PROJECT FOR A SCIENTIFIC PSYCHOLOGY[1]

[1] [The title has been chosen by the translator. The title in the German edition "Entwurf einer Psychologie" was chosen by its editors.] Freud's manuscript bears no title; in his letters he speaks of "the note-books" or "the psychology" [as well as of "the psychology for neurologists" and "the $\Phi\Psi\omega$ "] For the position occupied by the "Project" in Freud's development, see the Introduction, p. 25 ff.

Editorial Note

The following manuscript dates from the Autumn of 1895. The first and second parts (p. 355 ff., p. 405 ff.) were begun by Freud in the train after a meeting with Fliess. (Letter of September 23, 1895; part of the manuscript [up to the end of section 2 of Part I] is written in pencil.) They were finished on September 25 (see the date at the beginning of Part II). The third part (p. 417 ff.) was begun on October 5, 1895 (see the date at the beginning of the manuscript). All three parts were despatched to Fliess on October 8.

A fourth part, which was to deal with the psychology of repression, regarded by Freud as "the heart of the riddle", was evidently never completed. As he worked at this problem, Freud's doubts as to the fruitfulness of the line of approach attempted in the "Project" grew stronger. These doubts began to arise soon after he had concluded the work which he had begun with such feverish interest. He was already feeling sceptical on November 29, 1895 (Letter 36): "I no longer understand the state of mind in which I concocted the psychology". In his letter of January 1, 1896 (Letter 39), he attempts to give a revised account of his hypotheses on the interrelations of the three kinds of neurones, which, in particular, clears up the position of the "perceptual neurones". More than a year after he had written the "Project", his views had so far developed that he sketched out a diagram of the psychical apparatus with a sense similar to that contained in the seventh chapter of *The Interpretation of Dreams* (Letter 52, of December 6, 1896). From that time onwards, Freud lost interest in the question of representing the psychical apparatus in terms of neuro-physiology. Years later he alluded to the failure of his efforts in that direction in the following terms: "Research has afforded irrefutable proof that mental activity is bound up with the function of the brain as with that of no other organ. The discovery of the unequal importance of the different parts of the brain and their

individual relations to particular parts of the body and to intellectual activities takes us a step further—we do not know how big a step. But every attempt to deduce from these facts a localization of mental processes, every endeavour to think of ideas as stored up in nerve-cells and of excitations as travelling along nerve-fibres, has completely miscarried". (Freud, 1915 *e*.) Recent research into the physiology of the brain on the whole shares these views. (Cf. E. D. Adrian's brilliant paper on "The Mental and Physical Origins of Behaviour", 1946.)

Under the cloak of brain physiology, however, the "Project" reveals a wealth of concrete psychological hypotheses, of general theoretical assumptions and of various suggestive hints. Many of these thoughts, after the modifications necessitated by the abandonment of the abortive physiological attempt, were carried over into Freud's later writings, and some of them are numbered among the permanent stock-in-trade of psycho-analytic hypotheses. Other portions of the "Project" (such, for instance, as the treatment of the psychology of intellectual processes in the third part, p. 439ff.) received no similar consideration in Freud's published writings, though certain of the notions which he here develops could be fitted without difficulty into the system of psycho-analytic theories.

The immediate continuation of the "Project" among Freud's published writings is to be found in *The Interpretation of Dreams*. But the fresh formulation of the nature of the psychical apparatus which is attempted in the seventh chapter of that work falls short in one point at least of the hypotheses put forward in the "Project": the position of the perceptual function could not be fully explained in the later work. (Cf. Freud 1917 *d*.) The solution of this problem was only made possible by Freud's hypotheses on psychical *structure*, developed in *The Ego and the Id* (1923 *b*) and subsequently. But this very development was foreshadowed in the "Project" by the elaborately sustained hypothesis of a permanently cathected "ego organization", a hypothesis which was revived in Freud's mind after an interval of thirty years.

At the period in which Freud drew up his "Project" his interests were mainly focused on its connections with neuro-physiology. When his hypotheses on that subject broke down, he simultaneously

dropped for the time being others of the topics dealt with. And this may have been true in particular of his hypotheses about the ego, which, in the "Project", were attached to a specially designated group of neurones.

Immediately after Freud had written the "Project", his interests were diverted to other problems. With his return to clinical work during the autumn, the theory of the neuroses moved into the foreground of his thoughts, and his principal discovery of the autumn of 1895 related to the distinction between the genetic factors in obsessional neurosis and hysteria (Letter 34, etc.).

In order to make it easier for readers to follow the extremely condensed train of thought, we have drawn up a table of contents and, where a given topic is broken off, we have indicated in footnotes the point at which it is later resumed.

[A few further elucidations have been inserted in the text by the English translator and some footnotes have also been added by him. These additions are enclosed in square brackets. It will be understood that all other footnotes are by the editor of the German edition. In the English translation the sections have been numbered for purposes of reference.]

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PROJECT FOR A SCIENTIFIC PSYCHOLOGY

PART I

GENERAL SCHEME

INTRODUCTION

The intention of this project is to furnish us with a psychology which shall be a natural science: its aim, that is, is to represent psychical processes as quantitatively determined states of specifiable material particles and so to make them plain and void of contradictions. The project involves two principal ideas:—

1. That what distinguishes activity from rest is to be regarded as a quantity (Q) subject to the general laws of motion.
2. That it is to be assumed that the material particles in question are the neurones.

N and $Q\dot{\eta}$ [neurones and quantity][1].—Experiments of a

[1] In the manuscript Freud made use of numerous abbreviations, the majority of which have been filled out in the printed version. Apart, however, from customary or easily explicable abbreviations, he employed a certain number of fixed tokens: thus N stands regularly for "neurones" and Φ, Ψ and ω indicate the three systems of neurones (Φ being often used adjectivally). The system of ω -neurones is also frequently referred to as the system of "perceptual neurones" [or "*W*-neurones", *cf.* footnote, p. 370]. In such cases the abbreviations used by Freud have been added in round brackets. The term "quantity" is represented by Freud by two different abbreviations: Q and $Q\dot{\eta}$. Towards the end of the draft (p. 110) he gives criteria for distinguishing between them: Q relates to "external" quantity and $Q\dot{\eta}$ to "psychical" quantity. The distinction is not always maintained consistently and is entirely dropped in Letter 39 of January 1, 1896, p. 140ff.). In the present printed text both Q and $Q\dot{\eta}$ have been replaced by the word "quantity"; but the abbreviation used by Freud is in each case added in round brackets. Where no abbreviation is added, it should be assumed that Freud did not employ either symbol but wrote out the word in full.—[The translator is inclined to think, however, that Freud's use of the abbreviations Q and $Q\dot{\eta}$ might be.more accurately distinguished as follows. Q seems to be used by Freud quite generally for quantity—including quantity in the external world—when he is not particularly concerned to characterize it more precisely. $Q\dot{\eta}$ seems to be used by him primarily to mean quantity as it occurs in neurones; thus $Q\dot{\eta}$ is ascribed to the Φ-system of neurones (e.g., p. 385) and to the ω-system (e.g., p. 373) as well as to the Ψ-system. The Translator also ventures to hazard an explanation of the enigmatic symbol $Q\dot{\eta}$. As will be seen below (footnote p. 370) Freud jokingly used the Greek ω to stand for the *W* of *Wahrnehmung* (perception); it seems not impossible that he made similar use of the fact that the Greek $\dot{\eta}$ is only an "n" with a long tail. If so $Q\,\dot{\eta}$ would be an appropriate symbol for "neuronic quantity".]

similar kind are now common.[1]

[1] FIRST PRINCIPAL THESIS: THE QUANTITATIVE LINE OF APPROACH

This line of approach is derived directly from pathological clinical observations, especially from those concerned with "excessively intense ideas". (These occur in hysteria and obsessional neurosis, where, as we shall see, the quantitative characteristic emerges more plainly than in the normal. [See Part II, p. 405 ff.]) Processes such as stimulus, substitution, conversion and discharge, which had to be described in connection with these disorders, directly suggested the notion of viewing neuronic excitation as quantities in a condition of flow.[2] It seemed legitimate to make an attempt at generalizing what had been found in these particular instances. With this as a starting-point, it was possible to lay down a basic principle of neuronic activity in relation to quantity (Q) which promised to be highly enlightening, since it seemed to cover the entire [neuronic] function. What I have in mind is *the principle of neuronic inertia*, which asserts that neurones tend to divest themselves of quantity (Q). On this basis it becomes possible to understand

[1] It is not possible to say definitely what "experiments" Freud had in mind. See, however, as regards views upon brain physiology, the collected papers of E. Fleischl von Marxow (1893), with a biographical sketch by Sigmund von Exner, and, as regards the relations between physiology and psychology, Exner's own writings, particularly his *Outline of a Physiological Explanation of Psychical Phenomena* (1894). In the latter the following passage occurs (p. 225): "All the phenomena of quality and quantity in conscious sensations, perceptions and ideas can be traced back to variable quantitative excitations of various portions of this totality of paths". As regards the theory of memory, Freud may have derived suggestions from the French writers on the subject as well as from a lecture on "Memory and its Abnormalities" (1885) by A. Forel, which he read attentively.

[2] Freud's statement that the successful application of dynamic ideas to the problems of hysteria directly suggested his present line of approach reminds us that *Studies on Hysteria* had appeared only a short time before this draft was written. It is plausible to suppose that Freud was attempting in this "Project" to solve difficulties which Breuer had been unable to solve in his theoretical contribution to the *Studies*. Freud's starting-point is sharply opposed to that of Breuer, who wrote: "In what follows there will be little said of the brain and nothing at all of molecules. Psychical processes will be discussed in the language of psychology: indeed, there is no alternative".

the structure and development of neurones as well as their functions.

The principle of inertia accounts, in the first place, for the division of neurones into two classes, motor and sensory, as a contrivance for counteracting the reception of quantity ($Q\dot{\eta}$) by getting rid of it. Reflex movement now becomes intelligible as an established method of thus getting rid of quantity. The principle of inertia provides the reason for reflex movement. If we look still further back, we can in the first instance link the neuronic system (as inheritor of the general susceptibility of protoplasm to stimulus) with the irritable outer surface of protoplasm which is interspersed with considerable stretches of non-irritable [substance].[1] A primary neuronic system, having thus acquired a quantity ($Q\dot{\eta}$), employs it only in order to get rid of it through the connecting path leading to the muscular mechanism, and thus keeps itself free from stimulus. This process of discharge is the primary function of neuronic systems.

At this point there is an opportunity for the development of a *secondary* function. For among the various methods of discharge those are preferred and retained which involve a cessation of the stimulus—*i.e.*, *flight* from the stimulus. A balance is observed here between the quantity of the excitation and the effort required for flight from that stimulus; so that the principle of inertia is not disturbed in this case.

From the very first, however, the principle of inertia *is* upset by another set of circumstances. As the internal complexity of the organism increases, the neuronic system receives stimuli from the somatic element itself—endogenous stimuli, which call equally for discharge. These have their origin in the cells of the body and give rise to the major needs: hunger, respiration and sexuality. The organism cannot withdraw itself from them as it does from external stimuli; it cannot employ their quantity (Q) for the purpose of flight from the stimulus. They only cease if certain definite conditions are realized in the external world. (Take, for example, the case of the need for nourishment.) To carry out an action [that will bring these conditions about]—an action which deserves to be called "specific"—requires an effort which is independent of endogenous quantities ($Q\dot{\eta}$) and is generally greater than they are, since the individual is

[1] Word omitted in the manuscript.

placed under conditions which may be described as "the exigencies of life". The neuronic system is consequently obliged to abandon its original trend towards inertia (that is, towards a reduction of its level of tension to zero). It must learn to tolerate a store of quantity ($Q\dot{\eta}$) sufficient to meet the demands for specific action. In so far as it does so, however, the same trend still persists in the modified form of a tendency to keep the quantity down, at least, so far as possible and avoid any increase in it (that is, to keep its level of tension constant). All the performances of the neuronic system are to be comprised under the heading either of the primary function or of the secondary function imposed by the exigencies of life.[1]

[2] SECOND PRINCIPAL THESIS: THE NEURONE THEORY

The idea of combining this "quantity ($Q\dot{\eta}$) theory" with the knowledge of neurones which has been arrived at by modern histology is a second pillar of our theory. The essence of this new knowledge is that the neuronic system consists of distinct but similarly constructed neurones which only have contact with one another through an intervening foreign substance and which terminate on one another in the same manner as on a piece of foreign tissue; that certain lines of conduction are laid down in them, in so far as they receive excitations through a cell-process [or dendrite] and discharge them through an axis-cylinder [or axone]; and furthermore, that they have numerous ramifications with diameters of various dimensions.

If we combine this account of neurones with an approach on the lines of the quantity ($Q\dot{\eta}$) theory, we arrive at the idea of a "cathected" neurone (N) filled with a certain quantity ($Q\dot{\eta}$), though at other times it may be empty. The principle of inertia [p. 356] finds expression

[1] The thoughts developed in this passage find a continuation in Freud's discussion of the "two principles of mental functioning" (1911 *b*). Between these two lay the discussions in the seventh chapter of *The Interpretation of Dreams* (1900 *a*; *trans.*, 1953, p. 509 ff.). The distinction between a trend in the psychical apparatus towards reducing its level of tension to zero and the modification of this trend into one towards keeping the level of tension as low as possible—the distinction, that is, between the "Nirvana principle" and the "pleasure principle"—is discussed in *Beyond the Pleasure Principle* (1920 *g*; *trans.*, 1950, p. 76).

in the hypothesis of a *current*, passing from the cell-processes or dendrites to the axone. Each single neurone is thus a model of the neuronic system as a whole, with its division into two classes of neurones—the axone being its organ of discharge. The secondary function [p. 357], which requires quantity ($Q\dot{\eta}$) to be stored up, is made possible by supposing that there are resistances which oppose discharge; and the structure of the neurone makes it probable that these resistances are all to be found in the *contacts* [between the neurones] which thus function as *barriers*. The hypothesis of "contact-barriers"[1] is fruitful in many directions.

[3] THE CONTACT-BARRIERS

The first justification for this hypothesis lies in the consideration that at this point conduction passes through undifferentiated protoplasm, instead of through differentiated protoplasm (as it does elsewhere within the neurone) which is probably better adapted for conduction. This gives us a hint that there may be a connection between differentiation and capacity for conduction, so that we may expect to find that the process of conduction itself may create a differentiation in the protoplasm and consequently an improved capacity for *subsequent* conduction.

The theory of contact-barriers has, moreover, the following advantages. One of the chief characteristics of nervous tissue is that of "memory": that is, speaking generally, a susceptibility to permanent alteration by a single process. This offers a striking contrast to the behaviour of a material that allows a wave-movement to pass through it and then returns to its former condition. Any psychological theory deserving consideration must provide an explanation of memory. Now any such explanation comes up against the difficulty that, on the one hand, it must be assumed that after an excitation neurones are permanently different from what they were before, while, on the other hand, it cannot be denied that, in general, fresh excitations meet with the same conditions of reception as did the

[1] [The term "synapses" was not introduced (by Foster and Sherrington) till 1897, two years after Freud wrote the present paper.]

earlier ones. Thus the neurones would appear to be both influenced and also unaltered—"unprepossessed". We cannot off-hand imagine an apparatus capable of such complicated functioning. The situation is accordingly saved by assigning the characteristic of being permanently influenced by excitation to *one* class of neurones, and the immutability—the characteristic of being fresh for the reception of new excitations—to *another* class. Thus has arisen the current distinction between "sense cells" and "memory cells", a distinction, however, which fits into no other context and has nothing to support it.

The theory of contact-barriers can make use of this way out of the difficulty by expressing it in the following terms. There are two classes of neurones. First there are those which allow quantity ($Q\dot{\eta}$) to pass through them as though they had no contact-barriers, which accordingly, each time an excitation has passed, are left in the same condition in which they were before. And secondly, there are those whose contact-barriers make themselves felt, so that they allow quantity ($Q\dot{\eta}$) to pass through them only with difficulty or partially. This second class may be left in a modified condition after each excitation, and thus afford *a possibility of representing memory.*[1]

Thus there are *permeable* neurones (offering no resistance and retaining nothing) which serve the function of perception, and *impermeable* neurones (offering resistance and retaining quantity [$Q\dot{\eta}$]) which are the vehicles of memory and presumably, therefore, of psychical processes in general. Henceforward, accordingly, I shall call the former system of neurones Φ and the latter Ψ.[2]

[1] Freud has made use of some of these ideas in *Beyond the Pleasure Principle* (*trans.*, 1950, p. 27 ff.). He there states specifically that he has "adopted the views on localization held by cerebral anatomy". According to the analysis made by Dorer (1932, p. 128 ff. and especially p. 151) of Freud's relations to Meynert's theories, there can be no doubt that Freud had Meynert in mind when he wrote these words. Meynert's influence is to be suspected at several points in the development of the argument in the "Project", though it is not always possible to distinguish it at once from views which were generally held by the neurology of the 'nineties.

[2] From what follows below we shall find that the attributes of the two groups of neurones respectively are these: the Φ-neurones are "permeable", that is, offer no resistance, serve the purpose of mastering stimuli from the external world, and are to be identified with the grey matter of the spinal cord; the Ψ-neurones are retentive, serve the purpose of mastering internal stimuli, and are to be identified with the super-imposed grey matter of the brain.

At this point it will be advisable to make it clear what assumptions we must lay down concerning the Ψ-neurones if the most general characteristics of memory are to be covered. Here is the argument. These neurones are permanently altered by the course of an excitation; or (if we introduce the theory of contact-barriers) their contact-barriers are brought into a permanently altered condition. And since psychological experience tells us that there is such a thing as progressive learning based on recollection, this alteration must consist in the contact-barriers becoming more capable of conduction—less impermeable—becoming, that is, more like those of the Φ-system. We shall describe this condition of the contact-barriers as their degree of "facilitation" ["*Bahnung*"]. We can then assert that *memory is represented by the facilitations existing between the Ψ-neurones.*

If we were to suppose that all the Ψ-contact-barriers had equally good facilitations or, what is the same thing, offered equal resistances, the characteristics of memory would evidently not be brought out. For memory is obviously one of the determining and directing forces in relation to the path taken by excitations, and if facilitation were everywhere equal there would be nothing to explain why one path should be preferred to another. It is therefore more correct to say that memory is represented by the *differences* in the facilitations between the Ψ-neurones.

Now what does the facilitation in the Ψ-neurones depend on? Psychological experience shows that memory (that is, the persisting force of an experience) depends on a factor that is described as the "magnitude" of the impression and on the frequency of the recurrence of the same impression. Or, translated into our theory, facilitation depends on the quantity ($Q\dot{\eta}$) which passes through a neurone in the excitatory process and on the number of repetitions of that process. Thus we see that quantity ($Q\dot{\eta}$) is the operative factor, but that quantity ($Q\dot{\eta}$) can be replaced by quantity *plus* the facilitation resulting from quantity [Cf. p. 380].

In this connection we are reminded (almost involuntarily) of the primary effort of neuronic systems, retained through all their modifications, to avoid being burdened with quantity ($Q\dot{\eta}$) or to diminish it so far as possible. Under the pressure of the exigencies of life, the neuronic system has been obliged to lay up a store of quantity ($Q\dot{\eta}$)

[p. 358]. For this purpose it has had to increase the number of its neurones and these have had to be impermeable. But it now avoids, to some extent at least, being filled with quantity ($Q\dot{\eta}$)—avoids cathexis, that is,—by setting up facilitations. It will be seen, therefore, that *facilitations serve the primary function.*

The necessity for finding a place for memory in the theory of contact-barriers calls for something further. Every Ψ-neurone must in general be presumed to have several paths of connection with other neurones—that is, several contact-barriers. It is on this that the possibility depends of the excitation having a choice of path, determined by facilitation. This being so, it is quite clear that the condition of facilitation of each contact-barrier must be independent of that of all the others in the same Ψ-neurone. Otherwise there would once again be no possibility of one path being preferred to another—no motive, that is. From this we can draw a negative inference as to the nature of the condition of "facilitation". If we imagine a neurone filled with quantity ($Q\dot{\eta}$)—i.e., cathected—we can only suppose that this quantity (Q) is uniformly distributed over all the regions of the neurone, including all its contact-barriers. On the other hand, there is no difficulty in supposing that, in the case of a quantity ($Q\dot{\eta}$) in a condition of flow, it will take only one particular path through the neurone; so that only one of the contact-barriers will be influenced by that quantity ($Q\dot{\eta}$) and acquire facilitation from it. Therefore facilitation cannot be based upon a cathexis that is retained, for this would not produce the differences of facilitation in the contact-barriers of the same neurone.

It remains to be seen in what, apart from this, facilitation *does* consist. Our first idea might be that it consists in an absorption of quantity ($Q\dot{\eta}$) by the contact-barriers. Perhaps more light will be thrown on this later. The quantity ($Q\dot{\eta}$) which has left behind the facilitation is no doubt discharged, precisely on account of the facilitation, which increases permeability. Incidentally, we need not suppose that the facilitation remaining after the passage of the quantity ($Q\dot{\eta}$) is necessarily as great as it was during the actual passage. [Cf. p. 378.] Perhaps only a quotient of it is left in the form of *permanent* facilitation. In the same way we cannot yet tell whether an equivalent effect is produced by the passage of a given quantity ($Q\dot{\eta}$)

three times and by the passage of a quantity ($Q\dot{\eta}$) three times as great once only.[1] All these points remain to be considered in the light of later applications of the theory to the psychical facts.

[4] THE BIOLOGICAL STANDPOINT

Thus one peculiarity of neuronic systems—their capacity to retain and at the same time to remain receptive—seems to be explained by the hypothesis of there being two neuronic systems, Φ and Ψ, of which the former consists of permeable elements and the latter of impermeable. All psychical acquisition would on this basis consist in the organization of the Ψ-system through partial and locally determined suspensions of the resistance in the contact-barriers which distinguishes Ψ from Φ. As this organization proceeds, the capacity of the neuronic system for the reception of fresh impressions would in fact reach a limit.

Anyone, however, who is occupied in the scientific construction of hypotheses will only begin to take them seriously if they can be fitted into our knowledge from more than one direction and if the arbitrariness of a *constructio ad hoc* can thus be mitigated. It will be objected against our hypothesis of contact-barriers that it assumes the existence of two classes of neurones having a fundamental difference in the conditions of their functioning, whereas there is at present no other ground for making such a differentiation. From the morphological (that is, the histological) point of view, at any rate, there is no known evidence in support of this distinction.

Where else can we look for grounds for this division into two

[1] This question is answered on p. 383. Some of this section is carried further in a modified form in Freud's hypotheses on memory and consciousness. See in this connection *The Interpretation of Dreams* (*trans.*, 1953, p. 538 ff.), and the theory that "in the Ψ-systems memory and the quality that characterizes consciousness are mutually exclusive". Subsequently Freud formulated this idea even more drastically in the supposition that "consciousness arises *instead of* a memory-trace" (*Beyond the Pleasure Principle*, 1920 *g*, *trans.*, 1950, p. 29 [where the whole line of thought is explicitly attributed to Breuer] and "A Note on the 'Mystic Writing-Pad'," 1925 *a*, *Coll. Papers*, V, p. 177; see also Letter 52 of December 6, 1896). A similar view had been expressed by Breuer in his theoretical chapter of the *Studies on Hysteria*, 1895, p. 164: "This perceptual apparatus, including the sensory spheres of the cortex, must be distinct from the organ which stores up and reproduces sense impressions in the form of memory-images. . . ."

classes? If possible, to the *biological* development of the neuronic system, which, like all else, is regarded by the natural scientist as something that has come about step by step. We should like to know whether the two classes of neurones may have had some different biological significance, and, if so, by what mechanism they may have developed two such different characteristics as permeability and impermeability. The most satisfactory solution would of course be that the mechanism we are looking for should actually itself arise from the primitive biological part played [by the two classes of neurones]. We should thus have found a single answer to both questions.

Let us recall that from the very first the neuronic system had two functions: to receive stimuli from without and to discharge excitations of endogenous origin. It was from this latter duty, it will be remembered [p. 358], that a need for further biological development emerged under the pressure of the exigencies of life. The suspicion now arises that our systems Φ and Ψ may each have taken over one of these two primary duties. The system Φ might be the group of neurones which receive external stimuli, while the system Ψ might contain the neurones which receive endogenous excitations. If that were so, we should not have *invented* Φ and Ψ; we should have *discovered* them. It would only remain to identify them with what is already known. And in fact we know from anatomy that there is a system of neurones (the grey matter of the spinal cord) which is alone in contact with the external world, and a superimposed system (the grey matter of the brain) which has no direct peripheral contacts but which is responsible for the development of the neuronic system and for the psychical functions. The primary brain gives no bad picture of the characteristics we have attributed to the system Ψ, if we may assume that paths lead directly, and independently of Φ, from the brain to the interior of the body. The derivation and original biological significance of the primary brain is unknown to anatomists; on our theory it must have been neither more nor less than a sympathetic ganglion. Here is a first possibility of testing our theory by factual material.[1]

We shall provisionally regard the Ψ-system as identified with the

[1] Cf. p. 366 for a further such possibility.

grey matter of the brain. It will now be easily understood from my introductory biological remarks [p. 358] that it is precisely Ψ that is subject to further development through an increase in the number of its neurones and through an accumulation of quantity. It will also be seen how expedient it is that Ψ should consist of impermeable neurones, since otherwise it would be unable to fulfil the requirements of specific action. But how did Ψ acquire the characteristic of impermeability? After all Φ too has contact-barriers; and if *they* perform no function, why should those of Ψ perform one? To suppose that there was an original difference between the value of the contact-barriers of Φ and Ψ has once again a dubious appearance of arbitrariness, even though it would be possible, pursuing a Darwinian line of thought, to claim that impermeable neurones are indispensable and consequently bound to survive.

Another way out of the difficulty would seem more fruitful and less ambitious. Let us recall that the contact-barriers even of Ψ-neurones are in the end subject to facilitation [p. 361] and that what gives them facilitation is quantity ($Q\dot{\eta}$) [p. 361]. The greater the quantity ($Q\dot{\eta}$) concerned in the passage of the excitation, the greater is the facilitation—but that means the closer is the approach to the characteristics of the Φ-neurones. Let us therefore attribute the difference not to the neurones but to the quantities with which they have to deal. There is then reason to suspect that quantities pass through the Φ-neurones against which the resistance offered by the contact-barriers is negligible, but that the Ψ-neurones are only reached by quantities which are of the same order of magnitude as that resistance. If that is the case, a Φ-neurone would become impermeable and Ψ-neurone would become permeable if their locality and connections could be exchanged: they retain their characteristics because the Φ-neurones are connected only with the periphery and the Ψ-neurones only with the interior of the body. A distinction in their essence is thus replaced by a distinction in the *milieu* to which they happen to be allocated.

Now, however, we must examine our assumption that the quantities of stimulus reaching the neurones from the external periphery of the body are of a higher order than those from the internal periphery.

There is in fact much that speaks in favour of that view. In the first place, there can be no question but that the external world is the source of all major quantities of energy, for physical science informs us that it consists of powerful masses in violent movement and that this movement is transmitted by them. The system Φ, which is turned towards this external world, will have the task of discharging as rapidly as possible the quantities ($Q\dot{\eta}$) impinging on the neurones; but it will in any case be subjected to the influence of major quantities (Q).

To the best of our knowledge, the system Ψ is out of contact with the external world; it receives quantities (Q) only, on the one hand, from the Φ-neurones, and, on the other hand, from cellular elements in the interior of the body; and it is now a question of making it probable that these quantities of stimulus are of a comparatively low order. We may be disturbed at first by the fact that two such different sources of stimulus have to be attributed to the Ψ-neurones as Φ and the cells of the interior of the body; but precisely at this point we receive conclusive assistance from the recent histology of the neuronic systems. This shows us that the *endings* of neurones and the *connections* between neurones are constructed according to the same type, and that neurones terminate on one another in the same manner as they terminate on somatic elements [p. 358]; the functional side of the processes in both cases is also probably of the same kind. It is thus probable that similar quantities are dealt with at nerve endings and at intercellular connections. It is also reasonable to suppose that endogenous stimuli are of the same intercellular order of magnitude. And here, incidentally, we have a second opportunity for putting our theory to the test [p. 364].

[5] THE PROBLEM OF QUANTITY

I know nothing of the absolute magnitude of intercellular stimuli, but I venture to assume that it is of a comparatively small order and of the same order as that of the resistances of the contact-barriers. If this is so, it is easily understandable. The hypothesis I have been discussing preserves the essential sameness of Φ- and Ψ-neurones,

while their difference in respect of permeability is biologically explained.

In the absence of evidence, it is all the more interesting to consider certain points of view and possibilities opened up by this hypothesis. To begin with, if we have formed a correct impression of the magnitude of the quantities (Q) in the external world, we may ask whether the original trend of the neuronic system towards keeping its quantity ($Q\dot{\eta}$) down to zero (for what it seeks is rapid discharge) may not already be in operation in the process of reception of stimuli.[1] We find, in fact, that the Φ-neurones do not terminate in an unattached manner at the periphery, but end in cell-structures; and it is these and not the Φ-neurones which receive the exogenous stimulus. A "nerve-ending apparatus" of this kind (using the term in the most general sense) might well serve the purpose of not allowing exogenous quantities (Q) to impinge upon Φ in undiminished magnitude but of damping them down. Such pieces of apparatus would then have the function of screens against quantity (Q) which would only allow *quotients* of the exogenous quantities (Q) to pass through.

This would fit in with the fact that the other type of nerve-ending —the unattached kind, without any terminal organ—is by far the commoner at the *internal* periphery of the body. A screen against quantity (Q) seems to be unnecessary there, presumably because the quantities ($Q\dot{\eta}$) which have to be received there do not need to be reduced to the intercellular level, since they are already at that level in the first instance.

Since we can calculate the quantities (Q) which are received by the endings of the Φ-neurones, this may perhaps afford us a means of forming some notion of the magnitudes which pass between the Ψ-neurones and which will also be of the same order as the resistances of the contact-barriers.

Here, moreover, we have a glimpse of a trend which may determine the fact that the neuronic system is built up of *several* systems: a constantly increasing tendency to hold back quantity ($Q\dot{\eta}$) from the neurones. Thus the *structure* of the neuronic system would serve the purpose of *holding back* quantity ($Q\dot{\eta}$) from the neurones, while its *function* would serve the purpose of *discharging* it.

[1] See p. 358 and footnote.

[6] PAIN

Every contrivance of a biological nature has limits to its efficiency, beyond which it fails. Such failures exhibit themselves in phenomena bordering on the pathological—in what may be described as normal prototypes of the pathological. We have seen that the neuronic system is contrived in such a way that the major external quantities (Q) are held back from Φ and even more from Ψ. This purpose is served by the screens provided by the nerve-endings and by the fact that Ψ is only indirectly connected with the external world. Is there a phenomenon which can be made to coincide with a failure of these contrivances? Such a phenomenon is, I think, to be found in *pain.*

Everything that we know about pain fits in with this view. The neuronic system has the most decided inclination to fly from pain. In this we can see a manifestation of its primary inclination towards avoiding any increase in its quantitative ($Q\dot{\eta}$) tension, and we can conclude that pain consists in *the irruption of large quantities* (Q) *into* Ψ. The two inclinations are thus one and the same.

Pain sets both the Φ-system and the Ψ-system in motion. There are no obstacles to its conduction; it is the most imperative of all processes. The Ψ-neurones seem to be permeable to it, and it must therefore consist in the action of quantities of a relatively high order.

The exciting cause of pain may, on the one hand, be increase in quantity; all sensory excitations (even those of the highest sense organs) tend to turn into pain if the stimulus increases. This can without hesitation be interpreted as failure. On the other hand pain may occur where the external quantities are *small.* Where this is so, it is regularly associated with a breach of continuity: that is to say, if an external quantity (Q) acts directly on the endings of the Φ-neurones and not through the "nerve-ending apparatus", pain results. Pain is thus characterized by the irruption of excessively large quantities (Q) into Φ and Ψ —that is, of quantities (Q) which are of a higher order than the Φ-stimuli.

It is easy to understand the fact that pain passes along all the paths of discharge. On our theory that quantity (Q) produces facilitation [p. 361], pain no doubt leaves behind permanent facilitations in Ψ—like a stroke of lightning. It may be that these facilitations do away

entirely with the resistance of the contact-barriers and establish a path of conduction like those in Φ.[1]

[7] THE PROBLEM OF QUALITY

Hitherto we have made no mention of the fact that any psychological theory must, in addition to meeting the demands made by natural science, fulfil another major obligation. It must explain to us the things that we know, in the most puzzling fashion, through our "consciousness"; and, since this consciousness knows nothing of what we have so far been assuming—quantities and neurones—our theory must also explain to us this lack of knowledge.

A postulate by which we have all along been guided at once becomes explicit. We have been treating psychical processes as something that can dispense with being known by consciousness, something that exists independently of it; we are prepared to find that some of our assumptions are not confirmed by consciousness. If we refuse to let ourselves be confused by this, that is because we have postulated that consciousness gives us neither complete nor trustworthy information about the neuronic processes; the whole of these are to be regarded in the first instance as unconscious and are to be inferred in the same way as other natural phenomena.

We have, however, to find a place in our quantitative Ψ-processes for the content of consciousness. Consciousness gives us what we call "qualities"—sensations which show a great variety of "differences" and whose differences depend on relations to the external world. Among these differences there are series, similarities and so on, but there is nothing quantitative about them. We may ask *how* qualities originate and *where* qualities originate. These are questions that need the most careful investigation, but they cannot be exhaustively treated here.

Where do qualities originate? Not in the external world; for out there (according to the views of natural science, to which, in this discussion, psychology too must submit) there are only masses in motion and nothing else. In the Φ-system perhaps? This would tally

[1] This topic is developed further in Section 12 on "The Experience of Pain".

with the fact that qualities are connected with perception, but it is contradicted by everything that rightly speaks in favour of the seat of consciousness being in the higher levels of the neuronic system. In the Ψ-system then? There is an important objection to this. The Φ- and the Ψ-systems are in action together in perception; but there is one psychical process which is no doubt performed exclusively in Ψ—reproduction or recollection. This process, however, is, speaking generally, *devoid* of quality. Recollection normally brings about nothing that has the peculiar character of perceptual quality. Thus we must summon up enough courage to assume that there is a *third* system of neurones—"perceptual neurones" they might be called—which are excited along with the others during perception but not during reproduction, and whose states of excitation give rise to the different qualities—are, that is to say, conscious sensations.[1]

If we stick firmly to the view that our consciousness furnishes only *qualities* whereas science recognizes *quantities*, a characteristic of the perceptual neurones emerges—almost as though it were by rule of three. For whereas science has set itself the task of tracing back all the *qualities* of our sensations to external *quantity*, it is to be suspected from the structure of the neuronic system that that system consists in contrivances for changing external *quantity* into *quality*. In this latter fact the original trend towards holding off quantity seems to triumph once more. The nerve-ending apparatus was a screen for allowing only a quotient of the external quantity to become operative, while at the same time Φ dealt with the discharge of quantity in the rough. The system Ψ was already shielded from higher orders of quantity and had only to do with intercellular magnitudes. Carrying the process further, the system *W*[2] is moved, we may suppose, by still smaller quantities. It may be that the characteristic of quality

[1] The part played by the perceptual neurones and their relation to the Φ- and Ψ-neurones is formulated afresh in Letter 39 (of January 1, 1896): "In my new scheme I insert the perceptual neurones between the Φ-neurones and the Ψ-neurones; so that Φ transfers its quality to ω and ω transfers neither quality nor quantity to Ψ, but merely excites Ψ—that is, indicates the direction to be taken by the free psychical energy".

[2] [*W* stands for "*Wahrnehmung*" "perception". The "System *W*" has usually been translated in Freud's later works the "system *Pcpt.*" Here the "*W*" is kept because, as will be seen shortly, Freud jokingly changes the "*W*" into a Greek *omega* ("ω") to fit in with the Φ and Ψ.]

(that is, conscious sensation) only appears where quantities have so far as possible been excluded. They cannot be got rid of entirely, since these perceptual neurones must, like the rest, be regarded as cathected with quantity ($Q\dot{\eta}$) and striving to bring about discharge.

But at this point we are faced by what seems to be an immense difficulty. We have seen that permeability depends on the effects produced by quantity ($Q\dot{\eta}$) and that already the Ψ-neurones are impermeable. Since the quantity ($Q\dot{\eta}$) concerned is still smaller, the perceptual neurones must be still more impermeable. We cannot, however, attribute this characteristic to the vehicles of consciousness. The mutability of their content, the transitoriness of consciousness, the easy combination of simultaneously perceived qualities—all these tally only with complete permeability of the perceptual neurones coupled with full *restitutio in integrum* [return to their former state]. The perceptual neurones behave like organs of perception; and we could find no place in them for memory. Here then we have permeability, complete facilitation, which does not arise from quantities. Where, then, does it arise from?

I can see only one way of escape: to revise our basic hypothesis on the passage of quantity ($Q\dot{\eta}$). Hitherto I have regarded it only as a transference of quantity ($Q\dot{\eta}$) from one neurone to another. It must have another attribute, however—of a *temporal* character; for the mechanics of the physicists have assigned this temporal attribute even to the motions of masses in the external world. I shall describe this attribute briefly as "period". Thus I shall assume that the resistance of the contact-barriers applies only to the transference of quantity (Q), but that the *period* of neuronic motion is transmitted without inhibition in every direction, as though it were a process of induction.

Much remains to be done here in the way of physical clarification, for here as elsewhere the general laws of motion must apply without contradiction. But my hypothesis goes further, and asserts that the perceptual neurones are incapable of receiving quantities ($Q\dot{\eta}$), but that they assimilate the *period* of an excitation and that this condition of theirs of being affected by a period, while being filled with only a minimum of quantity ($Q\dot{\eta}$), is the fundamental basis of consciousness. The Ψ-neurones, too, have of course their period, but this is

devoid of quality, or, to put it more accurately, is monotonous. Deviations from this specific psychical period reach consciousness as qualities.

Where do these differences in period originate? Everything points to the sense-organs, whose qualities must be represented by different periods of neuronic motion. The sense organs operate not only as screens against quantity (Q)—like every nerve-ending apparatus—but as *sieves*; for they only let through stimuli from certain processes that have a particular period. They probably transfer these differences to Φ by communicating to the neuronic motion periods with differences that are in some way analogous [to those of the processes in the external world]—specific energy; and it is these modifications which pass from Φ through Ψ to W, and there, where they are almost devoid of quantity, generate conscious sensations of qualities.[1] This transmission of quality is not durable; it leaves no traces behind it and cannot be reproduced.

[8] CONSCIOUSNESS

Only by means of these complicated and far from self-evident hypotheses have I so far succeeded in introducing the phenomena of consciousness into the structure of quantitative psychology.

No attempt can be made, of course, to explain how it is that excitatory processes in the perceptual neurones (ωN) involve consciousness. Our only task is to find varying processes in the perceptual neurones which are parallel to the characteristics of consciousness that are known to us. And this is not difficult to do in some detail.

First, however, a word upon the relation of this theory of consciousness to others. According to a modern mechanistic theory, consciousness is no more than an appendage added to physiologico-psychical processes, an appendage whose absence would make no difference to the course of psychical events. According to another theory consciousness is the subjective side of all psychical events and is thus inseparable from physiologico-mental processes. The theory which I have here propounded lies between these two. According to it consciousness is the subjective side of a *part* of the physical processes in the neuronic system—namely, of the *perceptual* processes (ω-processes); and its absence would *not* leave psychical events unchanged but would imply the absence of any contribution from the W (ω)-system.

[1] [This is discussed more fully below, p. 374-5.]

If we represent consciousness by perceptual neurones (ωN), several consequences follow. These neurones must have a discharge, small though it may be; and there must be some means of filling the perceptual neurones with quantities ($Q\dot{\eta}$) of the necessary small amount. As in all other cases, this discharge will be in the direction of motility; and it is to be observed that, with the change-over into motion, obviously every characteristic of quality, every periodic peculiarity, is lost. The perceptual neurones must, no doubt, be filled with quantity only from Ψ, for we should wish to exclude any direct connection between this third system and Φ. It is impossible to suggest what may have been the original biological value of the perceptual neurones.

So far, however, we have only given an incomplete description of the content of consciousness. Apart from the series of sensory qualities, it presents another and very different series—the series of sensations of pleasure and unpleasure. And these we must now interpret. Since we have certain knowledge of a trend in psychical life towards *avoiding unpleasure*, we are tempted to identify that trend with the primary trend towards inertia. In that case *unpleasure* would coincide with a rise in the level of quantity ($Q\dot{\eta}$) or with a quantitative increase of pressure; it would be the perceptual sensation when there is an increase of quantity ($Q\dot{\eta}$) in Ψ. *Pleasure* would be the sensation of discharge. Since the system W is presumed to be filled from Ψ, it would follow that the cathexis in W increases when the level in Ψ rises, and diminishes when that level falls. Pleasure and unpleasure would be the sensations of W*'s* own cathexis, of its own level, while W and Ψ would function to some extent like inter-communicating pipes. Thus the quantitative processes in Ψ would reach consciousness in this way too, once again as qualities. [Cf. pp. 371-2.] Along with sensations of pleasure and unpleasure, the capacity disappears for perceiving sensory qualities which lie, so to speak, in the

indifferent zone between pleasure and unpleasure.[1] This must be translated thus: the perceptual neurones (ωN) show an optimum capacity for receiving the period of neuronic motion when they have a particular amount of cathexis; if the cathexis becomes stronger, unpleasure arises, if it becomes weaker, pleasure arises—till, when there is *no* cathexis, the capacity for reception vanishes. The form of motion in question would have to be constructed in accordance with these data.

[9] THE FUNCTIONING OF THE APPARATUS

We can now form the following picture of the functioning of the apparatus constituted by Φ Ψ ω.

Sums of excitation impinge from outside upon the endings of the Φ-system. They first come up against the nerve-ending apparatus and are broken up by it into quotients, which are probably of a higher order than intercellular stimuli (or possibly of the same order?). Here we have a first threshold. Below a certain quantity no effective quotient at all comes into being. So that the effectiveness of stimuli is restricted more or less to the *medium* quantities. At the same time the nature of the nerve-coverings acts as a sieve, so that not every kind of stimulus can be effective at the various endings. The stimuli which actually reach the Φ-neurones have a quantity and a qualitative characteristic[2]; in the external world they form a series possessing the same quality [as the stimuli] and increasing [degrees of] quantity, rising from the threshold up to the limit of pain.

The *processes* in the external world form a continuum in two directions—according to quantity and period (quality); whereas, the *stimuli* corresponding to those processes are, as regards quantity,

[1] [This point is expanded in the third paragraph of Section I of *Beyond the Pleasure Principle* (1920*g*). It is there attributed to Fechner.]

[2] [For the sake of clarity, it may be pointed out that neither the "processes" in the external world, nor the "stimuli" that pass through the "nerve-ending apparatus" into Φ, nor the cathexes in Φ or Ψ possess quality, but only a *characteristic*—"period"—which, when it reaches ω, *becomes* quality.]

firstly *reduced* and, secondly *limited* by excision, and are, as regards quality, *discontinuous*, so that certain periods do not operate at all as stimuli. [Fig. 12.]

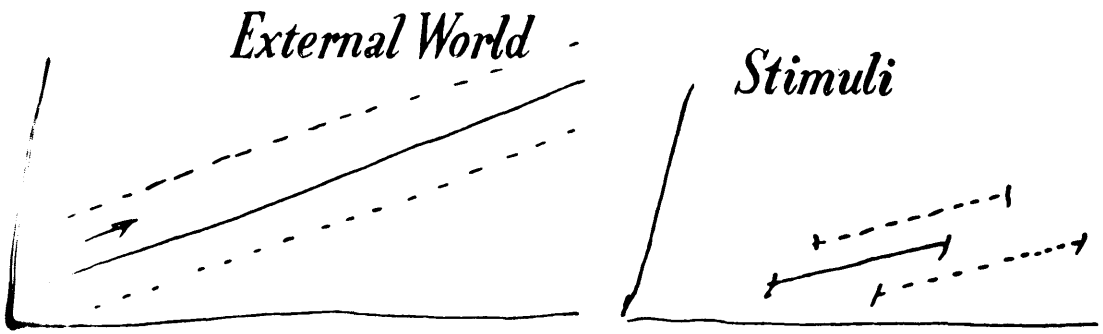

Fig. 12

The characteristic of quality in the stimuli now proceeds without hindrance through Φ by way of Ψ to ω, where it generates sensation; it is represented by a particular period of neuronic motion which is certainly not the same as that of the stimulus but has some relation to it, determined according to a reduction formula that is unknown to us. This period does not persist for long and vanishes in the direction of motility; nor, since it is allowed to pass through, does it leave any memory behind it.

The *quantity* of the Φ-stimulus excites the trend towards discharge in the nervous system, and it is converted into a proportional motor excitation. (The apparatus of motility is directly attached to Φ.) The quantities thus converted produce an effect which is quantitatively far superior to themselves; for they enter the muscles, glands, etc., and act in them as a *release* [of quantity], whereas between the neurones there is only a *transference* [of quantity].

Further, the Φ-neurones terminate in the Ψ-neurones, to which a part of the quantity ($Q\dot{\eta}$) is transferred, but only a part—a quotient, perhaps, corresponding to the magnitude of intercellular stimuli. At this point we may ask whether the quantity ($Q\dot{\eta}$) transferred to Ψ may not increase in proportion to the quantity (Q) of the current in Φ, so that a larger stimulus will produce a stronger psychical effect. A special contrivance seems to operate here, which once again holds

back quantity (Q) from Ψ. For the sensory paths of conduction in Φ have a peculiar structure. They constantly send out branches and exhibit thicker and thinner paths, which terminate at numerous end-points. This is probably to be explained as follows. [Fig. 13].

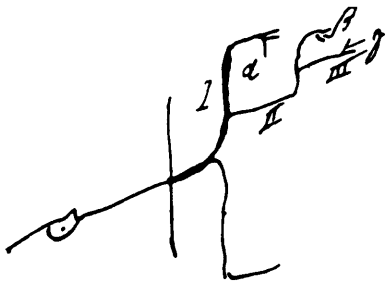

Fig. 13

A stronger stimulus pursues different paths from a weaker one. For instance, $Q\eta 1$ will only pass along path I and will transfer a quotient to Ψ at end-point α. $Q\eta 2$ [*i.e.*, a quantity twice as great as $Q\eta 1$] will not transfer a *double* quotient at α, but will be able to pass along path II, which is a narrower one, as well as along path I, and will open up a second endpoint to Ψ [at β]; $Q\eta 3$ will open up the narrowest path and will transfer through the end-point γ [see fig.] as well. In this way the single path will be relieved of its charge and the *larger* quantity in Ψ will be expressed by the fact that *several* neurones will be cathected in Ψ instead of a single one. Each of the cathexes of the different Ψ-neurones may, in such a case, be of approximately equal magnitude. If $Q\eta$ in Φ produces a cathexis in Ψ, then $Q\eta 3$ will be expressed by a cathexis in $\Psi_1+\Psi_2+\Psi_3$. Thus *quantity* in Φ is expressed by *complexity* in Ψ. And by this means quantity (Q) is held back from Ψ, within certain limits, at least. This is very reminiscent of Fechner's law,[1] which might in this way be localized.

In this way Ψ is cathected from Φ with quantities (Q) which, in the normal course of things, are small. While the *quantity* of the Φ-excitation is expressed in Ψ by complexity, the *quality* is expressed

[1] [A formulation of the relation between changes in the intensity of a stimulus and changes in the resultant sensation. Freud appears to be suggesting that Fechner's law comes into operation at this particular point in the neuronic system.]

topographically, since, in accordance with the anatomical relations, the different sense organs communicate only with particular Ψ-neurones. But Ψ also receives cathexes from the interior of the body, and it seems reasonable to divide the Ψ-neurones into two groups: the neurones of the pallium[1] which are cathected from Φ, and the nuclear neurones which are cathected from the endogenous paths of conduction.

[10] THE Ψ PATHS OF CONDUCTION

The nuclear portion of Ψ is connected with the paths by which endogenous quantities (Q) of excitation ascend. Without excluding the possibility that these paths may be connected with Φ, we must nevertheless adhere to our original assumption that a direct pathway leads from the interior of the body to the Ψ-neurones [p. 364]. But this implies that Ψ is exposed without protection to quantities (Q) from this direction, and in this fact [as we shall see (p. 379)] lies the driving force of the psychical mechanism.

What we know of the endogenous stimuli can be stated in the hypothesis that they are of an intercellular nature, that they arise continuously, and that it is only periodically that they become psychical stimuli. We cannot avoid supposing that they accumulate, and the intermittent nature of their psychical effect must lead to the view that in their path of conduction they come up against resistances which are only overcome when the quantity of excitation increases. The paths of conduction are thus arranged in a series, with several contact-barriers, leading up to the nucleus of Ψ. When they are above a certain quantity (Q) the endogenous stimuli act continuously, and every increase of quantity (Q) is perceived as an increase of the Ψ-stimulus. This, therefore, implies a state of affairs in which the path of conduction has become permeable. Experience further shows that after the discharge of the Ψ-stimulus the path of conduction once more resumes its resistance.

A process of this kind is termed "summation". The Ψ-paths of

[1] [Mid-nineteenth century histologists had distinguished two main strata of nerve-cells in the cerebral cortex, and gave the name of "pallium" ("mantle") to the outer layer. Recent neuro-anatomy has revealed a far more complex stratification.]

conduction are filled by summation until they become permeable. It is evidently the smallness of the separate stimuli that enables summation to occur. Summation is also found in the Φ-paths of conduction—for instance, in the case of the conduction of pain; but it applies in their case only to small quantities. The minor part played by summation on the Φ side argues in favour of the fact that there we are concerned with quantities (Q) of considerable magnitude. Very small ones seem to be held back by the operation of the nerve-ending apparatus as a threshold, whereas on the Ψ-side there is no such apparatus and only small quantities ($Q\dot{\eta}$) are operative.

It should be noticed that the Ψ-conduction-neurones can alternate between the characteristics of permeability and impermeability, since they can almost completely resume their resistance in spite of the passage of quantity ($Q\dot{\eta}$). This is in complete contradiction to the property which we have attributed to the Ψ-neurones of becoming permanently facilitated by a current of quantity ($Q\dot{\eta}$) [p. 361]. How is this contradiction to be explained? By supposing that a resumption of resistance after a current has ceased is a general attribute of contact-barriers. There is then not much difficulty in bringing this into harmony with the fact that the Ψ-neurones are influenced [by the passage of quantity] in the direction of facilitation. We need only suppose that the facilitation which remains after the quantity (Q) has passed consists not in the removal of *all* resistance but in its reduction to a necessary minimum. During the passage of the quantity (Q) the resistance is suspended, but afterwards it is restored—but only to a particular height, according to the quantity (Q) that has passed; so that next time a smaller quantity will be able to pass, and so on. When the most complete facilitation has been established, there will remain a certain resistance, equal in amount in the case of all contact-barriers; so that quantities (Q) will have to increase above a certain threshold in order to be able to pass it. This resistance would be a constant. Accordingly, the fact that endogenous quantities ($Q\dot{\eta}$) operate by summation means no more than that these quantities are composed of very small magnitudes of excitation, less than the constant; and there is complete facilitation in the endogenous paths of conduction.

It follows from this, however, that the Ψ-contact-barriers are in general higher than the barriers in [the endogenous] paths of conduction, so that a fresh accumulation of quantity ($Q\dot{\eta}$) can occur in the nuclear neurones. [See p. 384.] From the time when the path of conduction is filled up, no limit is set to this accumulation. Here (Ψ) is at the mercy of quantity (Q), and it is thus that there arises in the interior of the system the impulsion which sustains all psychical activity. We are familiar with this force as the "will"—the derivative of the "instincts". [Cf. p. 399.]

[11] THE EXPERIENCE OF SATISFACTION

The filling of the nuclear neurones in Ψ has as its consequence an effort to discharge, an impetus which is released along motor pathways. Experience shows that the first path to be followed is that leading to *internal change* (e.g., emotional expression, screaming, or vascular innervation). But, as we showed at the beginning of the discussion [p. 357], no discharge of this kind can bring about any relief of tension, because endogenous stimuli continue to be received in spite of it and the Ψ-tension is re-established. Here a removal of the stimulus can only be effected by an intervention which will temporarily stop the release of quantity ($Q\dot{\eta}$) in the interior of the body, and an intervention of this kind requires an alteration in the external world (e.g., the supply of nourishment or the proximity of the sexual object), and this, as a "specific action", can only be brought about in particular ways. At early stages the human organism is incapable of achieving this specific action. It is brought about by extraneous help, when the attention of an experienced person has been drawn to the child's condition by a discharge taking place along the path of internal change [e.g., by the child's screaming]. This path of discharge thus acquires an extremely important secondary function—viz., of bringing about an understanding with other people; and the original helplessness of human beings is thus the primal source of all moral motives. [Cf. p. 422-3.][1]

When the extraneous helper has carried out the specific action in

[1] In none of Freud's later formulations of this idea has the present one been equalled or surpassed: it indicates the part played by object-relations in the transition from the pleasure to the reality principle. See also p. 390 ff.

the external world on behalf of the helpless subject, the latter is in a position, by means of reflex contrivances, immediately to perform what is necessary in the interior of his body in order to remove the endogenous stimulus. This total event then constitutes an "experience of satisfaction", which has the most momentous consequences in the functional development of the individual. For three things occur in his Ψ-system: (1) A lasting discharge is effected, so that the urgency which had generated unpleasure in *W* is brought to an end. (2) A cathexis corresponding to the perception of an object occurs in one or more neurones of the pallium [p. 377]. (3) At other points of the pallium a report is received of the discharge brought about by the release of the reflex movement which followed the specific action. A facilitation is then established between these cathexes [(2) and (3)] and the nuclear neurones [which were being cathected from endogenous sources during the state of urgency].

(The report of the reflex discharge comes about owing to the fact that every movement, as a result of its collateral consequences, gives rise to fresh sensory excitations—of the skin and muscles—which produce a *motor [or kinaesthetic] image.*)

The facilitation arises in a manner which gives a deeper insight into the development of Ψ. Hitherto we have learned that the Ψ-neurones are influenced from the Φ-neurones and through the endogenous paths of conduction, while the separate Ψ-neurones are cut off from one another by contact-barriers with powerful resistances. There is, however, a fundamental law of *association by simultaneity*, which operates during pure Ψ-activity (during reproductive recollection); and this is the basis of all connections between Ψ-neurones. We find that consciousness (that is, quantitative cathexis) passes from one Ψ-neurone α to another β, if α and β have at some time been simultaneously cathected from Φ (or elsewhere). Thus the simultaneous cathexis α—β has led to the facilitation of a contact-barrier. It follows, in the language of our theory, that a quantity $(Q\dot{\eta})$ passes more easily from a neurone to a cathected neurone than to an uncathected one. Thus the cathexis of the second neurone operates in the same way as an increase in the cathexis of the first one; and in this case once again *cathexis is seen to be equivalent, in respect of the passage of quantity* $(Q\dot{\eta})$, *to facilitation.* [Cf. p. 361.]

Here then we learn of a second important factor in directing the course taken by a quantity $(Q\dot{\eta})$. A quantity $(Q\dot{\eta})$ in neurone α will go not only in the direction of the barrier which is best facilitated, but also in the direction of the barrier which is cathected on its further side. These two factors may support each other or may in some cases operate against each other.

Thus the experience of satisfaction leads to a facilitation between the two memory-images [of the object wished-for and of the reflex movement] and the nuclear neurones which had been cathected during the state of urgency. (No doubt, during [the actual course of] the discharge brought about by the satisfaction, the quantity $(Q\dot{\eta})$ flows out of the memory-images as well.) Now, when the state of urgency or wishing re-appears, the cathexis will pass also to the two memories and will activate *them*. And in all probability the memory-image of the object will be the first to experience this wishful activation.

I have no doubt that the wishful activation will in the first instance produce something similar to a perception—namely, a hallucination. And if this leads to the performance of the reflex action, disappointment will inevitably follow.

[12] THE EXPERIENCE OF PAIN

Ψ is normally exposed to quantity (*Q*) from the endogenous paths of conduction, and abnormally (though not yet pathologically) in cases where excessively large quantities (*Q*) break through the screening contrivances into Φ—that is to say, in cases of *pain* [p. 368]. Pain gives rise in Ψ to (1) a large rise in the level [of quantity], which is felt as unpleasure by *W* [p. 373] (2) an inclination to discharge, which can be modified in various directions and (3) a facilitation between this inclination to discharge and the memory-image of the object that generated the pain. Moreover there is no question but that pain has a special quality which makes itself felt alongside the unpleasure.

If the memory-image of the (hostile) [i.e., the pain-giving] object is in any manner freshly cathected (e.g., by fresh perceptions), a

condition arises which is not pain but has a similarity to pain. It includes unpleasure and the inclination to discharge corresponding to the experience of pain. Since unpleasure implies a heightened level [of quantity], the question arises of where this quantity ($Q\dot{\eta}$) comes from. In the experience of pain proper, it was the irrupting external quantity (Q) which raised the level in Ψ. In its reproduction—in the affect—the only quantity ($Q\dot{\eta}$) arising is the quantity (Q) cathecting the memory; and it is obvious that this is of the same nature as any other perception and cannot result in a general increase in quantity ($Q\dot{\eta}$).

We are thus driven to assume that unpleasure is *released* from the interior of the body—is freshly provoked—by the cathexis of memories. The mechanism of this release can only be pictured as follows. Just as there are motor neurones which, when they are filled up to a certain degree, conduct quantities ($Q\dot{\eta}$) into the muscles and thus discharge them, so too there must be "secretory" neurones which, when they are excited, cause the generation in the interior of the body of something which acts as a stimulus on the endogenous paths of conduction to Ψ. These secretory neurones must influence the production of endogenous quantities ($Q\dot{\eta}$) and accordingly do not *discharge* quantity ($Q\dot{\eta}$) but *introduce* it in roundabout ways. We shall give the name of "key neurones" to these secretory[1] neurones. Evidently they are only excited when a certain level has been reached in Ψ. The experience of pain provides an excellent facilitation between the memory-image of the hostile object and these key neurones; and by virtue of this facilitation an unpleasurable affect is now released.

Support is lent to this puzzling but indispensable hypothesis by what happens in the case of the release of sexual feeling. At the same time a suspicion forces itself on us that in both these examples the endogenous stimuli consist of chemical products, of which there may be a considerable number. Since the release of unpleasure can be extraordinarily large where there is only quite a slight cathexis of the hostile memory, we may conclude that pain leaves behind it specially abundant facilitations. And in this connection we may suspect that facilitation depends entirely on the [magnitude of the]

[1] [The manuscript reads "motor"– evidently a slip of the pen.]

quantity ($Q\dot{\eta}$) attained: so that the facilitating effect of $3Q\dot{\eta}$ may be far greater than that of $Q\dot{\eta}$ 3 times repeated. (See p. 363.)

[13] AFFECTS AND WISHFUL STATES

The residues of the two kinds of experiences [of satisfaction and of pain] which we have been discussing are *affects* and *wishful states*. These have in common the fact that both of them involve a heightening of the quantitative tension in Ψ: in the case of an affect this is brought about by a sudden release, and in that of a wish by means of summation. Both these states are of the greatest importance in relation to the passage of quantity in Ψ, since they leave motive forces behind them which affect that passage in a compulsive fashion. A wishful state produces what amounts to a positive *attraction* to the object of the wish, or rather to its memory-image; an experience of pain results in a repulsion, a disinclination to keep the hostile memory-image cathected. Here we have primary *wishful attraction* and primary *defence* [or fending-off].[1]

Wishful attraction can easily be explained by supposing that the cathexis of the friendly memory in a state of desire is far greater in quantity ($Q\dot{\eta}$) than it is in the case of mere perception; so that in the former case there is a particularly good facilitation between the Ψ-nucleus and the corresponding neurones of the pallium.

It is more difficult to explain primary defence or "repression"—the fact that a hostile memory-image has its cathexis removed as soon as possible.[2] The explanation may nevertheless be that the primary experiences of pain were brought to an end by reflex defence. The emergence of some other object in place of the hostile one acted as a signal for the fact that the experience of pain was at an end; and the Ψ-system, learning from biological experience, seeks to reproduce the state in Ψ which indicated the cessation of the pain. The phrase "learning from biological experience" introduces a fresh basis of

[1] [These states are further discussed in Part III, pp. 428 and 433 ff.]

[2] Further on in the present paper (p. 408) Freud already distinguishes between primary defence and repression. He later separated the reaction to pain from repression. (See his paper on "Repression", 1915*d*; *trans. Coll. Papers* IV, p. 85.)

explanation which must carry independent weight of its own, though at the same time it does not exclude (but indeed requires) a recourse to mechanical principles—that is, to quantitative factors.[1] In the case before us it may well be the increase in quantity ($Q\dot{\eta}$), invariably arising when hostile memories are cathected, which forces an increase in the activity of discharge and so at the same time a flow of quantity away from the memories as well.

[14] INTRODUCTION OF THE CONCEPT OF AN "EGO"[2]

With our hypothesis of "wishful attraction" and of a tendency to repression we have in fact already touched upon a state of Ψ which has not yet been discussed. For both these processes indicate that an organization has been formed in Ψ whose presence interferes with the passage [of quantities] if that passage occurred for the first time in a particular manner [i.e., if it was accompanied by satisfaction or pain]. This organization is called the "ego". It can easily be pictured if we consider that the constantly repeated reception of endogenous quantities ($Q\dot{\eta}$) in certain neurones (of the nucleus) and the consequent facilitating effects of that repeated reception will produce a group of neurones which retains a constant cathexis [p. 378-9] and which thus constitutes the vehicle for the store of quantity required by the secondary function [p. 358].[3] The ego may thus be defined as the totality of Ψ-cathexes at any given time; and in these a permanent portion may be distinguished from a changing one. [Cf. p. 390.] It is easy to see that the facilitations between the Ψ-neurones form part of the domain of the ego, since they represent possibilities of determining the extent of the changing ego from one moment to another.

[1] [The topic of "learning from biological experience" recurs frequently in Part III, *e.g.*, on pp. 417 and 428.]

[2] [This topic is further discussed in Part III, on p. 426 ff.]

[3] A constant cathexis of energy, the function of inhibiting or postponing certain discharges, and a connection with the secondary process—all of these are also among the characteristics of the "ego organization", as Freud uses the term in his structural theory. (See *The Ego and the Id*, 1923 *b*. and Freud's later writings.)

While it must be the ego's endeavour to get rid of its cathexes by the method of satisfaction, it (the ego) must inevitably influence the repetition of experiences of pain and affects; and it must do so in the following manner, which is generally called "inhibition".

A quantity ($Q\dot{\eta}$) which enters a neurone from anywhere will pursue its path through the contact-barrier which shows the greatest facilitation, and will give rise to a current flowing in that direction. To put this more accurately: the current of quantity ($Q\dot{\eta}$) will divide its course towards the different contact-barriers in inverse ratio to the resistance which they offer; and where a quotient of quantity comes up against a contact-barrier whose resistance is superior to it, nothing will in practice pass through. This distribution may easily be different for every difference in quantity ($Q\dot{\eta}$) there may happen to be in the neurone, for quotients may appear which rise above the threshold of still other contact-barriers. Thus the course taken depends on the quantities ($Q\dot{\eta}$) and the relative strength of the facilitations. We have, however, come to know a third powerful factor [p. 380]. If an adjoining neurone is simultaneously cathected, this acts like a temporary facilitation of the contact-barriers between the two neurones, and modifies the course of the current, which would otherwise have followed the direction of the only facilitated contact-barrier. A "lateral" cathexis thus acts as *an inhibition on the passage of quantity* ($Q\dot{\eta}$). Let us imagine the ego as a network of cathected neurones, well facilitated in relation to one another [See Fig. 14]. Then suppose a quantity ($Q\dot{\eta}$) enters neurone *a* from the outside (Φ). If it were uninfluenced it would have proceeded to neurone *b*. But it is in fact so much influenced by the lateral cathexis in neurone *x* that it only passes on a quotient to *b*, or may even not reach *b* at all. Where, then, an ego exists, it is bound to inhibit psychical processes.

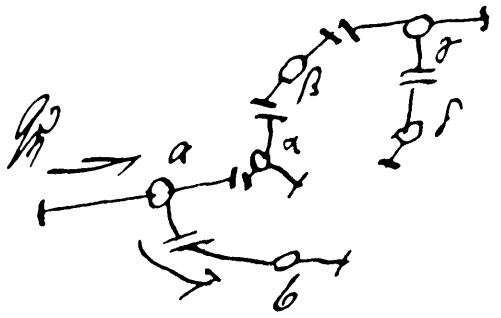

Fig. 14

But inhibition of this kind is decidedly to Ψ's advantage. Let us

suppose that *a* is a hostile memory and *b* a key neurone [p. 382] for unpleasure. Then, if *a* is aroused, the primary effect will be the release of unpleasure, which might perhaps be pointless—at all events in its full amount. But as a result of the inhibitory effect of α the release of unpleasure is very small and the neuronic system is spared the development and discharge of quantity without suffering damage in any other way. We can now easily see how, with the help of a mechanism which draws the ego's *attention*[1] to an imminent fresh cathexis of the hostile memory-image, the ego can succeed in inhibiting the passage of quantity from the memory-image to the release of unpleasure, by a copious lateral cathexis which can be increased as circumstances dictate. Indeed, if we assume that the initial unpleasurable release of quantity ($Q\dot{\eta}$) is received by the ego itself, it will have within itself the source of the quantity whose expenditure is necessary for the purpose of the inhibitory lateral cathexis.

Thus the stronger the unpleasure, the stronger will be the primary defence.

[15] THE PRIMARY AND SECONDARY PROCESSES IN Ψ

It follows from what we have so far made out that there are two situations in which the ego in Ψ (which we can treat in regard to its trends like the nervous system as a whole) is liable to fall into a helpless state in which it is exposed to damage.

The first of these arises if, while it is in a wishful state, it freshly cathects the memory of the object and then sets the process of discharge in motion, where there can be no satisfaction because the object is not present *really* but only as an imaginary idea. At an early stage Ψ is not in a position to make this distinction, since it can only work on the basis of the sequence of analogous states between its neurones [i.e. on the basis of its previous experience that the cathexis of the object was followed by satisfaction]. Thus it requires a criterion

[1] [The function of attention is discussed at great length in Part III (p. 418 ff.).]

from elsewhere in order to distinguish between perceptions and ideas.[1]

In the second place, Ψ is in need of an indication that will draw its attention to the re-cathexis of a hostile memory-image and enable it to avoid, by means of a lateral cathexis, the consequent release of unpleasure. If Ψ is able to effect this inhibition soon enough, both the release of unpleasure and the defence against it will be slight; whereas otherwise there will be immense unpleasure and an excessive primary defence.

Both a wishful cathexis and a release of unpleasure when there is a fresh cathexis of the memory concerned can be biologically damaging. This is true of a wishful cathexis whenever it oversteps a certain limit and thus encourages discharge; and it is true of a release of unpleasure at all events whenever the cathexis of the hostile memory-image arises from Ψ itself (by association) and not from the external world. Thus, in the latter case too what is needed is an indication which will distinguish a perception from a memory (or idea).

In all probability it is the perceptual neurones which furnish this indication—an "indication of reality". In the case of every external perception a qualitative excitation occurs in *W*. But this, as such, is of no importance to Ψ. We must therefore add that the perceptual excitation leads to a perceptual *discharge*, and that a report of this (as of all other kinds of discharge) reaches Ψ. *It is this report of a discharge coming from W* (ω) *that constitutes an indication of quality or reality to* Ψ.

If the wished-for object is fully cathected, so that it is activated in a hallucinatory manner, the same indication of discharge or reality will follow as in the case of an external perception. In this instance the criterion fails. But if the wishful cathexis is subjected to *inhibition*, as will be possible if the ego is cathected, a quantitative case may occur in which the wishful cathexis will not be intense enough for an indication of quality to be produced, as it would be in the case of an

[1] What follows contains the earliest formulation of a notion to which Freud gave frequent and varying expression and to which he finally gave shape in his statement that "reality-testing" is a function of the ego. Earlier formulations, which immediately follow upon the account given in the "Project", will be found in *The Interpretation of Dreams* and in Freud's paper on the two principles of mental functioning (1911 *b*; *trans. Coll. Papers* IV, especially p. 14).

external perception. In this instance, then, the criterion retains its value. The distinction between the two instances resides in the fact that, whereas indications of quality derived from outside make their appearance *whatever* the intensity of cathexis, those derived from Ψ only do so if the intensities are large. Accordingly, *it is the inhibition brought about by the ego that makes possible a criterion for distinguishing between a perception and a memory*. Biological experience will then teach the lesson that discharge must not be initiated until an indication of reality has arrived, and that for this reason the cathexis of the desired memories must not be carried beyond a certain degree.

On the other hand, the excitation of the perceptual neurones can also serve to protect the Ψ-system in the *second* situation: namely, by drawing the attention of Ψ to the fact of the presence or absence of a perception. For this purpose we must assume that the perceptual neurones (ωN) were originally connected anatomically with the paths of conduction from the different sense organs and that their discharge was directed back again to the motor apparatus belonging to these same sense organs. Then the report of this latter discharge (the report, that is, of *reflex attention*) will act as a biological signal to Ψ to send out a quantity of cathexis in the same direction.

To sum up. Where inhibition is operated by a cathected ego, the indications of ω-discharge serve in general as indications of reality which Ψ learns, by biological experience, to make use of. If the ego is in a state of wishful tension at the moment when an indication of reality emerges, it will allow discharge to follow along the lines of the specific action [p. 379]. If an increase of unpleasure coincides with the indication of reality, Ψ will institute a defence of normal magnitude by an appropriately large lateral cathexis at the point indicated. If neither of these is the case [i.e., if there is neither a wishful state nor an increase of unpleasure at the moment when an indication of reality is received], the cathexis will be allowed to proceed unhindered, according to the nature of the facilitations prevailing. Wishful cathexis carried to the point of hallucination and a complete generation of unpleasure, involving a complete expenditure of defence, may be described as "psychical primary processes". On the other hand, those processes which are only made possible by a good cathexis of the ego and which represent a moderation of the primary processes

may be described as "psychical secondary processes". It will be seen that the *sine qua non* of the latter is a correct exploitation of the indications of reality and that this is only possible when there is inhibition on the part of the ego.[1]

[16] COGNITIVE AND REPRODUCTIVE THOUGHT[2]

We have thus put forward a hypothesis to the effect that, during the process of wishing, inhibition on the part of the ego leads to a moderation of the cathexis of the object wished-for, which makes it possible for that object to be recognized as not being a real one. Let us now carry our analysis of this process further; and here there is more than one different possibility.

In the first case, the wishful cathexis of the memory-image may be accompanied by a simultaneous perception of it [that is, of the object to which the memory relates]. The two cathexes will then coincide (a situation from which no biological profit can be derived). In addition to this, an indication of reality arises from *W*, which, as we have seen, is followed by a discharge that is successful.[3] Thus this case is easily disposed of.

In the second case, the wishful cathexis that is present may be

[1] For purposes of comparison with this section, we may quote a passage from *The Interpretation of Dreams* (*trans.*, 1953, pp. 598-600): "A current of this kind in the apparatus, starting from unpleasure and aiming at pleasure, we have termed a 'wish'. . . . The first wishing seems to have been a hallucinatory cathecting of the memory of satisfaction . . . All that I insist upon is the idea that the activity of the *first* Ψ-system is directed towards securing the *free discharge* of the quantities of excitation, while the *second* system, by means of the cathexes emanating from it, succeeds in *inhibiting* this discharge and in transforming the cathexis into a quiescent one, no doubt with a simultaneous raising of its level. I presume, therefore, that under the dominion of the second system the discharge of excitation is governed by quite different mechanical conditions from those in force under the dominion of the first system. When once the second system has concluded its exploratory thought-activity, it releases the inhibition and damming-up of the excitations and allows them to discharge themselves in movement".

[2] [The topics of this and the two next sections are further elaborated in Part III.]

[3] Compare in connection with this and with what follows a later formulation dealing with this extended group of problems: "Thus the first and immediate aim of the process of testing reality is not to discover an object in real perception

accompanied by a perception which agrees with it only partly and not wholly. This is the moment at which to recall the fact that perceptual cathexes are never cathexes of single neurones but always of complexes. Hitherto we have neglected this feature and the time has come to take it into account. Let us suppose that the *wishful* cathexis, speaking quite generally, is attached to neurone a+neurone b; whereas the *perceptual* cathexis is attached to neurone a+neurone c. This being the commoner case—more common than that of identity—it deserves close study. Here, too, biological experience teaches that it is unsafe to initiate discharge if the indications of reality confirm only a part of the complex and not the whole of it. Now, however, we come upon a method of turning the similarity into a complete identity. If we compare this W-complex with other W-complexes, we are able to analyse it into two portions: a neurone a which on the whole remains the same and a neurone b which on the whole varies. Language later applies the term "judgement" to this process of analysis, and discovers the resemblance which exists between the nucleus of the ego and the constant portion of the perceptual complex on the one hand and between the changing cathexes in the pallium and the inconstant portion of the perceptual complex on the other [cf. p. 384]; language describes neurone a as a "thing" and neurone b as its activity or attribute—in short, as its "predicate". [Cf. pp. 393 and 423.]

Thus judgement is a Ψ-process which is only made possible by the inhibition exercised by the ego and which is brought about by the difference between the wishful cathexis of a memory and a similar perceptual cathexis. It follows from this that when these two cathexes

corresponding to what is imagined, but to *re-discover* such an object, to convince oneself that it is still there. The differentiation between what is subjective and what is objective is further assisted by another faculty of the power of thought. The reproduction of a perception as an image is not always a faithful one; it can be modified by omissions or by the fusion of a number of its elements. The process for testing the thing's reality must then investigate the extent of these distortions. But it is evident that an essential precondition for the institution of the function for testing reality is that objects shall have been lost which have formerly afforded real satisfaction". ("Negation", 1925 *h*, *trans. Coll. Papers*, V, p. 184.) The connection with an early object relation which is stated in this last sentence is often only implicit in the "Project". But the example used by Freud for his discussion of the establishment of an identity between the image and what is imagined is the infant's image of his mother's breast (pp. 391 and 393).

coincide, the fact will be a biological signal for ending the activity of thinking and for initiating discharge.[1] When they do *not* coincide, an impetus is given to the activity of thinking which will be brought to a close when they *do* coincide.

The process can be analysed further. If neurone a is present in both the wishful and the perceptual cathexis but if neurone c is perceived instead of neurone b, the efforts of the ego follow the connections of this neurone c and, by means of a flow of quantity($Q\dot{\eta}$) along these connections, cause fresh cathexes to emerge until at last the missing neurone b is reached. As a rule, what is interpolated between neurone c and neurone b is a motor image, and, when this image is revived by the actual carrying out of a movement, the perception of neurone b is obtained and the desired identity established. Suppose, for instance, that the memory-image wished for is—to take the case of a baby—an image of the mother's breast with a front view of its nipple, but that the baby begins by having a perception which is a *side* view of the same object without the nipple. Now, he has in his memory an experience, made accidentally while he was sucking, of a particular movement of his head which changed the front view into the side view. Accordingly, the side image which he now sees leads to the head-movement, and an experiment will show him that the reverse of the movement must be performed and the perception of the front view will thus be obtained.

This case still has little of judgement about it; but it is an example of the possibility, by reproducing cathexes, of arriving at an action which is one of the chance off-shoots of the specific action.

There is no doubt that what underlies this travelling along the facilitated neurones is quantity ($Q\dot{\eta}$) from the cathected ego, and that the travelling is not controlled by the facilitations but by an aim. What, then, is this aim and how is it attained?

The aim is to get back to the missing neurone b and to release the sensation of identity—that is, the moment at which only neurone b is cathected and the travelling cathexis finds its way into b. The aim is attained by experimentally displacing the quantities ($Q\dot{\eta}$) in all directions, and for that purpose sometimes a greater and sometimes a less

[1] [Cf. the very similar remarks on judgement in Freud's paper on "Negation" (1925 *h*).]

expenditure of lateral cathexis will clearly be necessary, according to whether one can make use of the existing facilitations or must work against them. The struggle between the fixed facilitations and the changing cathexes is characteristic of the secondary process of reproductive thinking as contrasted with the primary succession of associations.

What is it that directs the course of the travelling? The fact that memory of the wishful idea is kept cathected, all the while the chain of association is followed from neurone *c*. As we know, the fact of the cathexis of neurone *b* will increase the facilitation and accessibility of any connections it may have.

In the course of this travelling it may happen that the quantity (Q) comes up against a memory which is related to an experience of pain, and will thus give rise to a release of unpleasure. Since this is a sure sign that neurone *b* cannot be reached along this path, the current will at once be diverted from the cathexis in question. The unpleasureable paths retain their great value, however, in directing the current of reproduction.

17] REMEMBERING AND JUDGING

Thus reproductive thinking has a practical purpose and a biologically established end: namely, to lead a quantity ($Q\dot{\eta}$) that is travelling away from the undesired perception back to the missing neuronic cathexis. Identity is then achieved together with a right to discharge—provided that the indication of reality appears from neurone *b*. But the process can make itself independent of the second of these aims [i.e., discharge] and can strive for identity alone. In that case what we have before us is a pure act of thought, though it can always be put to practical use subsequently. Moreover, in such cases the cathected ego behaves in exactly the same fashion.

We will now turn to a third possibility which can arise in a wishful state. [For the first two see above p. 389.] With a wishful cathexis present, a perception may emerge which does not coincide in *any* way with the memory-image that is wished for (which we will call *Mem*+). It will then become a matter of interest to cognize—to get

to know—this perceptual image, so that in spite of everything it may perhaps be possible to find a way from it to *Mem*+. For this purpose the [whole] perception is presumably hypercathected from the ego, just as happens in the former case with the portion of the perception constituted by neurone *c* [p. 391]. If the perception is not an absolutely new one, it will now recall and revive the *memory* of some perception with which it will have at least something in common. And now the process of thought that I have previously described will be repeated in connection with this memory-image, though to some extent without the aim provided by the cathected wishful idea.

In so far as the cathexes coincide, they give no occasion for activity of thought. But the differing portions of the cathexes "arouse interest" and may give occasion for thought-activity of two sorts. The current will either be directed on to the revived memories and set an aimless activity of *memory* at work (which will thus find its motive in differences and not in resemblances), or it will remain concentrated on the newly presented portions of the perception and so set at work an equally aimless activity of *judgement*.

Let us suppose that the object presented by the perception is similar to the [percipient] subject himself—that is to say, a fellow human-being. The theoretical interest taken in it is then further explained by the fact that an object *of a similar kind* was the subject's first satisfying object (and also his first hostile object) as well as his sole assisting force. For this reason it is on his fellow-creatures that a human being first learns to cognize. The perceptual complexes arising from this fellow-creature will in part be new and non-comparable—for instance, its features (in the visual sphere); but other visual perceptions (for instance, the movements of its hands) will coincide in the subject with his own memory of quite similar visual impressions of his own body—a memory with which will be associated memories of movements experienced by himself. The same will be the case with other perceptions of the object; thus, for instance, if the object screams, a memory of the subject's own screaming will be aroused and will consequently revive his own experiences of pain. Thus the complex of a fellow-creature falls into two portions. One of these gives the impression of being a constant structure and remains as a coherent "thing"; while the other can be

understood by the activity of memory—that is, can be traced back to information about the subject's own body.[1] This process of analysing a perceptual complex is described as "cognizing" it; it involves a judgement and is brought to an end when that has been achieved. Judging, as will be seen, is not a primary process, and presupposes a cathexis from the ego of the disparate (non-comparable) portion of the complex. Judging has in the first instance no practical purpose; and, in the process of judging, the cathexis of the disparate portions is probably discharged, for this would explain why the activities or "predicates" have only a loose path of connection with the "subject" portion of the complex. [Cf. pp. 423 and 440 f.]

This might lead us deep into the analysis of the act of judging; but it would be a diversion from our theme.

Let us be satisfied with bearing firmly in mind that it is the original interest in establishing the situation of satisfaction that produces in the one case *reproductive reflection* and in the other case *judging* as methods of proceeding from the perceptual situation that is really presented to the situation that is wished for. It remains a *sine qua non* for this that the Ψ-processes shall not run their course without inhibition, but shall be subject to the activity of the ego. The eminently practical bearing of all thought-activity will thus be demonstrated.

[18] THOUGHT AND REALITY

Thus the aim and end of all processes of thought are the establishment of a *state of identity*, the transportation of a cathectic quantity ($Q\dot{\eta}$) emanating from outside into a neurone cathected by the ego. Cognitive or judging thought seeks for an identity with a somatic cathexis; reproductive thought seeks for an identity with a psychical cathexis (an experience of the subject's own). Judging thought

[1] These reflections on the roots of our understanding of other people's expressive actions were never adequately pursued in Freud's later writings. A section in his book on jokes (1905 *c*) makes use of the hypothesis that a recollection of one's own expenditure of nervous energy is what enables one to understand the facial play and gestures of other people. (Cf. p. 395.) Recent investigations of the "body schema" place these formulations of Freud's in a fresh light. Cf. Schilder, 1942. For the relation between earliest body contacts and identification, see Kris, 1952.

operates in advance of reproductive thought, since the former furnishes the latter with ready-made facilitations to assist further associative travelling. If at the conclusion of the act of thought the indication of reality also reaches perception, then a *judgement of reality*, a *belief*, is achieved and the aim of the whole activity is attained.

There is this more to be said about judgement: its basis is evidently the presence of somatic experiences, sensations and motor images of the subject's own. So long as they are absent the variable[1] portion of the perceptual complex cannot be understood; that is, it can be reproduced but cannot point a direction for further paths of thought. For instance (a fact which will be of importance later [in Part II]) no sexual experiences can produce any effect so long as the subject has no sexual feelings—that is, generally speaking, until the beginning of puberty.

Primary judgement seems to presuppose a lesser degree of influence by the cathected ego than do reproductive acts of thought. Though it may happen that an association is followed owing to there being a partial coincidence [between the wishful and the perceptual cathexes] and no need for modification, there are also instances in which the associative process of judging is performed with a full current of quantity. Perception may be said to correspond to a nuclear object *plus* a motor image. While one is perceiving *W*, one copies the movements oneself; that is to say, one innervates one's own motor image (which has been aroused to coincide with the perception) so strongly that one actually performs the movement. Thus one can speak of a perception as having an "imitative value". [Cf. p. 423.] Or the perception may arouse the memory-image of a sensation of pain of one's own, so that one feels the corresponding unpleasure and repeats the appropriate defensive movements. Here we have the "sympathetic value" of a perception.

No doubt these two cases show us the primary process at work in judging; and we may assume that all secondary judging has come about through a mitigation of these purely associative processes. Thus judging (which later becomes a means of cognizing an object that may be of practical importance) is in its origin a process of

[1] [So in the MS. Wrongly printed "*verarbeitende*" in the German edition of 1950.]

association between cathexes arriving from without and cathexes derived from one's own body—an identification between reports or cathexes coming from Φ and from the interior. It is perhaps justifiable to suspect that judging also indicates the way in which quantities coming from Φ can be transmitted and discharged. What we term "things" are residues that have evaded judgement.

The example of judgement gives us a hint of the quantitative difference which must be presumed to exist between thinking and the primary process. It is reasonable to suppose that in the act of thinking a small stream of motor innervation passes from Ψ—but only, of course, if during that act a motor or a key [i.e., secretory, see p. 382] neurone is innervated. Yet it would be wrong to regard this discharge as the thought-process itself—of which it is merely an unintended subsidiary result. The thought-process consists of the cathexis of Ψ-neurones accompanied by a change in the previously operative facilitations brought about by a lateral cathexis from the ego. It is intelligible from a mechanical standpoint that in this process only a portion of the quantity ($Q\dot{\eta}$) is able to follow the facilitations and that the magnitude of this portion is constantly regulated by the cathexes. But it is equally clear that in this way enough quantity ($Q\dot{\eta}$) is at the same time economized to make the reproduction profitable. Otherwise the *whole* of the quantity ($Q\dot{\eta}$) which is needed for final discharge would be given off to the points of motor outlet during its passage. Thus, *the secondary process is a repetition of the original course of excitation in* Ψ, *but at a lower level and with smaller quantities.*

With quantities, it may be asked, even smaller than those which normally pass through the Ψ-neurones? How is it possible for such small quantities ($Q\dot{\eta}$) to make their way along paths which are, indeed, only passable by larger ones than Ψ usually receives? The only possible answer is that this must be a mechanical consequence of the lateral cathexes. We must conclude that matters are so constituted that when there is a lateral cathexis small quantities ($Q\dot{\eta}$) can flow through facilitations which could normally be passed only by large ones. The lateral cathexis, as it were, "binds"[1] a certain amount of the quantity ($Q\dot{\eta}$) passing through the neurone.

[1] [This term is explained in Part III, p. 425 f., where this whole question is further discussed.]

Thought must further satisfy another condition. It must make no essential change in the facilitations laid down by the primary processes, or otherwise it would falsify the traces of reality. It is enough to say of this condition that facilitation is probably the result of the single passage of a major quantity, and that cathexis, though very powerful at the moment, leaves behind it no comparably lasting effect. The small quantities (Q) that pass during thought-processes cannot in general prevail over the facilitations.

Nevertheless there can be no doubt that thought-processes *do* leave permanent traces; since thinking something over a second time demands so much less effort than the first time. Therefore, in order that reality may not be falsified, there must be special traces (indications of thought-processes) which constitute a "thought-memory"—something which it has not so far been possible to formulate. We shall hear presently of the means by which traces of thought-processes are distinguished from traces of reality.[1]

[19] PRIMARY PROCESSES—SLEEP AND DREAMS

The question now arises as to the *source* of the quantitative means by which the primary Ψ-process is carried out. In the case of the experience of *pain* the source is obviously the quantity (Q) which irrupts from without; and in the case of *affect* it is the quantity released by facilitation. In the case of the secondary process of *reproductive thinking* a greater or less quantity can be transferred to neurone c from the ego [p. 391];[2] this may be described as "thought interest" and it is proportional to the "affective interest" where this is able to develop. The only question is whether there are Ψ-processes of a primary nature for which the quantity ($Q\dot{\eta}$) contributed from Φ suffices, or whether the Φ cathexis of a perception is automatically supplemented by a contribution from Ψ (namely, attention), and that

[1] [This whole question is discussed much more fully in Part III, p. 436 ff.]

[2] [What Freud here describes as "thought interest" seems to be the same as what is termed "attention" in the next sentence and on p. 399, as well as in Part III, where this subject is dealt with at greater length (p. 417 ff.).]

this alone makes a Ψ-process possible. This question remains an open one, though it may perhaps be decided by reference to some particular psychological facts.

One such important fact is that primary Ψ-processes, of a kind that have been gradually suppressed by biological pressure in the course of the evolution of Ψ, are daily presented to us during sleep. A second fact of equal importance is that the pathological mechanisms which are revealed by the most careful analysis in the psychoneuroses bear the greatest similarity to dream-processes. The most momentous conclusions follow from this comparison, which I shall discuss later. [See also p. 402.][1]

But first the fact of sleep must be fitted into our theory. The essential precondition of sleep is easily recognizable in children. Children sleep so long as they are not tormented by physical needs or external stimuli (e.g., by hunger or by sensations of cold from wetting). They fall asleep when they have obtained satisfaction (at the breast). So, too, adults fall asleep easily *post coenam et coitum* [after eating and copulating]. Accordingly the precondition of sleep is *a lowering of the endogenous charge in the Ψ-nucleus*, which renders the secondary function unnecessary. In sleep the subject is in the ideal state of inertia, with the store of quantity ($Q\dot{\eta}$) discharged.

In the waking state this store is collected in the "ego", and we may assume that it is the discharging of the ego which is the precondition and characteristic of sleep. And here, we can see at once, we have the precondition of primary psychical processes.

It is not certain whether, in adults, the ego is *completely* relieved of its charge in sleep. In any case it withdraws a large number of its cathexes, though on awakening these are re-established immediately and without trouble. This contradicts none of our presuppositions; but it draws attention to the fact that we must assume that between neurones which are effectively interconnected there must be currents which affect the total level [of cathexis] as happens in intercommunicating pipes—although the height of the level in the different

[1] Cf. in this connection *The Interpretation of Dreams*, particularly (*trans.* 1953) p. 597 f. It seems as though Freud lost sight of the discovery which he here reveals of the "similarity" between dream-processes and the mechanisms of the psychoneuroses, and did not rediscover it till the beginning of 1899 [in Letter 105]. See also p. 410 and the footnote to p. 209.

neurones need only be proportional [see p. 427] and is not necessarily uniform.

The characteristics of sleep reveal some things which could not have been guessed.

Sleep is characterized by motor paralysis, a paralysis of the will. [See below, p. 400.] The will is the discharge of the total Ψ-quantity ($Q\dot{\eta}$). [Cf. p. 379.] In sleep the spinal tonus is partly relaxed (it seems likely that motor Φ-discharge is manifested in tonus); other innervations persist, together with the sources of their excitation.

It is a highly interesting fact that the state of sleep begins and is evoked by the closing of those sense organs that are capable of being closed. Perceptions should not be made during sleep and nothing disturbs sleep more than the emergence of sense impressions, cathexes entering Ψ from Φ. This seems to indicate that in daytime a constant, though displaceable, cathexis (i.e., "attention")[1] is sent into the neurones of the pallium which receive perceptions from Φ; so that it is quite possible that the primary Ψ-processes may be performed with this contribution from Ψ. [Cf. p. 397-8.] (It remains to be seen whether the pallium neurones themselves or the adjoining nuclear neurones are already pre-cathected.) If Ψ withdraws these pallium cathexes, the perceptions reach uncathected neurones and are slight and may perhaps even be unable to give an indication of quality.[2] And as we have just hinted, along with the emptying of the perceptual neurones (ωN), an innervation of discharge that increases attention comes to a stop. At this point, too, we might approach the enigma of hypnosis. The apparent unexcitability of the sense organs in that condition would seem to rest on this withdrawal of the cathexis of attention.

Thus, by an automatic mechanism which is the opposite of the mechanism of attention, Ψ excludes Φ-impressions so long as it itself is uncathected.

But what is strangest of all is that during sleep there occur Ψ-processes—dreams which have many characteristics that are not understood.

[1] [See footnote, p. 397.]
[2] [So in the MS. Wrongly printed "*Quantität*" in the German edition of 1950.]

[20] THE ANALYSIS OF DREAMS[1]

Dreams exhibit every degree of transition to the waking state and of admixture with normal Ψ-processes; nevertheless, their essential character can easily be extracted.

1. Dreams are devoid of motor discharge and, for the most part, of motor elements. We are paralysed in dreams.

The easiest explanation of this characteristic is the absence of spinal pre-cathexis owing to the cessation of Φ-discharge. Since the neurones are uncathected, the motor excitation cannot pass over the barriers. In other dreamlike conditions movement is not excluded. This is not the essential characteristic of dreams.

2. The connections in dreams are partly nonsensical, partly feeble-minded or even meaningless or strangely demented.

The last of these attributes is explained by the fact that the compulsion to associate prevails in dreams, as no doubt it does primarily in all psychical life. Two cathexes that are simultaneously present must, so it seems, be brought into connection with each other.[2] I have collected some amusing examples of the dominance of this compulsion in waking life. (For instance, some provincial spectators who were present in the French Chamber during a bomb outrage concluded that whenever a deputy made a successful speech a shot was fired as a sign of applause.)[3]

The two other attributes, which are in fact identical, show that a part of the dreamer's psychical experiences have been forgotten. In

[1] The following first attempt at a theory of dreams is fragmentary in so many essential portions that it seems scarcely worth while to compare it in detail with the hypotheses developed in *The Interpretation of Dreams*. We can see that Freud approached the study of dreams from two directions: his attempts to establish the nature of the psychical apparatus enabled him to understand the general mechanisms of dream-formation, but it was only the analysis of his own dreams—and the concrete experience of his self-analysis—that made it possible for him to take the step forward which carried him from the views expressed in the 'Project' to those in *The Interpretation of Dreams*.

[2] [This point was insisted on by Freud in the course of a long footnote to the case history of Emmy von N. (under the date of May 15), in Breuer and Freud's *Studies on Hysteria* (1895). He recurs to it in Chapter V, Section A, of *The Interpretation of Dreams* (1900*a*).]

[3] Freud made use of these examples in *The Interpretation of Dreams* (*trans.* 1953, p. 500), and explained them as "efforts at making an intelligible pattern of the sense-impressions that are offered to us".

fact, all those biological experiences have been forgotten which normally inhibit the primary process, and this is due to the insufficient cathexis of the ego. The senseless and illogical nature of dreams is probably attributable to the same fact. It seems as though Ψ-cathexes which have not been withdrawn find their level partly in the adjoining facilitations and partly in neighbouring cathexes. If discharge from the ego were complete, sleep would necessarily be dreamless.

3. Ideas in dreams are of a hallucinatory nature; they awaken consciousness and meet with belief.

This is the most important characteristic of dreams. It becomes obvious at once in alternate fits of sleeping and waking. One shuts one's eyes and hallucinates, one opens them and thinks in words.[1] There are several explanations of the hallucinatory nature of the cathexes in dreams. In the first place, it might be supposed that the current from Φ to motility [in waking life] acts as an obstacle to any retrogressive cathexis of the Φ-neurones from Ψ, but that when that current ceases, Φ is retrogressively cathected and the conditions fulfilled for the production of quality.[2] The only argument against this is the consideration that the Φ-neurones should be protected from cathexis from Ψ by the fact of their being uncathected (just as motility is so protected [p. 400]). It is characteristic of sleep that it reverses the whole situation: it stops the motor discharge from Ψ and makes the retrogressive one to Φ possible. It is tempting to assign the determining role to the great waking current of discharge from Φ to motility. In the second place, we might turn back to the nature of the primary process and point out that the primary recollection of a perception is always a hallucination [cf. p. 402] and that it is only inhibition on the part of the ego which has taught us never to cathect *W* in such a way that it can transfer cathexis retrogressively to Φ. This hypothesis can be made more plausible by the consideration that conduction from Φ to Ψ is in any case easier than from Ψ to Φ; so that a Ψ-cathexis of a neurone, even if it is far more intense than the perceptual cathexis of the same neurone, need not involve retrogressive conduction. This explanation is further supported by the fact that in

[1] Cf. *The Interpretation of Dreams* (1900*a*), Chapter I, Section E.]

[2] [This explanation of regression in dreams is considered and criticized in Chapter VII, Section B, of *The Interpretation of Dreams* (1900*a*).]

dreams the vividness of the hallucination is in direct proportion to the importance (that is, to the quantitative cathexis) of the idea concerned. This indicates that it is quantity (Q) that conditions hallucination. If a perception comes from Φ in waking life, Ψ-cathexis (interest) makes it more distinct but not more vivid; it does not alter its quantitative character.

4. The purpose and meaning of dreams (or at least of normal ones) can be established with certainty. Dreams are *the fulfilments of wishes*[1]—that is, primary processes following on experiences of satisfaction; and they are not recognized as such, merely because the release of pleasure (the reproduction of pleasurable discharges) in them is slight, since in general they run their course almost without affect (*i.e.*, without motor release). But it is very easy to prove that this is their nature. And it is for this very reason that I am inclined to infer that *primary wishful cathexes too are of a hallucinatory character*.

5. It is noticeable how bad the memory is in dreams and how little damage dreams do compared with other primary processes. But this is easily explained by the fact that dreams mostly follow old facilitations and thus cause no changes, that Ψ-experiences are kept back from them and that, owing to the paralysis of motility, they leave no traces of discharge behind them.

6. It is, moreover, interesting that consciousness furnishes quality in dreams as easily as in waking life. This shows that consciousness is not restricted to the ego but can be attached to any Ψ-process. This is a warning against a possible identification of primary processes with unconscious ones. *Here are two invaluable hints for what follows.*

If, when dreams are remembered, we enquire from consciousness as to their content, we shall find that the meaning of dreams as wish-fulfilments is concealed by a number of Ψ-processes all of which we meet with once more in the neuroses and which are characteristic of the pathological nature of those disorders.[2]

[1] Freud reached this conclusion after interpreting his "dream of Irma's injection" in July 1895 (see Letter 137). It seems that the analysis of this dream was not yet correlated with his self-analysis. The analysis of the dream was dynamically directed but not genetically.

[2] Cf. p. 398 and footnote. [Cf. also pp. 407 and 410.]

[21] DREAM CONSCIOUSNESS

Our consciousness of dream ideas is above all a discontinuous one. It does not become aware of a whole chain of associations but only of separate points in it; and between them lie unconscious intermediate links which we can easily discover when we are awake. If we investigate the reasons for these leaps, here is what we find. Suppose [Fig. 4] that A is a dream-idea that has become conscious and that it leads to B. But, instead of B, C appears in consciousness and it does so because it lies on the path between B and another cathexis D, which is simultaneously present. Thus there is a diversion owing to a simultaneous cathexis of another kind, which is not, moreover, conscious.

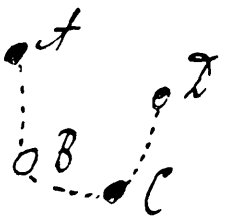

Fig. 15

C has therefore taken the place of B, though B fits in better with the chain of thought, that is, with the wish-fulfilment.

For instance, [I have a dream that] O. has given Irma an injection of propyl [A][1]. I then see "trimethylamin" very vividly before me, and hallucinate its formula [C]. The thought that is simultaneously present is of Irma's illness being of a sexual nature [D]. Between this thought and that of propyl lies an association [B] of a conversation on sexual chemistry with W. Fl. [Wilhelm Fliess] in which he drew my special attention to trimethylamin. This latter idea is then pushed into consciousness from both directions. It is a puzzling fact that neither the intermediate link (sexual chemistry [B]) nor the diversionary idea (the sexual nature of the illness [D]) are also conscious. And this needs explaining. One might suppose that the cathexis of B or D alone would not be intense enough to bring about a retrogressive hallucination, but that C, being cathected from both of them, would be able to do so. But in the example I have given D (the sexual nature of the illness) was certainly as intense as A (the injection of propyl), and the derivative of these two (the chemical formula [C]) was prodigiously vivid.

The problem of unconscious intermediate links applies equally to waking life, in which similar events occur daily. But what remains

[1] See the discussion of this part of the "dream of Irma's injection" in *The Interpretation of Dreams*, (*trans.* 1953), p. 115 f.

characteristic of dreams is *the ease with which quantity* ($Q\dot{\eta}$) *is displaced* in them and thus the way in which B is replaced by a C which is superior to it quantitatively.

And the like is true of wish-fulfilment in dreams generally. We shall not find, for instance, a wish that is conscious and afterwards its fulfilment hallucinated; but the latter only will be conscious and the intermediate link [the wish] will have to be inferred. It has quite certainly occurred, but without being able to give itself a qualitative shape. It is obvious, however, that the cathexis of the wishful idea cannot possibly be stronger than the motive impelling to it. Thus the psychical course of excitation in dreams takes place in accordance with quantity (Q); but it is not quantity (Q) that decides what shall become conscious.

We may also perhaps infer from dream-processes that consciousness emerges *during the passage* of a quantity ($Q\dot{\eta}$), that is to say that it is not aroused by a *constant* cathexis. On the other hand we might suspect that an intense current of quantity ($Q\dot{\eta}$) is not favourable to the emergence of consciousness, since consciousness is attached to the *outcome* of the current—to some extent, that is, to a comparatively quiescent persistence of cathexis. It is hard to find one's way to the real determinants of consciousness in view of these mutually contradictory preconditions. And we must also take into account the circumstances in which consciousness emerges in the secondary process.

This last peculiarity of dream-consciousness may perhaps be explained by supposing that a retrogressive current of quantity ($Q\dot{\eta}$) towards Φ is incompatible with a relatively energetic current towards the Ψ-paths of association. Other conditions seem to apply to the conscious Φ-processes.