The Relationship Between Somatic and Psychic Processes

Lessons from Freud's *Project*

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As the nineteenth century progressed, the intellectual worldview became increasingly mechanized. In the life sciences, the notion of vitalism was abandoned, and by extension, the insane came to be no longer regarded as possessed or wicked, but rather as sick: the victims of a fault in the mechanism of the brain. Freud took a final step. To him, even the expressions of the normal mind were the product of an *apparatus*. As it did for most of the physiologists, neurologists, and psychiatrists of his day, the choice of a scientific approach led automatically to a mechanistic view of the mind. Freud's predecessors were guided by particularly Cartesian notions: the brain was the organ of the mind and its working could be seen as part of the machine that was the body. But another Cartesian notion had been abandoned: the mind as substance, with wholly autonomous properties. After all, mental states were always the result of neurophysiological states, the search for which had brought physiology, neurology, and psychiatry to blossom. In his initial neurological period Freud adopted this prevalent *psychophysiological parallelistic* view. When he came to make it his goal to establish a scientific psychology, he distanced himself even further from Descartes: he now regarded the mind itself, not just the brain, as an apparatus. This had far-reaching heuristic implications.

In this chapter I will begin by discussing Freud's initial parallelism. Here every mental state is coupled with a neurophysiological state, but complete reduction is impossible. I will show that his *Project for a Scientific Psychology* of 1895 (in German, *Entwurf einer Psychologie* or *Psychologie für Neurologen*) still represents this point of departure. Next I will indicate what reasons compelled Freud to go beyond parallelism and to become a pronounced interactionist. Finally I will look at Freud's attempts to specify the nature of the interaction between body and mind. These various attempts are often obscure or old-fashioned. Yet there is a strategic line in them which, more than some of his other ideas, still deserves careful attention and prudent imitation today.

FREUD'S PSYCHOPHYSICAL PARALLELISM: EVERYTHING HAS AN ORGANIC BASIS BUT NOT EVERYTHING IS ORGANIC

To the physiologists, neurologists, and psychiatrists of Freud's day, the premise that the brain was the organ of the mind had become more or less axiomatic: Every psychological process was carried by processes in the brain; there was nothing mental without a material substrate. But they were very cautious not to identify one to the other: What happens in the mind might be carried by the body, but there was more to it than that. Accordingly, neurophysiology should confine itself to investigating the *conditions* under which mental phenomena occur, and have no pretensions to anything

more. In his monograph *On Aphasia* of 1891 Freud explicitly allied himself with this view. At the same time he distanced himself from the strict or radical materialism of Meynert, his psychiatric mentor.

Freud's criticism was aimed mainly at Meynert's direct translation of association psychology in terms of the anatomy and physiology of the brain. Such a translation leads to untenable views of the structure and working of the nervous system, since it would mean that:

- the sensory periphery was projected point by point into the cerebral cortex;
- for every idea of which we are conscious, a nerve cell in the cerebral cortex would be in a state of excitation;
- every association between ideas would be coupled with a state of excitation in a white nerve fiber linking the cortical cells concerned.

Freud believed that the relation between body and mind could not be so simple. Even if scientific association psychology is a lot more acceptable than the common or garden-variety phrenology of Gall and Spurzheim, and even if our knowledge of the structure and function of the brain has since increased enormously, ideas cannot be encapsulated in cells, nor associations in fibers, any more than psychic powers and personality traits are encapsulated in bumps in the skull. The fate that befell phrenology awaits all forms of an overhasty materialism: They will eventually be caught making presumptuous equations between psychological and physiological categories. What is simple at one level of explanation may well be complex at another level. Thus, having an idea at the neurophysiological level will unquestionably go together with something more complicated than the state of excitation of a cortical cell and, conversely, the physiology of orgasm will be simpler than the psychology of sexual desire. For example, Freud asks:

What then is the physiological correlate of the simple idea emerging or re-emerging? Obviously nothing static, but something in the nature of a process. This process is not incompatible with localization. It starts at a specific point in the cortex and from there spreads over the whole cortex and along certain pathways. When this event has taken place it leaves behind a modification, with the possibility of a memory, in the part of the cortex affected. It is very doubtful whether this physiological event is in any way associated with something psychic. Our consciousness contains nothing that would, from the psychological point of view, justify the term "latent memory image." Yet whenever the same cortical state is elicited again, the previous psychic event re-emerges as a memory. (Freud, 1891b, p. 56)

Between the first occurrence of a representation and its subsequent repetition, some enduring physiological change must take place to enable it to be recalled from memory.

The materialistic localization theory propounded by people like Meynert leads to statements like "the representation is localized in the brain cell." This in turn can lead one to think that excitation of cortical cells is the cause of having a representation. This way leads down the path to dualism: A nerve fiber, which from its sensory beginning along its entire length is exposed only to physiological influences, ends up with its cortical termination in the mind, where it suddenly evokes a representation or memory. Freud considered this rather implausible, since a physiological process in the nervous system could hardly be the cause of a psychic process. If the state of excitation of the cortical terminus of the nerve fiber is regarded as the cause of the origination of a representation, this implies an unlikely break in the chain of physiological events. Whether the mind is asleep or awake, physiological events follow their allotted course.

But Meynert could not be blamed for assuming a causal relationship between au-

tonomous physiological and psychic events. Rather, Freud's objection to Meynert is that his materialism has placed him on the slippery slope towards an elliptical manner of speaking that suggests such an assumption. When Meynert says that "a representation is localized in the brain cell," he presumably means that "the change in a nerve fibre brought about by a sensory stimulus causes another change in a central nervous cell, which change is the physiological event that correlates with the representation." Freud has no objection to such a formulation in principle, since it accords better with the more circumspect psychophysical parallelist position that he prefers. Problems only arise when people start regarding the correlating representation and brain cell change as one and the same thing, so that it no longer makes any difference whether one speaks of the one or of the other. This leads to a sloppy treatment of causal relations, leading to unfavorable repercussions when yet another all-too-easy identification of a physiological and a mental category proves to be untenable.

Freud formulates the psychophysical parallelism of his less radically inclined contemporaries as follows:

The relationship between the chain of physiological events in the nervous system and the mental processes is probably not one of cause and effect. The former do not cease when the latter set in; they tend to continue, but, from a certain moment, a mental phenomenon corresponds to each part of the chain, or to several parts. The psychic is, therefore, a process parallel to the physiological, 'a dependent concomitant'. (Freud, 1891b, p. 55)

In other words: *Mental processes go together with physical processes and are dependent on them.*

Does this mean that Freud was an epiphenomenalist in 1891? After all, he claims that from a certain moment onwards the links of the physiological chain are accompanied by consciousness phenomena which depend on the physiological links. Epiphenomenalism is the doctrine that the body produces mental side-effects, the epiphenomena, to be compared with the shadows that accompany somebody walking in the sun. What Freud claims looks very similar. Yet it is an inappropriate label, for Freud believes that what is separate in the mind—for example, representation and association—need not be separate in the matter. He opposes Meynert because he is all too prone to reduce psychological properties to physiological mechanisms and anatomic locations. The properties of physiological and psychological processes need to be investigated independently of each other in order to avoid confusion. To prevent premature reduction, Freud confines his investigation to the physiological processes and anatomic states which make certain psychological phenomena *possible*. He dedicates himself to the question of which centers and pathways in the brain have to be *intact* for us to speak and understand language. At the very least he goes about it as if the mind, though dependent on matter, has its own autonomous properties and is not an epiphenomenon. But to Freud a premature reduction from the mind to matter is more than just inconvenient. In earlier years he had already attributed a causal role to psychological states such as representations, and in particular to their *content*. From the philosophy lectures by Brentano, which he attended, Freud must have realized that content is irreducible. Something that is not only cause but also irreducible cannot be epiphenomenal. In short: epiphenomenalism never fitted into his program.

As to Freud's view of the way in which the mind depends on the body, the work of John Hughlings Jackson sheds some light. Jackson, a neurologist, was the most direct source of Freud's inspiration on this subject. According to Jackson, to arrive at a scientific physiology it is necessary to draw a sharp distinction between mental states and their corresponding physical states. He rejects every attempt to *explain* mental states in terms of physical states: "We cannot understand how any conceivable arrangement of

any sort of matter can give us mental states of any kind" (Jackson, 1875, p. 52). Thus, a complete reduction from the mental to the physical he regards as impossible. Jackson has no wish to degenerate to the verbalism of the radical materialists: brain centers (a "sleep center," for example) have just as dubious a status as the cerebral bumps of phrenology and the powers of vitalism (for example, the *vis dormitiva* made so notorious by Molière). He even rewrites his papers to erase all formulations associated with this easy materialism. Also, he explicitly rejects the view that physiological and psychic processes simply unfold in parallel to one another. Psychic processes depend on their physiological parallels. This means that (neuro)physiologists attempt "to discover the nature and conditions of activity of those nervous arrangements which are assumed to be the substrata of the mind" (*op. cit.*, p. 41). However, definitely no more than that. As physiologists, "we are not trying to explain verbal and visual ideation; we are only trying to find out the anatomy and physiology of their material bases" (*op. cit.*, p. 49). Jackson believed that this was how "most people" saw it, and he pointed to a whole bunch of prominent philosophers and physiologists: Spencer, Tyndall, Mill, Du Bois-Reymond, Griesinger, and Donders. He might also have mentioned Helmholtz, the "founder" of the school of physiology in which Freud received his training—a school that has erroneously come to be known as reductionist (see Conrat, 1904).

Let me recapitulate. Because Freud derived his parallelistic view of the relationship between body and mind directly from Jackson, we now have a more precise understanding of what this parallelism represented. Freud transplanted these "mainstream" points of departure, which Jackson thought he needed for a scientific *neuropsychology*, into the foundations deemed necessary for a scientific *psychology*.

FREUD'S PROJECT FOR A SCIENTIFIC PSYCHOLOGY (1895): NO REDUCTIONISM

Now that we are clearer about Freud's attitude to the mind-body problem in the early years of psychoanalysis, we can also shed some light on the manuscript *Entwurf einer Psychologie*, written in 1895 but not published until after Freud's death. It is a work that elicits a variety of responses from Freudian scholars.

According to Jones (1953), what happened was this: the manuscript was Freud's very last attempt to reduce psychology to neuropsychology, by building up a neurological model for the workings of the psychic apparatus. These final desperate efforts at reduction convinced him of the pointlessness of this pursuit and taught him that psychoanalytical theory had to develop separately from physiology and neurology. From now on, psychoanalytical theory would have to be pure psychology. Thus "fixation" and other neuro-energetic terms in the later psychoanalytical theory are nothing less than traces of a past that the mature Freud left behind him, the terms themselves acquiring a quite different, purely psychological meaning.

This version of events is demonstrably inaccurate. Holt (1965, 1968) demonstrated that the biological assumptions in the *Project* always have been the background to Freud's "purely psychological" theories. The myth that Freud completely broke with neuropsychological reductionism because of the failure of this project removed these biological assumptions from view, and they were accordingly never revised. As a result, psychoanalysis was left with a biological basis that was and is wholly outdated. Much of what is obscure in the theory is the result of this.

Sulloway (1979) allied himself with Holt in his defense of the continuity of Freud's thought. However, he was more positive in his appreciation of the contributions made by the neuropsychological and biological assumptions to the development of psychoanalytical theory in the *Project*. Irrespective of their validity, they were the heuristic

basis for a number of interesting notions which gained an enduring place in psychoanalysis: the distinction between primary and secondary processes, the view that secondary processes incorporate a testing against reality, the wish-fulfillment theory of dreams, and so on.

On the character of the *Project* as a project he concluded as follows:

. . . . the *Project* is neither a purely neurological document nor a projection of wholly psychological insights onto imagined neuro-anatomical structures; rather, it combines clinical insights and data, Freud's most fundamental psychophysical assumptions, certain undeniably mechanical and neuroanatomical constructs, and a number of organismic, evolutionary, and biological ideas—all into one remarkably well-integrated psychobiological system. (1979, p. 123)

According to Sulloway, this system had to serve three goals: (1) the reduction of the general laws of the mind to mechanistic-physiological considerations; (2) the bridging of the gap in the theorizing about normal psychic functioning on the one hand and abnormal psychic functioning on the other; and, above all, (3) the finding of a neurophysiological solution to the puzzle of pathological defense or repression. As regards the first two of these objectives, Freud was successful, though there was an important rider: Sulloway observes that he was looking for two sorts of biological reduction, one neurophysiological—*mechanistic* and the other biological—*evolutionary*. Thus, for example, Freud distinguished between neurons serving perception from those which served memory. This distinction he then attributed, on the one hand, to a mechanical property: Neurons were or were not permeable. On the other hand, he reasoned why higher organisms had to have both kinds of neurons in order to survive, to be able to meet the “demands of life” (*Not des Lebens*), which was an evolutionary justification. Sometimes Freud was successful with both sorts of reduction, sometimes not. Sometimes he was unable to reduce properties of the mind to mechanical properties, in which case he found himself obliged to confine himself to evolutionary considerations. Thus, he was forced to reduce intentionality and the power of anticipatory thinking to primary defense and attention, respectively, fundamental faculties that no organism can do without; but in this connection he was unable to think of mechanical properties. He found himself in the same quandary with repression. Therefore, as regards his third goal, the *Project* was defective.

In the opinion of Sulloway this was why Freud abandoned it. He had failed to solve the puzzle of repression in neurophysiological terms, and yet this had been his particular goal. Nevertheless, he continued to use the biological points of departure from the *Project* and their psychological offspring. The most important shift that Sulloway sees is that from a predominantly biomechanical to a biogenetic style of reduction.

I have already advanced Jones as the representative of those who regard the *Project* as Freud's last attempt to reduce mental life to neurophysiology, an attempt from which he proceeded to liberate himself and which survived in his later work only in its terminological packaging. I have presented Holt as the chief spokesman for those who see the *Project* as a formulation of the hidden neurophysiological and biological assumptions which Freud continued to use all his life. This point of view was refined by Sulloway. And then there is another party, yet to be mentioned, who maintains that the *Project* is an attempt by Freud to render his newly reached psychological insights palatable to his reductionistically inclined contemporaries.

All these different parties agree on one thing: the *Project* is a reductionist undertaking. But they are wrong: reductionism does not fit into Freud's view at that time of the relationship between physiology and psychology. At least as early as 1891 Freud followed Jackson and had warned against *brain mythology* à la Meynert and the confusion of psychological and physiological descriptions produced by it. It is, therefore, also

incorrect to interpret the *Project* as a (clumsy) *translation* of his clinical knowledge of the neuroses into physiological terms, as Solms and Saling (1986) do, or as a (very outdated) listing of *isomorphisms* between psychological and neurological processes, as in the interpretation of McCarley and Hobson (1977). In the *Project* he looked for the neuroanatomic and neurophysiological conditions under which perception, memory, thought and also repression were possible. His aim was not a complete, eliminative reduction of these psychic functions to the fundamental laws of physics and chemistry; rather, he believed that an approach to the mind in terms of the natural sciences ought to study the neurophysiological conditions for psychic functions right from the start. Following Jackson, Freud attempted “to discover the nature and conditions of activity of those nervous arrangements which are assumed to be the substrata of the mind.” It was his lack of success in this, coupled probably with his sense of having been unable to avoid the premature materialism of Meynert, that caused him to abandon the point of view that this attempt should be undertaken “right from the start.”

However, we do not need to guess Freud's reasons for writing the *Project*. His article entitled “The Neuro-Psychoses of Defence” (1894a) expressly advances a *psychological* theory to explain hysteria, phobias, obsessions, and hallucinations. Here he says he is using a certain “working hypothesis” or “auxiliary representation” (*Hilfsvorstellung*):

I refer to the concept that in mental functions something is to be distinguished—a quota of affect or sum of excitation—which possesses all the characteristics of a quantity (though we have no means of measuring it), which is capable of increase, displacement and discharge, and which is spread over the memory-traces of ideas somewhat as an electric charge is spread over the surface of a body. (*Standard Edition* 3, p. 60)

The value of this auxiliary representation was supposed to become apparent from its usefulness in explaining psychic phenomena. Physicists used such an auxiliary representation (or model) when they treated electricity as if it were a flowing electric fluid, and it was their success in doing so that Freud wished to repeat. He went in search of a model with which it would be possible to determine the physiological conditions for pathological defense. In the *Project* Freud formulated assumptions about the quantity of excitation and the systems of neurons in which this quantity was transported and removed.

His model of the neuronal apparatus of the mind had to be tested against the “individual facts of experimental psychology” and “adapted to the universal laws of motion,” as he declared in one of his letters to Fliess (Masson, 1895, p. 140). *Adaptation* is not the same as *reduction*. A very similar argument applies to the initial lines of the *Project*: “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 . . .” (Bonaparte *et al.*, 1954, p. 355). What the German text says is: *darstellen* (to represent). Here again a different kind of word from *reduce* has been used, and this goes on throughout the text. For example, alongside a class of highly impermeable neurons which serve the perception function, there is a second class of highly impermeable neurons which “may be left in a modified condition after each excitation, and thus afford a *possibility of representing memory*” (Bonaparte *et al.*, 1954, p. 360; italics Freud's). The properties of this second class of neurons tell us how *facilitation* is possible. Memory can be represented in neurophysiological terms as the acquired differences in facilitation between the neurons of this class. Freud wished to show what we can understand of the mind, or memory, if we form a representation of the underlying neuronal machinery. That was what he meant by *to represent*: to construct a model.

To Freud the question of the neurophysiological basis of memory was an urgent

one, since he had to answer it before the basis of repression could be tackled. Next, he would also be able to give the “physiopathological formula” for hysteria, which he had asked for already in his article on hysteria of 1888. The formula was supposed to indicate what changes in the conditions of excitation of the nervous system caused symptoms of hysteria: He supposed that the quantity of stable excitation was distributed unevenly over the nervous system. At this time he also supposed that hysterical patients had to contend with a superabundance of nervous excitation.

The *Project* offers such a formula. There hysteria is characterized by compulsion brought about by excessively intense representations. For every compulsive representation *A* which caused the hysterical patient unaccountably to burst into tears, for example, there is a repressed representation *B* to which an intense emotion is appropriate: The *content* of representation *B* explains the tears. *B* is only revealed by analysis. The excessive intensity of the compulsive representations points to the *quantitative* aspects of the hysterical state. In quantitative terms, repression means that the energy of the neurons involved in representation *B* is transferred to the neurons involved in representation *A*, which is why *A* becomes excessively intense. The sum of the two quantities of excitation remains the same: It is only the *distribution* of the total quantity of neuronal energy that changes. “Something has been added to *A* that has been subtracted from *B*” (Bonaparte *et al.*, 1954, p. 407). Next Freud wonders how these quantitative changes are brought about and maintained. The second problem he is able to solve satisfactorily (see Wegman, 1985), the first not.

The *Entwurf einer Psychologie* was not a reductionist project. Certainly it was not an attempt to identify *types of psychological processes*, such as memory and repression, with *types of neurophysiological process*, in order then to replace them by these neurophysiological types. Freud had learnt from Jackson’s teachings that such an attempt was inconsiderate. Rather it was an investigation into the neurophysiological basis of repression that had gotten out of hand. Freud wanted to know how the neurophysiological machine that is our body could bring about a mental phenomenon like repression. In his view a scientific psychology demanded this.

The *Project* provided Freud not only with a number of both neurophysiological and psychological hypotheses, but also with a number of problems. These problems explain why the *Project* never came to be published. Freud’s project ground to a halt (see Sulloway, 1979). In particular, he found himself unable to explain in mechanical terms how repression could come about. There were also difficulties with the related seduction hypothesis—that the etiology of psychoneuroses was tied up with sexual abuse in early childhood (see Panhuysen, 1990). However, Freud’s troubles were more general than this: Other psychic phenomena besides repression, including intentionality and the capacity for anticipatory thinking, were also proving difficult to link to neuronal machinery. And all too often he was unable to suppress the tendency to indulge in premature reduction.

Later Freud denied any commitment to the neurophysiology of the *Project*, but he retained its psychology. He had had enough of *neuronal* models, but he kept his preference for constructing *mechanical* models. From now on his goal was the construction of a *mental* apparatus. The complex functions of the mind may be understood from the more elementary functions of its *mental components* (see Cummins, 1984, and Flanagan, 1984).

FROM PARALLELISM TO INTERACTIONISM

Freud turned out to be an adherent of the view that all psychic processes were linked to physiological processes and, moreover, were dependent on them. In the

meanwhile, however, he had conceded the causal effect of psychic processes on physiological processes. This concession was threefold. First he acknowledged that hysteria (and the other psychoneuroses) could never be explained by reference to any organic lesion (Freud, 1888b); next he accepted the existence of ideogenic symptoms, and thus the causal role of the content of representations in psychic disturbances (e.g., Freud, 1893c); and finally it turned out that this causal role was typically unconscious (Freud, with Breuer, 1893a). Once he had become aware of these assumptions, probably by the failure of the *Project*, he shifted up from a parallelist position to an interactionist one. To be sure, all psychic processes are “dependent concomitants,” but their content may influence physiological processes in their turn, even in an unconscious way.

Not All That Is Psychic Is Conscious

Three classes of psychological phenomena made such an impression on Freud that he abandoned the Cartesian identification of the psychic with the conscious.

In the first place Charcot had demonstrated to him, during his stay in Paris, that the way in which hysterical paralysis and numbness spread across the body could not be reconciled with the neuroanatomic facts (Charcot, 1887–89). Rather, they reflect the kind of neuroanatomic representations that the uninitiated have—a sort of “layman’s anatomy.”

Second, he drew a great deal of his knowledge of hysteria from the case of Anna O., a hysteric who had been treated by Breuer in the early 1880s. From her, through Breuer, Freud learnt much (Freud, with Breuer, 1895d). Hysterical symptoms, which at first sight appear to be wholly incomprehensible and without purpose, become understandable and purposive in the light of the traumatizing circumstances in which they arise. The content of these traumatic experiences is repressed, but the now unconscious contents find expression in symptoms. Many such traumatic experiences surfaced spontaneously in Anna O.’s consciousness when she was in a kind of twilight state that to some extent resembled a hypnotic trance. Breuer deliberately started to use hypnosis to recall traumatic experiences. Once these experiences became conscious, it was possible for the patient to abreact “with” them.

In the third place the phenomena associated with posthypnotic suggestion led Freud to the conclusion that our mental life cannot be understood without including the content of our unconscious representations (Freud, 1888–89, 1916–17). One can put people into a hypnotic state with certain artifices and then plant a particular representation in their minds—a certain assignment, for example. Once they have woken from their trance, they proceed to carry out the assignment without having the slightest idea of why they behave as they do. Freud would later even consider posthypnotic suggestion as the experimental evidence for the existence of the unconscious.

Physiology Alone Is Not Enough

At several places in his *Introductory Lectures to Psycho-Analysis* Freud drew attention to the insufficiencies of medical-physiological explanations for neuroses, dreams, and failed actions (Freud, 1916–17). His study of neuroses had shown him that the content of representations can continue to have an effect even in the absence of any conscious awareness of them. He believed he could demonstrate this even more easily by reference to everyday occurrences such as bungled actions (“parapraxes”).

Traditional medical thought fails to explain such phenomena. Knowing that the au-

dience of his lectures consisted of students of medicine, Freud said to them that they are taught:

. . . to find an anatomical basis for the functions of the organism and their disorders, to explain them chemically and physically and to view them biologically. But no portion of your interest has been directed to psychical life, in which, after all, the achievement of this marvelous complex organism reaches its peak. For that reason psychological modes of thought have remained foreign to you. (1916–17, *S.E.* 15, p. 20)

The necessary knowledge of the relationship between physical and mental processes is lacking, which makes inaccessible any insight into the ways in which the mind could become disturbed. Psychiatric symptoms cannot be reduced to demonstrable changes in the brain. Where changes in the brain can be found, they did not indicate the nature of the symptoms. Thus, the reductionist approach to psychiatry had proved to be insufficient. That was the gap that psychoanalysis attempted to fill:

It tries to give psychiatry its missing psychological foundation. It hopes to discover the common ground on the basis of which the convergence of physical and mental disorder will become intelligible. With this aim in view, psycho-analysis must keep itself free from any hypothesis that is alien to it, whether of an anatomical, chemical or physiological kind, and must operate with purely psychological auxiliary ideas, and for that very reason, I fear, it will seem strange to you to begin with." (1916–1917, *S.E.* 15, p. 20)

Psychic disorders must be explained using psychic mechanisms; after all, they *signify* something. Even the failure of an act, such as a slip of the tongue, has a meaning which at first sight is hidden. A psychic process is involved with an "intention," with a particular place in a series of content-related representations, strivings, decisions, and so on. Two intentions appear to be at work: the manifest intention, which has failed, and a latent intention, which caused the failure. The content of the failed act becomes understandable when it is seen as a compromise between these two intentions.

What about the physical factors which theorists of the more traditional school adduce to explain slips of the tongue, mistakes etc.? They talk about a disturbance in the circulation, about fatigue, about excitement, about absent-mindedness, about difficulties in paying attention, and so on. Freud states emphatically that he has no intention of disputing the effect of these factors, but that they explain too little: They are not necessary conditions for the failure of an act; at most, they make it more likely. Psychophysiological factors provide explanations of considerable clumsiness: "They are only empty phrases, screens behind which we must not let ourselves be prevented from having a look" (1916–17, *S.E.* 15, p. 46). Only by looking behind the screens can we discover the psychic context that give psychic acts such as slips of the tongue their point. "By 'sense' we understand 'meaning,' 'intention,' 'purpose' and 'position in a continuous psychical context' " (1916–17, *S.E.* 15, p. 60–61).

We may safely assume that to Freud, too, there are causal series of purely physical processes which, accordingly, belong to the object of research of physiology. Besides, some mental phenomena are a direct expression of the working of the body; these too Freud accounted to the terrain of physiology (or perhaps psychophysiology). But there are also other psychic expressions, the psychic processes in the real sense, which cannot be understood without taking account of their place in causal series at the psychic level. They belong in a relationship of psychic mechanisms that regulate the processing of mental contents and thus determine the sense of human acts and perceptions. It is the task of psychology to discover the psychic mechanisms that explain these psychic processes. However, psychology cannot properly carry out that task without pos-

tulating *unconscious* psychic processes, for gaps in the series of psychic events can only be filled in by unconscious processing of mental contents.

Gaps in Consciousness

Neurotic symptoms seem to be the result of brain processes disturbing the functioning of the mind and so a physiological–mechanistic explanation should suffice. However, on closer inspection, it is rather a matter of mental disturbances of the functioning of the brain. In order to explain neurotic symptoms, therefore, psychic mechanisms must be employed that together constitute an apparatus processing representations. The content of representations continues to work unconsciously as well.

If this is the case, consciousness and mind can no longer be regarded as one and the same. Psychic processes can be both conscious and unconscious. For this reason the Cartesian criterion for the demarcation of mind and matter, according to which unconscious processes take place in the material arena, is untenable. The criterion of mental life is not consciousness, but the digestion of representations—what today we call *information processing*. A physiological apparatus that processes information has a mental life. Precisely for this reason, the brain is the organ of the mind. The neurophysiology of the brain permits psychic mechanisms, so that the content of representations can have a causal effect on what the organism does. Both psychic circumstances (traumatic experiences or pathological defense) and physiological conditions (overpowerful drives) can disturb the effect of these psychological mechanisms.

Thus, the mind is anything but a side-effect of the body: The causal role of the unconscious is irreconcilable with epiphenomenalism. It may be possible to reconcile the recognition of unconscious causes with the form of parallelism that Freud adopted in his neurological days. However, with the acceptance of psychic causes, this parallelism cannot be maintained just like that.

Therefore, Freud distances himself expressly from this position when introducing the unconscious psychic processes, at greatest length in *The Unconscious* (1915e, pp. 166–171), one of his so-called “metapsychological” writings. There his main argument for introducing the unconscious was that the chain of psychic events would show a large number of gaps if what is psychic is restricted to what is conscious. Only by assuming unconscious psychic processes can we close the causal chain.

We have already seen that Freud used a similar kind of argument in 1891 to support the parallelism that he had espoused at that time. Then, too, he had supposed that consciousness was not an uninterrupted flow and that, nevertheless, everything, including every moment of consciousness, had to fit into a chain of cause and effect. Next, he assumed that a physiological event could hardly be the cause of a moment of consciousness because that would lead to an interruption of the physiological chain. From these assumptions a serious problem arose: How was it possible to close the chain of cause and effect again? Freud forged the chain together again by postulating that each psychic process goes hand-in-hand with a physiological process from which it also depends. In this parallelistic solution the gaps in the flow of consciousness no longer pose a problem: The chain of physiological processes in the nervous system runs on, even if consciousness drops a stitch. Thus the causal relationship remains intact.

Later, Freud was to retain elements of this parallelistic solution. He stayed with the notion that there was no such thing as a psychic process without certain physiological conditions being fulfilled, and in that sense there is always an organic basis. However, in the light of the causal influence of unconscious representations this parallelism is too simple. Space has to be made for continuous causal chains at the psychic level, and it

is for this reason that in 1915 we come across the old argument again, though now it has been re-cast. The assumption of the unconscious

. . . is *necessary* because the data of consciousness have very large numbers of gaps in them; both in healthy and in sick people psychical acts often occur which can be explained only by presupposing other acts, of which, nevertheless, consciousness affords no evidence. These not only include parapraxes and dreams in healthy people, and everything described as a psychical symptom or an obsession in the sick; our most personal daily experience acquaints us with ideas that come into our head we do not know from where, and with intellectual conclusions arrived at we do not know how. All these conscious acts remain disconnected and unintelligible if we insist upon claiming that every mental act that occurs in us must also necessarily be experienced by us through consciousness; on the other hand, they fall into a demonstrable connection if we interpolate between them the unconscious acts which we have inferred. (1915e, pp. 166–167)

Our conscious psychic acts and representations often cannot be explained in causal terms proceeding from other conscious psychic acts and representations. Nor do physiological factors offer a solution: Only by postulating unconscious psychic acts and representations can we proceed further. If we restrict the psychic to consciousness, psychology is nothing other than a phenomenology that looks to see what kinds of perceptions, feelings, thought processes, and acts of will can be distinguished. The psychology of consciousness is content with a stream of consciousness which is full of gaps, and this is why it remains no more than a descriptive science. The psychology of the unconscious, by contrast, is a fully-fledged natural science, offering causal explanations:

Whereas the psychology of consciousness never went beyond the broken sequences which were obviously dependent on something else, the other view, which held that the psychical is unconscious in itself, enabled psychology to take its place as a natural science like any other. (*An Outline of Psycho-Analysis*, 1940a, p. 158)

This image of “gaps” in consciousness actually gives a false impression of the scope of the unconscious: in fact what we are dealing with is a thin film of lucidity superimposed on an impenetrable mass. Think of the holes in a cheese: they represent not the unconscious, but the conscious. We are conscious of only a very small part of our memories. Where are the memories of which we are *not* conscious? If only that which is conscious is psychic, these memories must largely do without psychic status: they must be purely physiological states. For example, they might be regarded as physiological traces left behind by representations that were once the object of conscious acts: in that case, we remember things only when these physiological tracks are reactivated. By 1915 this view, which was still being defended by Freud in 1891, was no longer tenable. Now unconscious memories, though linked to physiological traces, could hardly be seen as anything other than the causal product of psychic processes. Moreover, it is hardly possible to deny psychic status to processes which in all respects have the same features as conscious acts, on the sole ground that they are not conscious.

That in our world—and hence in psychology—we can get nowhere with an ontological equation of mind and consciousness also has epistemologic implications: Mind is found to be no more directly accessible than matter. Psychology is not in a privileged position.

Just as Kant warned us not to overlook the fact that our perceptions are subjectively conditioned and must not be regarded as identical with what is perceived

though unknowable, so psycho-analysis warns us not to equate perceptions by means of consciousness with the unconscious mental processes which are their object. Like the physical, the psychical is not necessarily in reality what it appears to us to be. (1915e, p. 171)

The internal perception of mind, like the external perception of matter, furnishes no more than hints of what is actually going on. However, when it comes to the possibility of understanding the mind and the possibility of correcting our superficial perception of it, we may be more optimistic in the psychological domain than in the physical one.

We shall be glad to learn . . . that the correction of internal perception will turn out not to offer such great difficulties as the correction of external perception—that internal objects are less unknowable than the external world. (1915e, p. 171)

Thanks to the method of free association, the deep layers of the mind are more readily accessible than those of matter. Freud had already formulated this epistemological view in *The Interpretation of Dreams* (1900a, *S.E.* 5, p. 612).

The Promised Organic Basis

For Freud, we have seen, it was always a foregone conclusion that all psychic phenomena are constituted by physiological processes and, accordingly, had to fit in with the fundamental laws of nature; it was not, however, his wish to reduce them to those laws.

In the *Introductory Lectures* (1916–17) he wrote: “The theoretical structure of psychoanalysis that we have created is in truth a superstructure, which will one day have to be set upon its organic foundation. But we are still ignorant of this.” (*S.E.* 16, p. 389). Here Freud was *not* promising the ultimate victory of reductionism. His promise is more modest. The youthful arrogance of the view that there was already much that could be said about the physiological basis of the psychic realm, leading to mythology of the brain, was long dead and buried. In 1898 he lamented this in a letter to Fliess:

I am . . . not at all inclined to leave the psychology hanging in the air without an organic basis. But apart from this conviction I do not know how to go on, neither theoretically nor therapeutically, and therefore must behave as if only the psychology were under consideration. Why I cannot fit it together [the organic and the psychological] I have not even begun to fathom. (Masson, 1985, p. 326)

His successes in the psychological field over the subsequent years gave this feeling a more positive twist. Indeed, only in the distant future we might expect insight into the material mechanisms that made the workings of the mind possible, but we can already see how the psychic apparatus works and how its operation could be disturbed. For that we are not dependent on knowledge of physiological processes. Psychological top structure and physiological basis could be constructed relatively independently.

Freud’s remark, quoted above, was made as part of his discussion of the “decisive distinction” between actual neuroses and psychoneuroses. Both sorts of neurosis, he believed, involved abnormal use of libido—a view consonant with his general thesis that there could be no neurosis with a normal, satisfying sexual life. However, the symptoms of an actual neurosis (headache, other pains, weakened organic functions) have no psychological significance and do not belong to a series of psychic events. They are, rather, purely physical processes in which complicated psychic mechanisms such as re-

pression play no part. Conversely, the symptoms of the psychoneuroses are caused by additional psychic mechanisms. After all, sexuality is no more purely somatic than it is purely mental: it influences both body and mind. Therefore, it is hardly surprising that there are disorders in the sexual function which express either deficiencies in psychic processes or purely somatic defects. That is precisely the difference between psychoneuroses and actual neuroses. At the same time it explains how it is possible for a psychological theory to explain illness: At least some of our biological functions have mental as well as somatic aspects, and there is no way of ruling out the possibility that illness can stem from a purely mental disorder.

As usual, Freud's speculations here are based on a medical metaphor. He pointed to the strong similarity between neurotic symptoms and manifestations of intoxication and abstinence. The similarity was even more striking when we look at the features of illnesses caused not by extraneous toxins but by toxic substances produced by our own metabolism. (Presumably Freud was thinking of substances which are indispensable to the proper functioning of the body, but which become toxic when concentrations rise to excessive levels.) We cannot avoid, he maintains, seeing "the neuroses as results of disturbances in the sexual metabolism, whether because more of this sexual toxin is produced than the subject can deal with, or whether because internal and even psychical conditions restrict the proper employment of these substances" (1916–17, *S.E.* 16, p. 388). In that case psychic (defense) mechanisms are at work and psychoneuroses are involved. The result of some psychic processes is that the sexual metabolism is disturbed.

This was the direction Freud was taking when he speculated on the organic basis for neuroses. Psychic disorders cannot remain hanging in the air: future research will have to reveal how they interfere with somatic functions. The promised organic basis for the psychoneuroses has to be able to provide an answer to this question, but according to Freud that is something for the future. In the *Introductory Lectures* he still finds:

. . . the phrase "sexual metabolism" or "chemistry of sexuality" a term without content; we know nothing about it and cannot even decide whether we are to assume two sexual substances, which would then be named "male" and "female," or whether we could be satisfied with *one* sexual toxin which we should have to recognize as the vehicle of all the stimulant effects of the libido. (1916–1917, *S.E.* 16, p. 389)

What we now regard as a hormonal process can to Freud's way of thinking embody the result of certain psychic processes. (One might think of something like an excessive accumulation of testosterone poisoning body as well as mind.) However, Freud did not believe that this route would make it possible to reduce all psychic processes to physiological processes, even in the remote future. It might one day be possible to explain the direct somatic symptoms of the actual neuroses in this way, but not those of the psychoneuroses. After all, psychoneurotic symptoms serve a purpose, and, accordingly, they can only be understood within a series of psychic events. To explain the psychoneuroses it is necessary to turn to psychic mechanisms such as defense. There is no reason to suppose that these could ever be wholly reduced to the physiological level. According to Freud, sociology is nothing more nor less than applied psychology, but psychology cannot be completely reduced to physics. "Strictly speaking there are only two sciences, psychology, fundamental and applied, and physics." (1933a, p. 180). This position enabled him to be engaged on the construction of a model of the mental apparatus, rather unconcerned about the functioning of the bodily machinery.

THE INTERACTION BETWEEN BODY AND MIND

In this way Freud switched from a parallelist to a definite interactionistic position. On the one hand the mind is dependent on the body, on the other hand the body is controlled by the mind. Let us now see how Freud imagined this mutual interaction.

The Pleasure Pump

Freud's interactionism is already apparent in his first notions about the interaction between the physiological and psychic aspects of sexuality. As soon as he suspected that neuroses had something to do with disorders in sexual functioning, he formed a schematic figure of what happens in sexual stimulation (Masson 1985, draft G of 1895; notice that 1895 is the year of the *Project*). This scheme gave direction to the development of his theory, particularly to his analysis of the various neuroses. The scheme deals with demarcation and interplay between body and mind (FIG. 1).

According to Freud, a normal cycle of sexual activity passes through the following phases (Sulloway, 1979, p. 105):

- (1) The organism perceives a sexual object.
- (2) This perception activates the psychological group of (sexual) representations in the brain.
- (3) The activity of this psychic group leads to efferent stimulation of the nerves (passing, somewhere along the line, the boundary between psychic and purely physiological processes), so that the genital organ produces sexual substances.
- (4) The increase in sexual substances in this organ is the source of somatic sexual stimulation and leads to afferent nervous stimulus in the form of sexual tension (which in turn transcends the somatic-psychic boundary).
- (5) This sexual tension stimulates the psychic group of sexual representations so as to cause the organism to undertake specific action to relieve the tension.
- (6) If there are no obstacles and the organism succeeds in maneuvering the sexual object into a favorable position, it will proceed to direct sexual activity.
- (7) This motor activity further increases the sexual tension and ultimately brings about an orgasmic reflex in which the tension that has accumulated in the genital organ is released.
- (8) The orgasmic discharge leads (after another passing of the psychic-somatic boundary) to a (climax in the) sensation of pleasure.

The boundary between psyche and soma is one of the most striking features of Freud's scheme. Why does he place so much emphasis on it? Because sexual functioning can be disturbed in two very different ways: Something might go wrong with (the processing of) sexual stimulation either at the *purely physiological level* or at the *psychic* one. In the first case the somatic symptoms of the neurosis are direct manifestations of physiological dysfunctioning, and also the psychic symptoms are no more than side-effects of physiological processes. In the second case the psychic symptoms as well as the somatic ones give expression to the disturbed way in which sexual representations are processed.

Freud's conception of the relationship between body and mind led him to look for particular classes of disorders. Thus, anxiety neurosis is an actual neurosis in which sufficient sexual tension has been created, but circumstances (abstinence, coitus interruptus, etc.) stand in the way of adequate psychic digestion and of satisfying sexual activity. The sexual tension comes up, as it were, against the interface between body and

FIGURE 1. Freud's schematic representation of the sexual function, drawn again by G. Fichtner (Schröter, 1986); there is also an English version in Sulzway's book (1979).

mind and turns into anxiety: The sexual substances accumulate and “poison” the body; this poisoning expresses itself in physical symptoms. (FIG. 2).

Conversely, phobias and obsessions are *psychoneuroses*. The sexual tension is allowed to pass to the psyche, but its psychic “digestion” is coupled with defense. The sexual tension, averted but not released, leads to enduring *unpleasure*, “poisons” the body, and finds expression in psychic symptoms.

On the basis of Freud’s scheme I arrive at the following classification of possible disorders in the normal cycle of sexual activity:

A: Disorders in the psychic digestion of sexual stimuli

Aa: The perception of sexual objects meets with psychic defense; the psychic digestion of sexual perceptions fails to produce stimulation of the production of sexual substances in the genital organ.

Ab: Somatic sexual tension is unable to pass the boundary of the psyche; there is an absence of psychic digestion of sexual tension.

Ac: Somatic sexual tension meets with psychic defense; sexual tension is digested in a psychic way, but fails to lead to specific action.

B: Disorders in somatic sexual stimulation

Ba: The production of sexual substances, and hence of somatic sexual stimulation, is too slight. This phenomenon may in turn have either a purely physiological or psychic cause.

Bb: Production of sexual substances is so great that the psyche is overwhelmed by sexual tension. This phenomenon may have various causes as well, including psychic ones.

Freud’s attempts to create order in neurotic phenomena were undoubtedly informed by the insight into possible disorders that was provided by his blueprint of the “pleasure pump.” For example, on the basis of “careful observation” he concluded (in the same draft G of 1895), that girls suffering from anorexia nervosa were sexually undeveloped. He linked their lost appetite to the lost sexual drive which is a characteristic of melancholia (depression); a melancholic would be in pathologic mourning for the loss of his or her libido. He envisaged the following mechanism: Because of the extremely low sexual tension, a state of “underpressure” would occur, as a result of which the psychic excitation of adjacent representations is sucked away towards the sexual vacuum. In the case of anorexia nervosa the appetite for food would disappear into this vacuum. This was the same mechanism as that involved in melancholia, except that now it was an inhibited sexual development that was the cause of the missing sexual tension.

Instructive also is Freud’s attempt to explain hypochondria as an actual neurosis (in his introduction to narcissism, 1914c). Here he departs from the mental reaction to pain and feelings of unpleasure in organic diseases. Not only does the sufferer’s interest turn away from the outside world, so that he becomes wholly absorbed in his own body, but also his libido retreats to focus on his ego. Something of the kind also happens with hypochondria. The pain and unpleasure of the hypochondriac have to do with changes in the organs, even if these are not ordinary organic disorders. The most suitable example of such a pain-sensitive change, according to Freud, is the sexual organ in its aroused state. In that state it becomes “congested with blood, swollen and humected, and it is the seat of a multiplicity of sensations” (1914c, p. 84). Precisely in this state the sexual organ causes sexual excitation of the psychic apparatus. But while the genitalia may provide the best example of this *erogenous* property of organs, they share it with other parts of the body: the erogenous zones. Each change in the erogenous state of an organ goes together with a change in the libidinous position of that organ in the ego. This linkage is the basis of hypochondria: heightened erogeneity leads to excessive accumulation of ego-libido, which expresses itself in the form of pain and

unpleasure. Since in Freud's view erogeneity is a direct consequence of the physiological state of a part of the body, he leaves a closer study of it to physiology. He confines himself to a number of broad pronouncements on the relationship of pleasure and unpleasure to changes in the physiological intensity of states of excitement.

The Pleasure Principle

Freud's schematic presentation of sexuality comprises interactions and cycles between physical and mental processes. For example, sexual tension is transformed from somatic-sexual excitation to psychosexual activation. Apparently, interaction is possible on the basis of two sorts of linkage between mind and body. On the one hand, the result of a given psychic process is paired with a change in the state of excitation of the nervous system, which then initiates a purely neurophysiological process. On the other hand, a given purely neurophysiological process leads to a change in the state of excitation, which is paired with the initiation of a process controlled by psychic mechanisms. The two sorts of connection differ in their direction, but their character is the same: they bring about *changes in the state of excitation of the nervous system*. The *pleasure principle* specifies *which* types of change in the state of excitation of the nervous system correspond to the fundamental motivational states of the mind. Freud links the quantitative properties of matter with the qualitative psychic properties of pleasure and unpleasure. A rise in the tension in the nervous system (that is, an increase in the intensity of physiological excitation) is coupled loosely with unpleasure, a reduction of the tension with pleasure. Increasing the tension is the neurophysiological condition which sets the mind in motion, and unpleasure is the corresponding psychological condition. Increasing and reducing tension, unpleasure and pleasure, regulate the motions of the mind. Unpleasure "automatically" demands activity that will remove the unpleasure; activities that cause unpleasure are avoided and activities that bring pleasure are repeated.

In this way it is possible for the mind to affect the body. The mind can make the body ill: Certain psychic processes (e.g., processes in which repression is involved) lead to the impossibility of adequately relieving tension, and hence to accumulated tension which expresses itself in symptoms. The mind can also keep the body healthy: Sublimation allows us to still relieve tension.

A few simple assumptions about the link between energetically physiological and psychic processes get the psychic machinery to work. Moreover, there is room in them for relatively independent laws and mechanisms at the psychic level. To Freud, this implies that psychology could operate more or less autonomously. These are attractive sides to Freud's pleasure principle, but it also has its problems.

Freud recognized these problems early on, and sought a variety of solutions. This is the greatest difficulty: "It seems that in the series of feelings of tension we have a direct sense of the increase and decrease of the amounts of excitation, and it cannot be doubted that there are pleasurable tensions and unpleasurable relaxations of tension." (1924c, p. 160). Anybody who looks into sexuality in any detail can hardly escape noticing that tensions can also bring pleasure. The pleasure of sexual activity consists largely of raising the tension; only the enjoyment of the brief climax can be linked to the release of tension. There can be no question of the *absolute magnitude* of the intensity of the excitation determining the degree of unpleasure; it may, however, be a *function* of this (1914c, p. 85). If it cannot be argued that the increase of unpleasure is proportional to the increase in the intensity of the excitation, then perhaps it is the *rate* of change in the intensity of the excitation that determines the character of the sensation (1920g, p. 8). Or has it to do with the *rhythm*, the temporal pattern in the rises and falls in the quantity of excitation (1914c, p. 85)?

To Freud, these problems were not of fundamental importance. They were not a reason to doubt the part played by pleasure and unpleasure in the regulation of psychic activity. In many cases he regarded the assumption that an increase in tension goes together with unpleasure as sufficient. To the extent that he needed a more precise notion of the relationship between somatic and psychic excitation, this was provided for by his doctrine of drives. More penetrating research into the subject inevitably leads to biology, and that was not where his priorities lay. This appears to be one of the weaknesses of Freud's undertaking, particularly because to his way of thinking pleasure and unpleasure were able to do their regulating work without reaching consciousness. Without more precise specifications of the physiological basis of pleasure and unpleasure this assumption, however, cannot be tested.

The Drives As the Fire under the Kettle

To understand Freud's views on interaction it is useful to know his general notion of the character of drives. The *drive*, according to him:

. . . appears to us as a concept on the boundary between the mental and the somatic, as the psychic representative of the excitation arising from the inner body that enters into the mind, as a measure of the amount of work imposed to the mind in consequence of its connection to the body. (1915c, p. 121)

Each drive has a *somatic* source: the organ or erogenous zone where tension arises, or, more precisely, the physical-chemical process which is localized in a particular part of the body and produces excitation. A drive produces the *urge* to undertake action which will lead to the achievement of the *purpose* of the drive. The *general* purpose of each drive is to remove tension (according to the so-called "constancy principle"); its *particular* purpose is to remove the tension that springs from the source of the drive. The purpose of the drive is sometimes achieved through the subject's own body, but as a rule an *object* in the outside world is employed. Even then, however, the purpose is still to bring about a satisfying change in the state of the subject's own body. Somewhere "along the way from source to purpose the drive becomes psychically active" (1933a, p. 96). In other words, somewhere along the way, the drive, which is initially no more than the excitation welling up from a particular somatic source, becomes its psychic representative.

Freud says nothing about the location and other details of this event, but he does say something about the way in which a drive is represented in the psyche. The use of the word *representation* has implications. The drive representative is a delegate having a mandate (Laplanche & Pontalis, 1967), but also certain authorizations. The representative, while standing for the claims made by the drive, will also have to allow itself to be guided by the rules of the "court" (the psyche) in which it defends those claims: the drive's claims must be phrased or coded in the terms of the psychic frame of reference within which the representative belongs. When the drive has won its psychic representation, its fate lies in the hands of the court of the mind and its representative there. This metaphor is needed, of course, because there is nothing better. So much is clear: the drive's representative cannot simply be the drive's psychic parallel, and the drive cannot simply be the cause of the drive's representative.

Freud distinguishes two ways in which drives are expressed in the mind: (1) in *affects*, which correspond to the quantitative aspect of the drives, and (2) by means of particular *representations*, which are the psychic code in which the individual records his drives. The drive's affect may be seen as the psychic parallel of the excitation that wells up from the somatic source, caused directly by the change in the intensity of the excitation.

For reasons of this kind Freud was able to write about the theory of drives: "In fact one is operating here in the domain of biological psychology, is investigating the psychic side-effects of biological processes" (1933a, p. 95). However, this does not apply to the representations of the drives in the psyche. In Freud's view, after all, drive representatives could not be seen as psychic byproducts of drives. The only psychic byproduct of a drive is the *activation* of a representation (or series of representations) of the drive. However, representations belong in a psychic context and the fate of representations is thus determined by purely psychological laws.

In the end, then, what claim does Freud's theory of drives make about the interaction between body and mind? Physiological mechanisms mean that particular changes within an organ or erogenous zone cause it to function as a source from which a particular state of excitation wells up. This state of excitation is coupled with particular affects and with the activation of a particular representation or group of representations, which are standing for the drive in the psyche. It is this activation that sets certain psychological mechanisms in train. One result of this may be motor activity which will achieve the purpose of the drive. This activity brings about a change in the organ or erogenous zone concerned, after which physiological mechanisms can lead to a removal of the excitation and the satisfaction of the drive.

This model of interaction has two important features: (1) it presupposes relatively autonomous psychic mechanisms, and (2) the interaction between body and mind is brought about by means of particular linking states in which the neurophysiological and psychic aspects are joined together in a relatively simple way.

The drives are the product of physiological mechanisms. By their representation in the psychic apparatus they *cause* the psychological apparatus to work. The fate of each individual drive is subject to the mechanisms that determine the working of the psychic apparatus. Where there is insufficient satisfaction, the drives *keep* this apparatus at work. This is what I would like to call "the Freudian egg": a psychic apparatus that works by virtue of somatic drives (FIG. 3). The most physical part of our psychic apparatus is the id:

We are dealing with the Id through analogies, calling it a chaos, a kettle of seething upwellings. We imagine it as open at its [under]end to the soma, at that side assimilating the drives, which find there their psychic expression, but we are not able to say into which substrate. From the drives the Id is filled with energy . . . (1933a, p. 73)

By way of the drives, the body produces the fire that raises the steam in the mind.

CONCLUSION

In this paper I discussed first the psychophysical parallelism of Freud's neurological beginnings. This parallelism presupposes a neurophysiological process for every psychic state, but rejects the notion that every property of the mind can be reduced to properties of the body. Therefore, neurophysiology must see its task as being to track down the conditions under which specific psychic phenomena are possible, and it should not claim to be able to do more than that. When Freud allied himself with this view he expressly distanced himself from the strict materialism of Meynert, his psychiatric mentor. Freud's *Entwurf einer Psychologie* should be seen in this light. This manuscript searches the material conditions under which psychic phenomena, particularly repression, occur, but cannot be regarded as Freud's last reductionist spasm. He did never adhere to eliminative reductionism.

I then indicated the reasons for Freud the parallelist becoming Freud the interac-

FIGURE 3. Freud's sketch of the psychic apparatus (in the *Standard Edition* 22, p. 78) to which I have added the upwelling drives.

tionist. Hysterical phenomena, in particular, made him see that the content of unconscious representations has a causal effect on physical processes. This makes the Cartesian identification of mind and consciousness untenable. Freud also assumed that the content of psychic acts cannot be reduced to neurophysiological properties. From these premises he concluded, then, that physical processes are in turn dependent on the mind. Thus he reached an interactionist position, without having to give up much of his earlier position.

Finally I looked for the general thread of Freud's attempts to identify the nature of the interaction between body and mind. In this way I arrived at "Freud's egg": the drives as intermediary. The attraction of this model of motivation is closely bound up with the way in which Freud linked the motives behind human activities and experiences to the innermost part of the body. In abstract form this offers useful guidelines for research into the interaction between body and mind: Specify psychic mechanisms, specify physiological mechanisms, and look for particular states or processes in which psychic and physiological aspects are so directly correlated that they can at one and the same time function as the result or effect of one sort of mechanism and as the source or cause of the other sort of mechanism.

Freud's interactionism makes the mechanization of the mind possible. It paves the way for autonomous psychological research into the "higher" psychic functions and for a mechanistic analysis of them. According to Freud, they unquestionably have a material substrate which we have yet to discover. He rightly saw that this was not a major problem: When postulating a psychic mechanism all we have to know is that it does not conflict with physical and chemical laws: there is no need for us to know more than the material (neurophysiological) conditions under which that mechanism is possible. To use a metaphor popular today: just as computer software writers no longer need to

know much about the physical characteristics of their computers beyond the fact that the *ones* and *zeroes* of their programs correspond to the *ons* and *offs* of electronic circuits, so psychologists already know almost enough about the organic basis of the mind if they know that an increase in tension goes hand in hand with unpleasure and a decline in tension is coupled with pleasure.

There are also some serious objections to Freud's approach. In the first place there is the concrete shape of his drive theory. His drives are too little elaborated (and are capable of being elaborated too much): Not only are Eros and Thanatos mythical beings, but also all drives remain vague shadows, principally because the transition from somatic upwelling to drive represented in a psychic way remains too indeterminate. In another respect his view of drives is too narrow: Our biological constitution also drives us to spontaneous behavior without there being any question of tension or excitation from a physical source such as an erogenous zone or organ. Nor is Freud's restriction of the interaction between body and mind to the drives tenable: There are also direct links between body and mind that have quite a different character (for example, the physiological consequences of eating habits).

In the second place Freud erroneously shifts biological and physiological research that is relevant to his "pure" psychological theory into the indefinite future. This postponement cannot be reconciled with his own interactionist view, and certainly not with his exceedingly understandable abhorrence of gaps in the causal chain. In addition, inaccurate biological presuppositions and implications of his psychological theories are systematically prevented by this programmatic postponement from being corrected. As a result of this excessively slight contact with the body, psychoanalysis itself also remains out of range. This is one of the ways in which it places itself beyond the reach of criticism. Holt is right when he says that psychoanalytic theory is contaminated with debatable, dated, and sometimes downright obsolete biological elements. However, the advice he gives is wrong. It is not a matter of purging the theory of all biology. On the contrary, from an interactionist perspective, biological corrections and additions are just what is wanted. We must look not just for psychic mechanisms, but also for physiological mechanisms, and for the circuits that link both kinds of mechanism. Just like physiological reductionism, psychological reductionism leads to enduring gaps in our knowledge (Panhuysen & Tuiten, 1993, and 1995).

REFERENCES

- NOTE. *S.E.* refers to *The standard edition of the complete psychological works of Sigmund Freud*. 24 Vols. Strachey, J. (Ed.). London: Hogarth Press and The Institute of Psycho-Analysis (1953–1974).
- CHARCOT, J.M. (1887–1889). *Leçons du mardi à la Salpêtrière*. Paris: Bureaux du Progrès Médical.
- CONRAT, F. (1904). *Hermann von Helmholtz' psychologische Anschauungen*. Halle: Niemeyer.
- CUMMINS, R. (1984). *The nature of psychological explanation*. Cambridge, MA: Bradford Books.
- FLANAGAN, O.J. (1984). *The science of the mind*. Cambridge, MA: Bradford Books.
- FREUD, S. (1888b). Hysteria. In *S.E.* Vol. 1, 39–57.
- FREUD, S. (1888–1889). Preface to the translation of Bernheim's *Suggestion*. In *S.E.* Vol. 1, 73–85.
- FREUD, S. (1891b/1953). *On Aphasia: A Critical Study*. New York: International Universities Press.
- FREUD, S., with BREUER, J. (1893a). On the psychical mechanism of hysterical phenomena: Preliminary communication. In *S.E.* Vol. 2, 3–17.
- FREUD, S. (1893c). Some points for a comparative study of organic and hysterical motor paralyses. In *S.E.* Vol. 1, 157–172.
- FREUD, S. (1894a). The neuro-psychoses of defence. In *S.E.* Vol. 3, 43–61.
- FREUD, S., with BREUER, J. (1895d). *Studies on hysteria*. In *S.E.* Vol. 2.

- FREUD, S. (1895/1954). *Project for a scientific psychology*. In *The origins of psycho-analysis*. M. Bonaparte, A. Freud & E. Kris, (Eds.) New York: Basic Books, pp. 337–445.
- FREUD, S. (1900a). *The Interpretation of Dreams*. In *S.E.* Vols. 4–5.
- FREUD, S. (1914c). On narcissism: An introduction. In *S.E.* Vol. 14, 69–102.
- FREUD, S. (1915c). Instincts and their vicissitudes. *S.E.* Vol. 14, 11–140.
- FREUD, S. (1915e). The unconscious. *S.E.* Vol. 14, 161–204.
- FREUD, S. (1916–1917). *Introductory lectures on psycho-analysis*. In *S.E.* Vols. 15–16.
- FREUD, S. (1920g). *Beyond the pleasure principle*. In *S.E.* Vol. 18, 3–64.
- FREUD, S. (1924c). The economic problem of masochism. In *S.E.* Vol. 19, 157–170.
- FREUD, S. (1933a). *New introductory lectures on psycho-analysis*. In *S.E.* Vol. 22, 3–182.
- FREUD, S. (1940a). *An outline of psycho-analysis*. In *S.E.* Vol. 23, 141–207.
- HOLT, R.R. (1965). A review of some of Freud's biological assumptions and their influence on his theories. In Greenfield, N.S. & Lewis, W.C. (Eds.), *Psychoanalysis and current biological thought*. Madison and Milwaukee: University of Wisconsin Press, pp. 93–124.
- HOLT, R.R. (1968). Beyond vitalism and mechanism: Freud's concept of psychic energy. In Wolman, B.B. (Ed.), *Historical roots of contemporary psychology*. New York: Harper & Row, pp. 196–226.
- HOLT, R.R. (1976). Drive or wish? A reconstruction of the psychoanalytic theory of motivation. *Psychological Issues* 9, 158–197.
- JACKSON, J.H. (1875). On the anatomical and physiological localization of movements in the brain. In J. Taylor, (Ed.), *Selected Writings of John Hughlings Jackson* (1931). Vol. 1. London: Hodder & Stoughton, pp. 37–76.
- JONES, E. (1953). *The life and work of Sigmund Freud*. Vol. 1: *The formative years and the great discoveries, 1856–1900*. New York: Basic Books.
- LAPLANCHE, J. & PONTALIS, J.B. (1967). *Vocabulaire de la Psychoanalyse*. Paris: Presses Universitaires de France.
- MASSON, J.M., (Ed.). (1985). *The complete letters of Sigmund Freud to Wilhelm Fliess*. Cambridge MA: Belknap Press.
- MCCARLEY, R. & HOBSON, J. (1977). The neurobiological origins of psychoanalytic dream theory. *American Journal of Psychiatry*, 134, 1211–1221.
- PANHUYSSEN, G.E.M. (1990). *Het ei van Freud. Over de bijdrage van medische heuristieken aan geboorte en groei van de psychoanalyse*. [The "Freudian Egg." On the contribution of medical heuristics to the birth and growth of psychoanalysis.] Amsterdam: Swets & Zeitlinger.
- PANHUYSSEN, G.E.M. & TUITEN, J.J.A. (1993). How mental and physiological mechanisms gear into one other. In H. Stam, L. Mos, W. Thorngate & B. Kaplan, (Eds.), *Recent trends in theoretical psychology*, Vol. III. New York: Springer Verlag, pp. 283–293.
- PANHUYSSEN, G. & TUITEN, A. (1995). On the importance of being interactionist. In I. Lubek, R. van Hezewijk, G. Pheterson, & Ch. Tolman, (Eds.), *Trends and issues in theoretical psychology*. New York: Springer, pp. 334–340.
- SCHRÖTER, M. (Ed.) (1986). *Briefe an Wilhelm Fliess*. Frankfurt am Main: S. Fischer Verlag.
- SOLMS, M. & SALING, M. (1986). On psycho-analysis and neuroscience: Freud's attitude to the localizationist tradition. *International Journal of Psycho-Analysis*, 67, 397–416.
- SULLOWAY, F.J. (1979). *Freud: Biologist of the mind. Beyond the psychoanalytic legend*. New York: Basic Books.
- WEGMAN, C. (1985). *Psychoanalysis and cognitive psychology: A formalization of Freud's earliest theory*. London: Academic Press.