

THE PRINCIPLE OF ENTROPY AND THE DEATH INSTINCT

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In the psycho-analytical theory of instincts the death instinct occupies a peculiar position. Some psycho-analysts are of opinion that it is entirely superfluous, while others make use of it as of a notion based on proved clinical experience. Freud constantly reiterates that this notion is conjectural,¹ and he holds that we must not regard the instincts of death or Eros as ranking with the other propositions he has laid down in his theory of the libido. In his view, with the assumption of the death instinct that theory enters the realm of speculation, for here it oversteps the boundaries of psychological or psycho-analytical methods, since the notions of the death instinct and Eros purport to embrace biological facts—indeed, the universal behaviour of nature (the stability principle). Many uncertainties, confusions and errors arise from the circumstance that we do not always sufficiently distinguish between the different meanings attached to the one word: 'instinct' [I].

As we know, from the psychological standpoint—i.e. as concrete forces within the personality (id, ego and superego)—Freud differentiates the sexual instinct and the instinct of destruction. In antithesis to these stand the speculative biological notions of Eros and the death instinct, by which we mean not so much forces within the personality, but the most universal behaviour of living substance. They are principles, or, if you like, natural forces, but not instincts in the narrower sense of the word. The term 'death instinct' denotes the fact that everything living is of limited duration, has a beginning and an end, and it represents the course of life as the restoration of the inanimate state in which life originated. 'Eros' denotes the constant prolonging of life through reproduction and the aggregation of ever-greater organic masses in increasingly complicated unities. This clear distinction between the 'speculative' (biological) and the psychological standpoint has been frequently emphasized by Freud; nevertheless, it is still possible for misunderstandings to occur because he

¹ Not only in *Beyond the Pleasure Principle* [11], but also, e.g. in [12].

now seeks to abolish this differentiation by enunciating a fundamental principle. He tries to connect the two instincts (the sexual instinct and the instinct of destruction) with the extrapsychic natural forces (Eros and the death instinct). He looks for analogies for the two last within the ego and discovers there Eros, in operation as the sexual instinct, and the death instinct operating as the instinct of destruction. It is this idea which really belongs to the realm of theory and which is, on the one hand, rejected as empty speculation, and, on the other, employed uncritically as a proved fact.

Now that Freud has overstepped the boundaries of psychoanalysis, not only in the direction of biology, but also in that of physics,³ it is the more urgently important to decide whether in his speculation he is misusing an analogy which takes us nowhere or whether he has introduced into biology and psychology a new natural scientific theory. For he expressly emphasizes the fact that he is identifying the death instinct with the general principle of stability in nature [11].

The decision is especially important for our theoretical study of the psychology of energy and instinct. In this connection we might borrow a criterion from the methodology of the natural sciences and say that similarities between physical, biological and psychic processes may be appraised as more than mere analogies if they can be demonstrated to be special cases of some more comprehensive natural law.

Freud states clearly that he regards the death instinct as the special biological case of the principle of stability [11]. The pleasure principle, which subserves the death instinct, is presumably the psychological special case of that principle. Opponents of Freud's theory of the death instinct, who scent mysticism and religion in *Beyond the Pleasure Principle*, have entirely overlooked this fact. The conjunction of physical, biological, physiological and psychological facts and laws is neither inadmissible, 'unscientific', nor (as has actually been suggested) meaningless. It depends altogether on whether we have any concrete success in demonstrating that a hitherto unknown case comes under a general law; but endeavours in this direction by no means deserve to be dismissed as speculative or as *a priori* inadmissible from the standpoint of methodology.

How far removed the Freudian conception is from mere physico-psychological analogy is shewn by that important part of his theory of

³ And of late also of the history of cultural development [15].

the death instinct which represents the pleasure principle as a special case of that instinct, shall we say on the level of the system P.³ What is remarkable about this hypothesis is, surely, just that it unifies apparent opposites, not things analogous. Self-observation and naive perception and evaluation discern in death and pleasure merely irreconcilable opposites. Freud maintains that there exists a hidden functional connection between these two apparently entirely heterogeneous spheres.

It cannot, of course, be maintained that he has proved this. It is not, however, his purpose merely to announce dogmatically a paradoxical and bewildering theory; on the contrary, he develops it into a true working hypothesis in the following sentences: 'The pleasure principle seems directly to subserve the death instincts. . . . At this point innumerable other questions arise to which no answer can be given. We must be patient and wait for other means and opportunities for investigation' [II, p. 83].

Let us now see whether the conceptions of a dual system and its energies propounded by us [3, 4, 5] will help to corroborate these ideas of Freud's in some respects.

He takes as his starting-point the principle of stability, but in our view this does not formulate with sufficient precision or concreteness the facts intended to be conveyed. In its most recent form, that adopted by Petzold, it runs as follows: 'Every system left to itself and in process of development ultimately terminates in a state of more or less permanence, or at least in a state which either no longer contains the inherent conditions for further change or else contains them, at any rate over a long period of time, only to a negligible extent' [16, p. 241]. Whether we accept this formulation or the very similar one by Fechner or Spencer [6], what is connoted by the principle of stability is simply this: that all movement and, indeed, all change are of limited duration. Leaving aside a possible philosophical content, this statement scarcely advances us beyond the confines of naive knowledge. Nor do we gain anything by drawing an analogy between the states of repose and death,

³ [In a previous paper (*Imago*, B. XVI, p. 66) the authors divide the organism into two systems: (1) central apparatus, which is roughly the same as the central nervous system (system P); (2) system of cells (system C), which consists of the rest of the body. In a unicellular organism these systems are represented by the nucleus and the cytoplasm.—Translator's Note.]

the formula then being that everything set in motion leads to death. The value of the principle is still further diminished by the reflection that motion and rest, life and death, are concepts of relative significance and can never be grasped except in reference to a given system in relation to other systems, or else in reference to a particular level in a given system. Thus the 'macrocosmic' repose of a stone which has just fallen to the ground connotes intensified movements of a 'microcosmic' nature (thermal motion of the molecules), and the state of repose in a sleeping human being implies repose in the system P but intensified activity (growth) of the integrated systems C. Rest and motion, life and death, cannot be defined with precision at all, i.e. they are dialectical opposites. So long as we deduce from them universal modes of behaviour, we remain in the realm of philosophy.

The facts connoted by the principle of stability find pregnant and concrete formulation in the theory of energy. We shall not discuss whether this theory exhausts the content of the stability principle in its physical aspect. We will confine ourselves to the theory of energy because it has sufficient theoretical substantiation and because it must be considered first of all when we are dealing with our psycho-analytical problem. This theory includes the quantity and trend of those changes which are the subject of the stability principle, and it formulates quite plainly the condition which, in terms of that principle, is called indefinitely 'repose' or 'death'. The second main thesis of the theory of energy is this: that all physical processes in any isolated system have a definite trend, namely, towards the equalization of the different intensities [*Intensität*] of the system's energies; a state is aimed at in which such differences no longer exist, that is to say, a state also in which no movement can any longer take place by means of endosystemic factors alone. Such an ultimate cancelling out occurs only when differences in *temperature* are equalized (when *mechanical* differences of intensity are equalized, oscillations arise which, in the process of equalization, create fresh differences); hence, what the second main thesis affirms is that this maximum state of repose can occur only when all the energies have been converted into heat.

This state to which every isolated system (and so, perhaps, the whole universe) tends acquires the maximum durability, for it must last as long as the isolation of the system (of the universe) lasts. But, even here, there can be no talk of a state of absolute repose, for the 'microcosmic' thermal oscillations of the molecules persist. On account of the macrocosmic permanent rigidity of the system in its

'ultimate state' it has been held to be analogous to death and termed 'thermal death'. A more exact term is 'the more probable state' (Boltzmann), and the measure of this is called *entropy*. Henceforward we will give this second principle of the theory of energy the not wholly accurate but concise name of the entropy principle and speak of the entropy law or the tendency to entropy.

Interesting philosophical discussions have taken place on 'thermal death', and the attempt has been made to prove that it is not inevitable, or at least to leave open the possibility that it may not involve the death of living matter. In support of this view Stern [19, 20] has cited in a brilliant passage Fechner's law, which, he says, represents the most favourable situation that we can conceive of for organisms which are endeavouring to maintain themselves in spite of constantly diminishing differences of intensity in their environment. Fechner's law makes organisms dependent not on the absolute but the relative degree of the differences in intensity; hence it is possible for them to exist up to the point of zero. In recent times the most important attempt to handle the problem has been made by Nernst [18], who endeavours, with the help of new findings in physics, to prove that it is inadmissible to apply the entropy law to the universe. We may spare ourselves this discussion, for we are concerned exclusively with systems which are finite in space and time. To these, however, applies the third principle of thermodynamics, the theorem of Nernst, according to which it is not possible to reach zero in finite systems. It is true that in a concrete system all differences in the intensity of energy may be equalized, so that there exists in it only more thermal energy; but it is impossible by means of any exosystemic influence wholly to withdraw this energy from the system and thus reduce its temperature to absolute zero. Accordingly, although from the macrocosmic standpoint absolute repose is attainable, there is bound up with it a corresponding increase in microcosmic (molecular) motion, and this can never be wholly destroyed. Absolute repose is unattainable.

Our discussion of the death instinct will be more fruitful if we take as our starting point not the stability principle, but the entropy principle. The first question we must ask is whether the death instinct can be conceived of as a special case of the latter principle in the realm of organic process.

There is no need for me to prove here that this is the trend of Freud's argument; but I must point out that, even if it be demonstrated that the entropy principle is identical with the death instinct

and death with the 'probable state', his train of thought would not be exhausted. For with the death instinct the historical character of all instincts plays an important part, and Freud holds outright that this instinct represents the striving of organic substance to return to the *earlier* state of inanimate matter. In a consideration of dynamics this historical factor must be disregarded. This is self-evident, but by emphasizing it afresh we may guard against confusion with the Ostwaldian or similar natural philosophy and escape the reproach of substituting physics for psychology.

To adduce the required proof is, of course, beyond our scope, for biology and physiology to-day have not yet progressed beyond the rudiments of a dynamics of the life-process. Nevertheless, it is certain that the processes of life are fixed. It is characteristic of such processes that certain conditions within the system compel the transformation of energy to follow a cyclical course, so that the initial phase is constantly reached again. So long as the exosystemic accession of energy is ensured and so long as the conditions within the system which cause the cycle remain unchanged, the fixed system endures. 'Death' occurs only as an accident in functioning. Many biologists do, in fact, hold this view. The life-processes themselves (apart from traumatic injuries) produce a progressive deterioration of the 'machine', and this, when the so-called necrobiotic processes have reached a certain point, results in the final impairment of the conditions of the cycle, i.e. in death. 'Death is evolved from life' [20, p. 160]. We must conceive of death as in some sense a functional accident which, from birth on, is gradually prepared for by deficiencies of functioning. It is inevitable, because the conditions of the cycle are very complicated and the factor of safety in the machine is indeed low; but, in principle, it is merely an accident, an inadequacy.

'Death as an incident', as Ehrenberg says [8, p. 29]—the isolated process of dying in the individual—would, according to this view, not subserve entropy. 'Death no more furnishes energy than does the breaking of an electric current' [8, p. 29 ff]. Yet it must be pointed out that the result of death is the dissolution of the system, i.e. that at death considerable differences of intensity between the system and the environment arise, which during life (indeed, precisely by means of life) were compensated. All the same it is true that, after a certain period, dissolution results in their ultimate equalization, which life prevented. These contradictions can be explained if we make use of our concept of the individual as a dual system. We differentiate the

processes in the cells (system C) from those in system P. Death is an incident which overtakes the latter system and destroys its regulating function, with which is inseparably bound up the existence of the cells which now undergo dissolution. Of course this accelerates the attainment of equilibrium in system C, which becomes subject to the laws of physics instead of those of life. For system C the death of its superior system signifies accelerated equalization; the death of system P, we may say for the moment, 'subverts the entropy' of the cells. For the entropy of system P (i.e. for the height of its potential = difference of intensity between the central apparatus and the body) no concrete significance can be attributed to death, because what death annihilates is precisely the relation between the parts of the dual system.⁴ The system P keeps the common reckoning of energy for the cells and endeavours to hold the 'balance of energy' steady. At the moment when the death of the system occurs, it is futile to ask whether the accounts balance, for they no longer exist. The cells appropriate the balance and each keeps its own account, which the physicist can check by his measurements. Thus the question is not whether the death of system P signifies an increase of entropy in that system,⁵ but whether life has the function of increasing the entropy of it.

If the death instinct is to be conceived of as an instinct at all after the incident which we call 'the death of an individual', it cannot be held to be a special organic case of the entropy principle, but (and this is Freud's opinion) it must be historically determined, like all genuine instincts.

Nevertheless, from the dynamic standpoint the dictum that for the living organism 'the goal of all life is death' has ample justification if the concepts in question are suitably defined. It is gratifying to be able to quote a biologist in this connection.

Ehrenberg builds up a biological theory upon the basic idea of the irreversibility of the elementary life-processes. Life consists in a continuous structural process, the growth of substance at the expense

⁴ Moreover, the same statement seems to apply to the living system C which is also a dual system (plasm and nucleus) of a lower order, whose death is brought about by cariolysis.

⁵ An observation by Crile [7, p. 536] seems actually to indicate the contrary, for after death the electrical potential difference between brain and body, which at the moment of death had the value 0, rises again.

of fluid; it consists of the utilizing of energy-intensities to build up substance from which no more work can be extracted, which is partly secreted from the body and partly precipitated within it as cell-nucleus structure (apparatus structure). The structural substance (e.g. the cell-nucleus) determines the velocity, intensity, etc., of the subsequent life-processes. It is this metabolism, this substance-formation, this dying which constitutes life. What we call the life of an individual is the integration of countless elementary life-processes to form a unity determined by the structures which produce those processes. Every individual elementary life-process leads to the irreversible binding of the energies in structure, i.e. to 'death'. The life of the individual aims at the filling of the 'vital space' with structure; its intensity and duration are determined by the gradient between the vital space and the amount of structure it contains. At any point before the end (which can probably never be reached) the 'incident of death' may bring the process life-death to a standstill.

Freud ascribes to organic substance the tendency to strive after stable conditions and to achieve lasting states of repose, and he calls the agent which executes this tendency the 'death instinct'; it seems that we may not unreasonably anticipate that biology and physiology, as they advance, will adduce cogent evidence that this tendency is the special case of the entropy principle for organic systems. The death instinct (using the term in the sense attached to it in biological theory) is, if we leave aside the historical factor, rightly regarded from the standpoint of dynamics as a scientific and not a merely speculative hypothesis. Of course the words 'death' and 'instinct' do give prominence to the historic factors in the behaviour of a system, and this easily leads to misunderstanding. We should probably therefore be wise, when considering the death instinct in this sense (which is entirely in accordance with Freud's view), to reserve for it the term 'Nirvana principle' [10].

The attempt to see in the pleasure principle the psychological special case of the entropy principle must for the moment remain at a very rudimentary stage of theory. If we should succeed in evolving satisfactory methods for measuring the libido, we should no doubt be able to arrive at an exact proof of this hypothesis, arguing from the principles of psycho-analytical psychology. Freud has repeatedly shown that the problems of the pleasure principle are *quantitative* and ranks them as a separate economic standpoint. According to his economic hypothesis, pleasure is experienced when quantities of

excitation within the psychic system are diminished and pain when they are increased. He does not overlook the fact that this experience does not depend on the absolute quantities and that possibly the quality of the tension plays a part [12]. If we could demonstrate experimentally that these quantities of excitation and tension represented quantities of energy, we could prove that the decisive part of the individual's whole behaviour is regulated by the entropy principle [12].

Our first attempt at an experimental computation of libido [5] testifies clearly to the correctness of Freud's theory of pleasure, provided that we guard against vague analogies in our discussion. According to our findings, the potential of the individual is raised in the state of repose (sleep), hence repose does not represent increased entropy; on the contrary, the differences in intensity are considerably augmented. To try to draw an analogy between repose and 'entropy' would result unfavourably for the psycho-analytical theory of instinct. But the state of repose of system P must not be construed as a state of physical equalization of account of the phenomenon of rest. It is obvious that, during sleep, system P is to a great extent eliminated. Directly the individual awakes and motor actions occur, which are regulated by system P, the potential is lowered. Whilst retaining the notion that P is a superior system, we may assert that its function is to lower, and keep low, the potential, which rises as soon as P is eliminated. This elimination (the state of repose) produces a dynamic situation in opposition to the principle of entropy: hence system P 'subverses entropy'.

In one of the sleep-curves plotted by Mosso [5, p. 180] we see that in restless sleep, talking during sleep, etc., there is always a decrease in the temperature-difference (which, according to our view, is a factor of the potential). We cannot immediately reject the supposition that the lowering of the potential during the state of repose corresponds to dreaming. In dreams the system P once more comes partly into play, its function being to guard sleep. Without anticipating future experiments, we might conjecture that this is another proof that system P operates to increase entropy. We thus arrive at the notion (which is in accordance with the practical findings, if not with the theories, of the biology and physiology of sleep) that out of the lively metabolism of the cells during sleep there accumulates a considerable measure of potential difference, which presses to be lowered. The individual awakes, the energies are personalized [4] and are diminished by the psychic work performed during the waking state. We may even say

that spontaneous waking occurs because the potential has become too high. The curves of sleep and narcosis [5, p. 181] do indeed show that, with awaking, the potential begins to be lowered. So, from this point of view also, partial awaking—dreaming—with its lowering of potential must be looked upon as 'guarding sleep'.

The waking, rested system has a large store of potential, while the exhausted system has a minimum. At first sight it seems from the dynamic point of view almost self-evident that potential is lowered by the working of system P; for work uses up energy. But when we realize that in the waking state a constant stream of energy flows into system P (e.g. through the process of perception), and when we remember that various considerations have forced us to conceive of muscular activities as not merely using up the energies of P (on the contrary, part of these energies is augmented by muscular action) [4, p. 112], the question arises how that system's function of lowering the potential is achieved. The waking, rested individual displays a lively inclination towards the stimuli and objects of its environment; it craves for stimulus and finds pleasure in the gratification of this craving. This mode of behaviour is especially characteristic of the sexual instincts, where it takes the form of attraction and attachment to an object; but we have evidence of it in connection with the instinct of destruction also. The result of this turning towards objects is that the system receives accessions of energy, and this seems the more unreasonable because it is just when the system is rested that it has a very high potential, whereas in a sleepy state with a low potential it cuts itself off from stimuli. At first it seems that the fact of the craving for stimulus is in direct contradiction to a tendency in the system P to keep the 'sum of excitation' as low as possible. Here we are faced with the same problem in the psychological aspect as the life-instinct presents to the Nirvana principle.⁴

If there is really a contradiction to the entropy principle here, the explanation must lie in the mechanical conditions of system P, and it must be only apparent and ultimately capable of solution. In the thermodynamic-osmotic model of the dual system P [4, p. 82] the potential difference between the sphere (central apparatus) and the

⁴ In our subsequent argument we shall modify and give a greater exactness to Bernfeld's argument [1] that the solution of the problem of craving for stimulus and delight in it lies in their agreement with the Nirvana principle.

cylinder (system C—'body') arises from the fact that the initial temperature of the former is lower than that of the latter. Autonomous equalization of temperature is impossible because the temperature of the cylinder is kept constant. It would appear that the easiest way to secure in the model a minimum of potential (the difference in temperature) would be to prevent fresh energy being conducted to the cylinder from outside. This is in accordance with the kindred psychological notion that through the avoidance of stimuli, i.e. through narcissistic isolation, the 'excitation-level' is kept low. But the potential can be kept constant through isolation in the model only, not in a living organism, for in the latter the potential is raised endo-systemically. In the model the potential can be lowered only by conducting new energy to the cylinder which, according to the mechanical conditions, must be transferred to the sphere, so that its temperature is raised and the difference in temperature—the potential—between cylinder and sphere is diminished. The model's mode of functioning corresponds exactly to the apparently paradoxical behaviour of system P. Only if it receives fresh energy can its potential be lowered. This energy is conveyed by waking psychic activities and is guaranteed by the psychic phenomenon of the craving for stimulus. Libido directed towards the outer world, all the activities of self-preservation and many of those of the instinct of destruction, fulfil the dynamic function of lessening the difference of intensity in system P—lowering its potential. That is to say, they increase the entropy of that system. From the dynamic standpoint Freud's view that the life instincts pave the way to death is most exactly correct. The pleasure principle is the most general conscious regulator of the individual's behaviour. In its function of avoiding pain and achieving pleasure and in its modified development as the reality principle it accomplishes the lowering of the potential in accordance with the law of entropy. Through the pleasure principle the objects, actions and affects, which, dynamically regarded, are processes tending to raise the entropy of system P, become valuable for pleasure and for life itself. When the optimal entropy has been reached, that system has fulfilled its task and 'goes quietly to sleep'; its function is suspended. But when it ceases to operate to reduce the amount of energy, the potential once more is quickly raised to a degree which rouses system P to work again.

If, then, the experience of pleasure is associated with a lowering of potential and if this acts, as we may say, as a physical force, the

question arises how it comes about that pain is experienced at all or that there is any painful tension other than that of quite brief duration which is immediately cancelled by pleasure?

According to the view of Fechner and Freud, it would seem natural to include amongst painful experiences those processes in the system P which are contrary to the conditions of pleasure—that is to say, to assume that pain occurs when the potential of the system is raised. What are the conditions in the dual system under which the potential is thus raised for considerable periods, contrary to the 'natural trend' of the processes of nature?

In discussing perception we endeavoured to show [4, pp. 80 and 88 ff.] that through the operation of the intensities of the environment energy is conducted to system P and, through personalization, lowers that system's potential. This energy reaches the central apparatus through the sense-organs. The potential is lowered through the conducting of energy to the central apparatus and through its personalization, i.e. through the raising of the level of energy in one part of the dual system. On the other hand, this conduction of energy depends on the difference of intensity between the cells and the central apparatus, and therefore on the presence of the potential. If the latter is considerably lowered it must entail difficulties in the mastering of the energies conducted to the system through external stimuli. The energy so conducted must remain in the sense-organ, in system C (in our model, the cylinder) and augment its intensity, thus raising the potential. It is evident, then, that the conception of a dual system enables us to interpret pain dynamically. Pain is associated with conditions in which the potential is low, as we assume it to be in fatigue before sleep. This is in accordance with our empirical knowledge, for it is characteristic of these states that stimuli are felt to be painful and the objects from which they proceed are shunned and eliminated from consciousness.

When the potential is high, the individual's behaviour is characterized by a readiness to turn towards objects and to desire them libidinally. So we could describe as narcissistic or as a flight from objects the state of minimal potential, in which stimuli and objects are shunned (in our model this state is represented by equality of temperature in the cylinder and the sphere). Dynamically we must conceive of the craving for stimulus and flight from objects as two easily differentiated modes of behaviour of system P. Both aim at the increase of entropy but under different mechanical conditions. From the discussion of the economics of energy in the dual system when the

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potential is low, we gain some light on the question which had to be left open at the end of our second work [4]: painful conscious processes occur when there is a difficulty in augmenting the intensity in the central apparatus, i.e. in the transport of energy from the cells to that apparatus.

The reason why human life is accompanied by so much pain, in spite of the pleasure principle and the physical tendency to entropy which this safeguards, must be sought in the conditions of the dual system which, given a certain distribution of energy, may lead to temporary malfunctioning. That this possibility is, in fact, so abundantly realized is due to all the social and psychological conditions and complications of natural processes, upon which psycho-analysis throws all the light we need. There are historical influences (ontogenetic and phylogenetic detours, and others imposed upon the individual by the conditions of his social station, which have now become historical) forbidding us many of those activities which would lead to a pleasurable equalizing of tensions. In a word, the restrictions of instinct which reality and the super-ego impose on the system P are the cause of the painful states so remarkably common and persistent.

It is very probable that constitutional factors, i.e. exceptional mechanical conditions, make it physiologically difficult to equalize the potential difference and so provide an opportunity for the excessive development of pain. Or they may permanently keep the potential difference very low, making the individual in question either chary of stimuli or over-sensitive to them, apathetic and narcissistically secluded in himself. Above all we should expect that any pathological structure of the central apparatus would be an important factor here (understanding by structure the energy-capacity in both senses of the term [4, p. 88 ff.]).

As far as it is possible to make an assertion before experimental psycho-analytical work has been done, it seems quite conceivable that the pleasure principle may be demonstrated to be a special case of the entropy principle on the level of system P.

But with this conclusion we have not reached the end of the task which we set before us in this paper, for Freud's argument to which, so far, we have exclusively adhered has hitherto had but little place in psycho-analytical discussion. When we speak of the death instinct, we are struck by a whole series of other elements in Freud's construction: above all, there is dying as an incident. We sometimes find

psycho-analytical writers expressing the view that the premature death of children, or even of adults, is a manifestation of their death instinct (cf. Ferenczi, 9). From the nature of the case there can be no clinical proof of the correctness of this opinion, for it is part of the essence of the death instinct that it is not readily noticeable and sometimes cannot be detected at all. From the dynamic-economic standpoint it is impossible to decide whether this hypothesis is justified. As against it we may point out that, as we have shown, dying is not a concept which can be expressed in terms of dynamics, and that probably it cannot be adopted as an instinctual aim in the proper sense of the term. Freud has constantly asserted that dying and death cannot be instinctual aims for the id. Hence the question is only whether they represent an aim of the ego or a demand of the superego. Nevertheless, we would freely admit that a constant starvation of the erotic life or constant dissatisfaction and pain may have a very injurious effect upon the functioning power of system P. In suicide it certainly seems as though we had a direct manifestation of the 'death instinct'. Of course, in examining suicide analysis constantly reveals nothing else but complicated libidinal situations, implacable demands of the superego, identifications and, finally, a hatred of the subject's own ego or person, which feelings can usually be shown to have their origin in relations with objects. The mysterious factors in suicide, the intensity of the hate or other qualitative characteristics which are difficult to understand, possibly have not much to do with the final result: self-destruction. Like the corresponding factor of sadism these should probably be attributed rather to the instinct of destruction than to the death instinct (Nirvana principle).

But in psycho-analytical discussion it is just the instinct of destruction which constitutes the real difficulty. In *Beyond the Pleasure Principle* Freud recognizes as the pleasure principle within the ego the death instinct of biological speculation (an idea to which, so far, we have confined our discussion). Since then, however, it has become increasingly clear that he is seeking to identify the death instinct with the instinct of destruction, and in his terminology the two are interchangeable. The question is whether it is justifiable so to identify them even from the dynamic-economic standpoint. We shall show that this is not so unless the death instinct which Freud identifies with the instinct of destruction has already acquired a meaning other than that attaching to the term in *Beyond the Pleasure Principle*, where it is regarded as a special case of the stability principle. His writings of

recent years do not lead to any final decision on the point. But it is noteworthy that he accepts the death instinct (or instinct of destruction) as a psychological fact—a dynamic, and no longer an economic, fact. He does not attempt to describe it in terms of biological theory, nor does he link it up with the stability principle. He views it as a counterpart to the sexual instinct, but not in relation to the pleasure principle. We read, for instance: 'We must confess that it is more difficult for us to detect the latter [the death instinct] and to a great extent we can merely conjecture its existence as a background to Eros, also that it eludes us wherever it is not betrayed by a fusion with Eros' [15, p. 101].

The instinct of destruction and the sexual instinct give rise to two easily differentiated modes of behaviour of the individual in relation to his environment; undoubtedly they are to be construed as two different instincts. Instinct is the urge to restore a lost situation of gratification [11]. Though it is not possible to name with certainty any definite situation of this sort which can be attributed exclusively to either of these two instincts, yet on the whole the trend of the instinct of destruction is to recover gratification by annihilation of the environment and probably also by isolation of the subject from objects. The sexual instinct aims at attaining gratification by turning towards the environment and by retention of objects, i.e. by their preservation. Love is characteristic of the one instinct, hate of the other. They are certainly both of a biological nature, but not, like the death instinct, simply hypotheses in biological theory: these two easily distinguishable modes of behaviour may be demonstrated as concrete facts in the animal world also, right down to the protozoa. Freud observes that it was extraordinarily difficult for psycho-analysis to recognize the instinct of destruction [15], but it is for the biologist precisely the behaviour motivated by destruction which is an incontestable fact, while it is more difficult to discover love-activities not associated with a sexual instinct tinged with the tendency to destroy. Even when studying earliest infancy we see clearly that originally, in the first weeks of life, the predominant behaviour is rejection of the stimuli of the environment, exclusion and 'hatred' of them [Bernfeld, 1]. When the environment gradually begins to become interesting and stimulating, the infant's first aim is to master it in order to annihilate or reject it orally; finally this urge to mastery issues in an active, aggressive, destructive phase which imparts to the child's pregenital development an obviously sadistic character. In

Psychologie des Säuglings [1] all these facts are classified under a single heading according to the primal aim: that of restoring the repose of sleep, which has been interrupted by the disturbing values of the environment and by hunger-stimuli. To this group we give the name: 'repose instinct'. The term 'destruction instinct', however, describes subsequent development very much more clearly. This is the supremely conservative instinct which aims at preservation of the state of sleep—narcissistic repose—which feels and treats the world as an interruption to be escaped or annihilated. Ontogenetically the instinct of destruction as a guardian of sleep, as hunger, as an urge to mastery, is the earlier. It is in connection with the gratification of this instinct that the infant discovers the pleasure of the erotogenic zones and, through modification, restriction and transformation of the activities which it motivates, passes on to manifestations of tenderness and to libidinal object-attachment.⁷

The study of the sexual instinct and that of destruction (even if extended to include all living beings), the demonstration of the differences between the two, of their origin, mutual determinants, the development of their aims, the individual and secular evolution of the

⁷ A more precise account cannot be given here of the reasons for the view which we are advocating and of which Bernfeld [1] has given a detailed exposition, namely, that a very close connection exists between narcissism and the instinct of destruction. In his work on *Fascination* [2] he shows that the preliminary phases of libidinal identification are conditioned by the suppression of motor activity (mastery). Perhaps if we follow this line of thought we shall be able to arrive at more concrete ideas about the energy of the instinct of death or destruction as contrasted with libidinal energy [15]. In the following remark Freud seems to hint at the affinity between narcissism and the instinct of destruction, on the one hand, and the process of binding with libido, on the other: 'But even where it shows itself without any sexual purpose, even in the blindest frenzy of destructiveness, one cannot ignore the fact that satisfaction of it is accompanied by an extraordinarily intense narcissistic enjoyment, due to the fulfilment it brings to the ego of its oldest omnipotence-wishes. The instinct of destruction, when tempered and harnessed (as it were, inhibited in its aim) and directed towards objects, is compelled to provide the ego with satisfaction of its needs and with power over nature' [15, p. 101]. Perhaps this affinity inspired Cohen-Kysper with the idea that the goal of the death instincts is repose and that they aim at lulling to rest . . . Eros, the disturber of the peace [6, p. 405].

means of gratification—all this lies within the sphere of the *qualitative*. These are problems which are germane to Freud's dynamic conception. Though the instincts may be characterized generally as being directed towards gratification, and this may in fact mean the restoration of a state of repose or equilibrium, and though we may even identify this equilibrium of 'release from tension' with a physical equilibrium—nevertheless, all this is merely a quite general proposition inadequate for the characterization of an instinct or its differentiation from other instincts. The gratification aimed at (even if it were in the physicist's view an increase in the entropy of the system) is in every instance a qualitatively determined situation, which has become historic and has certain conditioning factors which are extradynamic. From the point of view of dynamics there is no sense in considering it except in its *quantitative* aspect. The qualitative and historic factors must be considered from other points of view. They will of course be comprehended in the dynamic-economic purview also, in so far as they enter into the mechanical conditions of the system or the integrated subsystems. We must leave it to future investigators to examine whether in the case of the instinct of destruction and the sexual instinct these factors do so co-operate.

But we may venture to make a suggestion. In deriving pain from the mechanical conditions of the dual system we have become acquainted with a state in which the dynamic intensity is so distributed that it is necessary to eliminate and annihilate the sources of excitation (i.e. objects) in order to secure the minimum of potential. This probably corresponds to the psychic situation in which stimuli from the outside world are felt as disturbing factors which must be annihilated if they cannot be ignored—it corresponds, that is to say, to the instinct of destruction.

On various occasions and from various standpoints Freud has made a number of statements about the death instinct. If we were to summarize all that he has said about it under a single heading (because he uses the same term throughout) the result, from the standpoint of dynamics, would be a notion full of contradictions, for he alternates dynamic with economic considerations. The 'death instinct' is synonymous with the instinct of destruction, its partner is the sexual instinct and it is a dynamic concept in the theory of instinct; yet at the same time it is an *historic* concept, definitely comprising qualitative elements. It is to be found in the ego like the sexual instinct, with which it generally appears in combination, and, though it possibly

presents more problems for research than that instinct, these problems are of the same nature. Being ubiquitous, it has biological validity. Being, like the sexual instinct, on the boundary-line between psychic and physical concepts, it is a subject for physiological, but not for dynamic, examination.

The death instinct is something 'other' than the instinct of destruction only when we use the term to connote the biopsychic special case of the principle of stability; to physicists a more significant way of expressing this is to say: when the term 'death instinct' is used to denote the general tendency to entropy in all natural systems. We should be wise not to employ the term 'instinct' to describe this general behaviour of systems. For such a terminology obscures the problem of the function of the instincts (instinct of destruction and sexual instinct) in the general behaviour of the system, i.e. the equalization of difference of intensity.

If this exposition contain a germ of truth, then Freud's notion of the death instinct loses, it is true, the fine philosophical flavour which makes it at once so attractive and so controversial. For to the antithesis: instinct of destruction—sexual instinct, he opposes the antithesis: death instinct—Eros. In the physico-biological notion of the death instinct Eros has no place. The theory of energy has no cognizance of any partner, rival or opponent where the law of entropy is concerned, or at least of none other than the 'mechanical conditions' which in certain cases lengthen the way to entropy and enforce detours. Moreover, the combination of increasingly large masses of substance to form single entities is not in accordance with the trend of the physical process; on the contrary, this aims not merely at the dispersal of energy, but also at the dispersal of substance. From the point of view of physics the philosophically satisfying idea of 'forces opposed to death' has little meaning: from the standpoint of dynamic theory it has none at all. The death instinct, regarded as the behaviour of a system, has no partnership with Eros. Eros is not a mode of behaviour of systems in general; it belongs specifically to organic systems. Similarly, the tendency to destruction does not connote physical behaviour of systems in general: it, likewise, is specific for organic systems. These two modes of behaviour may, in the strictest sense of the word, aspire to the title of instinct—that which differentiates the behaviour of organic systems from the inorganic.

One might possibly have the impression that these ideas tend to a monism contradicting the dualism of instinct upon which Freud

insists. In particular, when we compare libido with free energy (potential of the individual) [4, p. 104] we may well be struck by a resemblance to the psycho-dynamic monism of Jung, his equation of libido and energy (primal libido). This is not the place in which to discuss Jung's theory. What he calls '*Energetik*' (dynamics) [17], has little more than the word in common with the physicists' concept of energy. It is precisely when we wish to establish the dualism of instinct that we lay special emphasis on the monistic character of energy and distinguish it from the multiplicity (dualism) of the instincts. Energy is the sum of the capacity for doing work. Hence it is the 'same' energy which operates as the libido and as the motive power of the instinct of destruction. The free energy of the system P, its potential, can be measured only by a 'monistic' computation. The potential is directed, moreover, to one end only, as is all dynamic movement in nature—namely, towards diminution. Certain specific organic conditions of the system compel organisms to follow this trend in two modes qualitatively so different, accompanied by such opposite phenomena and consciously felt to be so incommensurable. To revert to the language of psycho-analysis, I refer to the manifestations of the instinct of destruction and the sexual instinct.

We have tried to find out something about these specific conditions of the system. When the course of dynamic processes in a dual system, subject to the mechanical conditions of osmosis, is such that a single potential difference exists between the two parts of that system (central apparatus [brain plus nervous system] and cells [body]), the entropy-law impels it to a lowering of the potential. So long as the latter does not exceed a certain minimum, it may be lowered by cutting off from the system supplies of energy from the outside world. If, however, this minimum be exceeded the potential can be lowered only by the accession to the system of fresh quantities of energy. Hence our physicist's model can achieve its entropy in two opposite ways. These correspond respectively to narcissistic-destructive and to object-libidinal behaviour. It would be more accurate to say that, dynamically, these two modes of instinctual behaviour are identical with the two modes of behaviour in the model. So that, without for a moment abandoning our theory of the dualism of instinct, the single trend of the physical processes in the system is maintained. Indeed, this 'referring' of the two instincts to the single dynamic process which comprehends them both adds certainty to Freud's thesis that from the dynamic standpoint the two are essentially different.

The general behaviour of systems is associated with the principle of Le Chatelier [3]. This lays down that every system resists the influences of the outside world, its aim being 'self-preservation', and is a special formulation of the more comprehensive entropy principle. It applies to systems in stable equilibrium. System P cannot behave simply in accordance with Le Chatelier's principle, for it is only in special border-line states that it has a stable equilibrium (or at any rate for short periods of time, e.g. in sleep). In these states the system's behaviour does actually consist of nothing but the simplest activities of resistance or yielding—it is motivated by the 'instinct of repose' (the instinct of destruction). In general, however, its task is not merely to strike a balance of energy, which would soon lead to a stable condition in its relation to the outside world, but it has also to master the differences of energy arising within it and therefore it has need of the more complicated mechanism of the craving for stimulus, libidinal behaviour and the sexual instincts.

From the hypothesis of the dual system we draw the conclusion that the sexual instinct and the instinct of destruction alone can claim to rank as instincts: the specific behaviour of living systems (osmotic dual systems). The death instinct in the sense of the Nirvana principle represents the general behaviour of natural systems (the same applies to the so-called instinct of 'self-preservation' [3]) which, on the level of system P with its historical mechanical conditions, is secured only by the operation of the instinct of destruction and the sexual instinct.

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