse*, trans. S. Jankélévitch, Paris, Payot, new ed. 1972, p. 80. (In agreement with the terminology recommended by Laplanche and Pontalis, *op. cit.*, we have substituted in the translation used "instincts" by "pulsions." We have also underlined the term "resolution").

produce a strange relief to the driving force which resides therein.”³⁶ But the image and even the idea of wastage are justified if one pays less attention to the anorganic *state* than to the *process of disorganisation* which “breaks all relations” and destroys “the ever greater unities” created by Eros.³⁷

3) The Freudian conviction is met with a certain doubt by Piaget. He writes that it would still be a matter of knowing whether “the subject always tends towards the best forms of equilibrium,” that is to say to those which realise a compromise between “the maximum of associations constructed and the minimum of transformations.”³⁸

At the least, if the economic-type prescriptions more specifically affect—as far as thought is concerned—the deductive processes and the explanatory arguments, one could say that they totally dominate heuristic thought. This, without doubt, also proceeds by analogy or by continuity, and in so far as they are logical, the paths of induction are, in their own way, parsimonious. But research is not satisfied with this: it does not mind about long detours, costly and only possibly fertile oppositions, rejections and experiments ‘just to see’; it can remorselessly consume materials and hypotheses and one might suspect that this perpetual “hunt for Pan”—as Bacon said, is not always void of pleasure for the hunter.

* * *

A system of natural economy extended to the economy of deductive thought, a counter-system of entropy extended, via the pulsions of death, to the pleasure of free research: the still new and henceforth daily experience of our societies of organisation and consumption seems to confirm without any difficulty a similar dual polarity also in its excessive aspects.³⁹ And yet

³⁶ *Le monde comme volonté et comme représentation*, Supplement to book IV, trans. Burdeau, ed. Roos, Paris, PUF, 1966, p. 1211.

³⁷ Freud, *Abrégé de psychanalyse*, (1938) trans. A. Berman, Paris, PUF, 1949, p. 8.

³⁸ Piaget, *Logique et équilibre*, pp. 42-43.

³⁹ Although we shall attempt to do so here, it seems possible to us to find this dual polarity in the opposition—which is considerable nowadays—of philosophies of difference to philosophies of identity.

The Principle of Thrift

the counter-system does not ruin the system. On the contrary, until a new order arrives at least, everything still happens as if there was some secret way to recover wastage, preserving the strong alliance of the economic and the rational; that is, likewise, the alliance of physical nature, life, controlled thought and information. To sustain this probable prevalence, one still has to get over certain appearances. Order and disorder, intense rationalisation and fearful wastage in fact look as if they want to co-exist. What is more, if one plans from this dual viewpoint, thrift/wastage, the overall behaviour of our industrial societies, it appears that rationalisation is practised to a remarkable degree, but on a short-term or small-scale basis: the rationalisation of the sector or firm, or of the department, office and even of the file! Whereas on a long-term and very large-scale basis, things are quite different: the aptitude of the agents of organisation and decision is immense when it comes to masking the ill-omened consequences which they christen the condition of order and progress but which, in most cases, is no more than a short-sighted quest for immediate profit. Reason is certainly not on the side of this short-term form of rationalisation.