



FREUD'S SOLUTION TO THE MIND/BODY PROBLEM

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Professor Coetsier, Professor Thiery, Professor Quackelbeen, esteemed colleagues, ladies and gentlemen. In comparison to previous recipients of the George Sarton medal, my achievements in the history and philosophy of science have been modest indeed. In fact I do not even consider myself to be an historian or a philosopher. I am, rather, a clinician and a scientist - albeit one who is fully aware of how insoluble life's mysteries really are, and that much of what preoccupies us in science today is not that very different from what preoccupied scientists 100 years ago and more.

The topic that I have chosen to discuss with you this afternoon is one that countless clinicians and scientists before me have pondered on. I am referring to *the nature of the relationship between the mind and the brain*. What I intend to do is to describe a possible solution to this problem that was proposed almost exactly 100 years ago in 1899, by Sigmund Freud, one of the great clinicians and scientists of the century now ending.

Obviously in the time available to me I can only do so in a very schematic way. I will have time to say just a few words about the attitude to the mind/body problem that was prevalent among European neuroscientists in the 1880s, which is when Freud joined their ranks as a recently qualified neurologist with research interests in neuroanatomy. Next, I will characterize Freud's own attitude to the problem, by tracing the progression of his views on the relationship between the mind and the brain during the last decade of the nineteenth century. Finally, I will conclude my presentation by making a few brief observations on the current standing of Freud's solution to that problem, in relation to subsequent developments in neuroscience.

The last decade of the nineteenth century was a crucial period in Sigmund Freud's intellectual development. I shall focus on three landmark texts from this period: Freud's monograph *On Aphasia* (which was published in 1891); his 'Project for a scientific psychology' (which was written in 1895 but not published during Freud's lifetime); and his *Interpretation of Dreams* (which was published in 1899, but dated 1900). In the process of discussing these texts, I hope to be able to show that Freud's changing views concerning the mind/body problem during the 1890s (1) exposed the serious limitations of the neuropsychology of his time, and (2) laid the foundations for a new discipline which held out the promise of finally reducing the private and seemingly impenetrable sanctuary of our subjective consciousness to natural-scientific laws.

So, to begin: what was the prevailing attitude among Freud's contemporaries in the 1890s to the problem of the relationship between the mind and the brain? I think Peter Amacher summed up this attitude rather well when he wrote in his influential monograph on *Freud's Neurological Education and its Influence on Psychoanalytic Theory* (1965) that the work of Freud's teachers was characterized by "unrestrained shifting from descriptions in terms of mind to descriptions in physical terms", and that his contemporaries "did not conceive of mental processes as in any detail independent of physical ones" (pp. 16-17). This prevalent attitude was based above all on the neuroanatomical doctrines of Freud's revered teacher, Theodor Meynert, who, to quote Amacher once again, "saw consciousness and voluntary action as the middle links in a chain of 'cause and effect' in which the end links were the transmission of excitation in afferent and efferent nerves" (ibid).

I shall briefly illustrate Meynert's doctrines by describing two classical neuropsychological models that were derived from them. The first concerns the neuropsychological organization of speech and language, and the second concerns the neuropsychological organization of visual perception. These two models capture succinctly the manner in which Freud's contemporaries were attempting in the last decades of the 19th century to localize mental faculties within the tissues of the human brain.

The prevailing neuropsychological theory of *language* in the 1890s (which was articulated in the mid 1880s by Carl Wernicke and his pupil Ludwig Lichtheim) attributed the mental components of speech comprehension and production to three cortical centres, which formed the middle links in a chain of cause and effect, in which the end links were subcortical auditory and motor nerves. According to this model, acoustic stimuli travelled from the ear up the auditory nerve and through various specific nuclei in a purely physiological form, until they reached the cells of the primary auditory cortex. At that point the physiological stimuli in question were perceived as conscious sensations of sound. The primary auditory cells in turn excited secondary auditory cells in a region of the brain known as 'Wernicke's centre'. In Wernicke's centre the sound impulses excited memories of words. The words were then transmitted to the tertiary association cortex, which was known as the 'centre for concepts', at which point they were associated with visual and other images, and thereby acquired their meaning. From the centre for concepts, the sensory word-images could in turn excite motor word images, which were located in cell-groups in another part of the brain known as 'Broca's centre'. Finally, these cells stimulated the motor cells in the precentral gyrus, which controlled the peripheral organs of speech. In this way conscious and meaningful words were transformed back into purely physiological processes. Notice the "unrestrained shifting from descriptions in terms of mind to descriptions in physical terms" that Amacher mentioned.

A directly analogous model was proposed for *visual perception* in 1890 by Heinrich Lissauer. According to Lissauer's model, visual stimuli were propagated from the retinal cells of the eye to the primary visual cortex in a purely physiological form, at which point they were transformed into conscious visual sensations. These sensations in turn excited cell-groups in Lissauer's 'apperceptive' centre, which transformed the visual stimuli into perceptual images of objects, to which meaning was then attached when they, too, were associated with the so-called 'centre for concepts'. Note once again the "unrestrained shifting from descriptions in terms of mind to descriptions in physical terms".

In 1891 Sigmund Freud published a devastating critique of this

approach to mind-brain relations which was so prevalent among his contemporaries. I am referring now to Freud's monograph *On Aphasia*, which is remembered to this day as a landmark contribution to the neuropsychology of language and higher visual perception. On p. 55 of that work Freud asked the following rhetorical question, which cut to the heart of the problem. He asked:

"Is it justified to immerse a nerve fibre, which over the whole length of its course has been only a physiological structure subject to physiological modifications, with its end in the psyche and to furnish this end with an idea or a memory?"

In Freud's view, this most certainly was not justified. He therefore continued:

"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 a part of the [physiological] chain, or to several parts. The psychic is, therefore, a process *parallel* to the physiological" (ibid, emphasis added).

In other words, Freud argued that certain physiological processes occurring at specific points in the causal chain are *experienced consciously* as meaningful words or objects, but that does not mean that these conscious experiences occur *instead* of physiological processes; it does not mean that you have first a physiological impulse, then a conscious image, then another physiological impulse, and so on. You do not have a chain of cause and effect leading from brain to mind and then back to brain again. In other words, the conscious images of words or objects cannot actually be found *inside* the tissues corresponding to the middle links of the chain of cortical linguistic and visual processes. In Freud's view, the conscious experiences of words and objects exist outside of the physiological chain. Conscious experiences and the physiological

processes corresponding to those experiences are two fundamentally different things; the words and objects are perceived in *parallel* with certain physiological modifications that occur in certain parts of the brain. How and why the conscious experiences occur remained a mystery to Freud, but he felt that the important conceptual problem raised by this mysterious parallelism should not be avoided by elliptical phrases which actually explained nothing. He wrote:

"I am well aware that the writers whose views I am opposing here cannot have been guilty of thoughtless mistakes in their scientific approach. They obviously mean only that the physiological modification of the nerve fibre through sensory stimuli produces another modification in the central cells which then become the *physiological correlate* of the 'concept' or 'idea'. As they know more about ideas than of the physiological modifications, which are still undefined and unknown, they use the elliptic phrase: an idea is localized in a nerve cell. Yet this substitution at once leads to a confusion of the two processes which need have nothing in common with each other. In psychology the simple idea is to us something elementary which we can clearly differentiate from its connection with other ideas. This is why we are tempted to assume that its physiological correlate, i.e., the modification of the nerve cells which originates from the stimulation of the nerve fibres, be also something simple and localizable. Such an inference is, of course, unwarranted; the qualities of this [physiological] modification have to be established for themselves and independently of their psychological concomitants" (pp. 55-56, emphasis added).

Freud felt that the meaningful structure of consciousness might have little in common with the anatomical structure of the brain. We have no valid grounds for projecting the anatomical pathways of the brain onto a psychological theory of language or perception. It is entirely possible that language is organized in a manner quite different from the cellular structure of the auditory and motor cortex, that is, it is possible that a

highly complex relationship exists between these two domains. In order to do justice to *both* sides of this psycho-physical equation, and thereby to understand the relationship between them on a properly scientific basis, Freud proposed an alternative approach to the study of the neurology of mental functions. He proposed that we study the psychological and physiological aspects of the problem *separately*, and that we thereafter *correlate* the two domains of knowledge with one another.

I shall now briefly describe how this approach worked in practice, using the neuropsychology of language as an example.

As regards the *anatomical* side of language, Freud concluded from the available evidence in his 1891 monograph that the physical substrate of language takes the form not of a few simple centres connected to one another (and to the ear and the mouth) by a few simple pathways. Rather, it takes the form of an extremely intricate and densely interconnected network, which begins in the auditory, visual, glossokinesthetic and cheirokinesthetic sensory end-organs, incorporates their subcortical modality-specific nuclei and pathways, projects onto the primary cortices for hearing, vision and kinaesthesia bilaterally, encompasses the entire cortical and subcortical expanse surrounding the left Sylvian fissure, which associatively connects these primary sensory zones with one another on the one hand and with the motor zones for the hands and organs of articulation on the other, and terminates in those end-organs themselves, via the complex cortico-subcortical nuclei and pathways which connect them with the motor cortex.

As for the details of the *physiological* processes that occur within this complex web of anatomical elements, Freud frankly admitted his ignorance. He inferred from the clinical fact that damage to the cortical components of the anatomical structures that I have just mentioned impairs the faculty of speech in specific ways that the physiological processes of these structures must somehow be equivalent to the psychological processes of language. However, he admitted that the actual cortical processes that correspond to the conscious experience of words in the mental sphere were still quite unknown. Freud could only surmise that the physiological processes in question must involve an ongoing

function of "association" between different types of sensory and motor stimuli, and that these associations must produce a modification in the tissue in question, which he described as "the possibility of a memory" (p. 56). Freud therefore only felt able to conceptualize the physiological processes of language in vague "functional" terms. On this basis he suggested that we think of the complex network of cortical cells and fibres that form the physical substratum of language as a *functional system*, to which he assigned the name of the "speech apparatus".

Next he turned to the *psychological* side of the equation. Freud concluded from the available evidence that the unit of language - which he took to be the word - could be reduced analytically to a number of elementary components, namely, the visual and motor images of written words, and the auditory and motor images of spoken words. He then proposed a cognitive model, consistent with the theoretical assumptions of the prevailing academic psychology, of how these components might unite during development to form language. Freud's conception of the internal mental processes involved in this observable learning process was very obscure, and it was ultimately no different from his "functional" conception of the *physiology* of language. That is, Freud ultimately conceptualized the *psychology* of language, too, in terms of the functional (associative and mnemonic) properties of the physiological "speech apparatus".

As regards the all-important question of the empirical *relationship between* the neurological and psychological manifestations of language, Freud had this to say. On the basis of the clinico-anatomical evidence available to him, he concluded that one could correlate the two aspects directly with one another only at a few very specific places on the surface of the human brain. These were the primary cortical zones for hearing, vision, kinaesthesia and movement. In these four places specific aspects of language were correlated with specific physiological processes. This correlation was based on the observation that discrete damage to these four areas resulted in the isolated loss of the four elementary modalities of language, namely its auditory, visual, kinaesthetic or motor components. It was therefore legitimate to *localize* these mental components to these discrete anatomical areas.

Since these elementary mental components were also the elementary physiological properties of the speech apparatus, Freud described them as the "cornerstones" of that apparatus. But the nature of the relationship between the physical and mental processes which lay *between* these "cornerstones" remained unknown, for the reason that the essential processes involved in both the psychical and the physical interior of the apparatus had not yet yielded to scientific observation.

This was because, in both of its manifestations, only the most superficial workings of the speech apparatus seemed to be accessible to empirical observation and understanding. The internal workings of the apparatus could only be *inferred*, and described in 'functional' terms which were, strictly speaking, neither physiological nor psychological. For this reason Freud's concept of a "speech apparatus" ultimately embodied many of the same psycho-physical confusions that he had detected in the theories of his teachers. While Freud had brought simple clarity to the nature of the empirical relationship between mind and brain at the superficial, observable level of the conscious manifestations of speech, the functional *depths* of his "speech apparatus" still remained shrouded in obscurity.

The origin of this obscurity can be recognized in the following sentences, which appeared on p. 56 of Freud's aphasia monograph:

"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 it spreads over the whole cortex along certain pathways. When this event has taken place it leaves behind 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". (emphasis added)

As you can see, here Freud was hampered not only by a lack of physiological knowledge; he was hampered also by a *conceptual* limitation. He could not conceive of the possibility that something non-conscious could be described as a 'memory'. At that time, Freud was no different from his contemporaries in this respect; psychological processes were *by definition* equated with conscious processes. Since it seemed to Freud in 1891 that our *consciousness* contained nothing that justified the term "latent memory image", it made no sense to him to speak of the mnemic processes underlying speech in psychological terms. The underlying modifications must be something *physiological*. That is why Freud could only establish empirical psycho-physiological correlations at the superficial level of the conscious modalities of language, and that is why he was forced to conceptualize the deeper structure of language in quasi-physiological (functional) terms. This same assumption - namely that all mental processes are conscious processes - prompted Freud, three years later, to write his 'Project for a scientific psychology'.

"I turn now to the 'Project' itself. In the opening lines of that work Freud wrote the following (now famous) words:

The intention is to furnish a psychology that shall be a natural science: that is, to *represent* psychical processes as quantitatively determinate states of specifiable *material* particles, thus rendering those processes perspicuous and free from contradiction". (1950, p. 295, emphasis added)

These words demonstrate that in 1895 Freud still believed that it was necessary to describe the natural processes underlying consciousness in *physiological* terms, if they were to be accessible to scientific understanding. The psychical processes needed to be *represented* as states of material particles, *then* they could be understood scientifically. Freud believed that this translation of psychical processes into physical processes was necessary because he had not yet hit upon the notion of unconscious mental processes.

In his 1891 monograph Freud had realized that conscious states were not the middle link in a chain of cause and effect in which the end links were physiological processes; he had realized that the middle links, too, were physiological processes. All that distinguished these physiological processes from others was that they were *correlated* with conscious processes in the mental sphere, whereas the interpolated links were not correlated with conscious processes. This generated two parallel causal chains, a physiological chain which was continuous (and therefore perspicuous and free from contradiction), and a mental chain which was broken, comprising erratic sequences of conscious awareness arising as if from nowhere. Under these circumstances the only way in which the conscious processes could be understood scientifically was to translate them into their physiological correlates, which were causally continuous and therefore amenable to explanation in terms of natural-scientific laws. But please note that this way of dealing with the problem left consciousness *itself* outside of science.

Years later, when Freud wrote his final outline of his life's work, in 1938, he made this point explicitly. He wrote:

"Many people, both inside and outside science, are satisfied with the assumption that consciousness alone is psychical; in that case nothing remains for psychology but to discriminate among psychical phenomena between perceptions, feelings, thought-processes and volitions. It is generally agreed, however, that these conscious processes do not form unbroken sequences which are complete in themselves; there would thus be no alternative left to assuming that there are physical and somatic processes which are concomitant with the psychical ones and which we should necessarily have to recognize as more complete than the psychical sequences, since some of them would have conscious processes parallel to them but others would not. If so, it would of course become plausible to lay the stress in psychology on these somatic processes, to see in *them* the true essence of what is psychical and to look for some other assessment of the conscious processes". (Freud

1940a, p. 158)

This is precisely what Freud did when he wrote the 'Project'; he laid the stress in psychology on the somatic processes, and he saw in *them* the true essence of what was psychical. But the problem that Freud was confronted with in 1895, when he set about translating everything that he knew about mental processes into physiological and anatomical terms, in order to explain them scientifically, was the uncomfortable reality that *so very little was known* about the physiological correlates of mind. In fact, neuropsychological knowledge still did not extend much further than the elementary correlations that Freud had made a few years earlier, with regard to the function of language. He was therefore paradoxically forced, in his quest for a scientifically respectable model of the mental apparatus, to rely more than ever upon *speculation*. Freud implicitly admitted this to his friend Wilhelm Fliess, in a letter that he wrote at the time, in which he described his work on the 'Project' in the following terms:

"During recent weeks I have devoted every free minute to [this] work; the hours of the night from eleven to two have been occupied with *imaginings, transpositions, and guesses*, only abandoned when I arrived at some absurdity". (letter dated 25 May 1895, Freud 1954 p. 120)

So this is what Freud was occupied with when he attempted in 1895 to construct a neuroscientific model of the mind - "*imaginings, transpositions, and guesses*". The only empirical knowledge of the brain that Freud was able to rely on at that time was purely *anatomical* knowledge. He knew that the nervous system was composed of discrete histological units known as neurones, and that these units "have contact with one another through the medium of a foreign substance" (Freud 1950, p. 298), the functional properties of which were unknown, but which he elected to call "contact barriers". He also knew a fair amount about the basic arrangement of these units into layers or nuclei, about the gross relations of the grey tissues to each other through the major fibre paths of the brain and spinal cord, and about the broad correlations between these anatomical arrangements and the primary modalities of

consciousness, and their functional relations with elementary forms of muscular activity. Quite a bit more was known about the physiology of the sensory and motor end-organs themselves. But everything else was unknown.

The gap between these rudimentary anatomical and physiological facts and the facts that were required to explain the *mental* functions that interested Freud - such as perception, affect, attention, memory, motivation, defence, dreaming, and the like - was unbridgeable by anything other than "imaginings, transpositions, and guesses". Even the nature of the nerve impulse itself was still shrouded in ignorance in 1895, let alone the nature of the molecular modifications that corresponded to what Freud had described as "the possibility of a memory". The fundamental postulates of the 'Project' in this regard, concerning the passage of a nervous energy known as Q through the systems of neurones, the consequent facilitation of the contact barriers between them, and the so-called 'cathexis' of the neurones that were filled with this energy, had no basis in experimental observation. The physiological significance of the morphological differences that had been detected between cortical regions was also quite unknown, and there was nothing in the available evidence to support the important functional differentiations that Freud postulated between his three hypothetical systems of neurones, known as omega, psi and phi. In short, all of the fundamental concepts upon which the 'Project' model was based, were nothing more or less than speculations, with the sole exception of the histological fact of the neurone. Marvel as we well might, therefore, at Freud's prescient anticipation of so many modern neuropsychological concepts - as Pribram and Gill have shown in their fascinating (1976) study - the fact remains that at the time that Freud introduced those concepts, they were speculative in the extreme.

Ironically, the only *empirical* knowledge that Freud could rely on in 1895, as regards the complex mental processes that interested him, were the inferences that he himself had drawn from *clinical observation* about what the *functional* properties and mechanisms must be of an apparatus which produced the psychological phenomena that he had observed. That is why Freud described the 'Project' repeatedly in his

letters as "mechanical explanations" of "clinical knowledge" (Freud 1950 p. 126), as I showed in my 1986 paper on the 'Project' (Solms & Saling 1986). By transforming his clinical knowledge into a hypothetical neurological machine, Freud laid the foundations for a future neuropsychology, but the knowledge in the 'Project' itself remained psychological.

Most important of all, the weakness of the psycho-physical assumption that prompted Freud to write the 'Project' in the first place, namely, the assumption that conscious processes must be translated into physiological processes before they can be explained scientifically, left the essential problem of psychology, the mystery of consciousness itself, completely unexplained. Freud was ultimately forced to concede this point, too, when he wrote the following words on p. 311 of the 'Project':

"It is only by means of such complicated and far from perspicuous hypotheses that I have hitherto succeeded in introducing the phenomena of consciousness into the structure of quantitative psychology. No attempt, of course, can be made to explain *how it is* that excitatory processes in the omega neurones bring consciousness along with them. It is only a question of establishing a *coincidence* between the characteristics of consciousness that are known to us and processes in the omega neurones which vary *in parallel* with them". (emphasis added)

Small wonder, then, that Freud was so ambivalent about the model that he had constructed. It is not surprising that he was eventually driven to dissociate himself from the whole enterprise, and ultimately to reflect in a letter to his correspondent Fliess that:

"I can no longer understand the state of mind in which I concocted the [Project]; I cannot conceive how I came to inflict it on you ... it seems to have been a kind of aberration" (letter dated 29 November 1895, 1954 p. 134)

This realization, then, and the consequent abandonment of the

psycho-physical assumption that motivated the writing of the 'Project', finally led Freud to his conceptual breakthrough into psychoanalysis. This occurred two months later, when he formally renamed his 'psychology' as '*metapsychology*' - that is, as a psychology which transcends consciousness. Freud had finally accepted that the functional processes that he had inferred on the basis of his clinical observations could legitimately be described as *mental* processes, and he abandoned the false security of translating them into a neuroscientific language. Freud had realized that the current state of neuroscientific knowledge was such in 1895 that his physiological and anatomical speculations were in fact *pseudoscientific* explanations, and - ironically - that he was on far more solid ground scientifically if he confined himself to a *psychological* language, even if that language now had to be extended to accommodate such strange-sounding notions as unconscious memories, beliefs and desires.

Thus Freud arrived at his final conceptualization of the relationship between the brain and the mind. Henceforward he pictured the causal sequence of mental events as consisting of a *continuous* chain: an uninterrupted sequence of *psychological* processes - some of which were conscious and some of which were not. This made it possible for Freud to achieve his ambition of furnishing a psychology which could be a natural science, by inserting states of consciousness into a natural sequence of events, subject to natural causal laws. As he wrote 40 years later:

"The equation of what is mental with what is conscious had the unwelcome result of divorcing psychical processes from the general context of events in the universe and setting them in complete contrast to all others". (Freud 1940b, p. 283)

The fruits of his new way of conceptualizing consciousness, not as something emerging inexplicably in parallel with certain physiological events, but rather as something causally determined by the general context of *mental* events (even if those events were unconscious, and therefore had to be *inferred* from the observable data), first saw the light

of day four years after Freud abandoned his 'Project', in Chapter 7 of *The Interpretation of Dreams*. There Freud described his new scientific position in the following celebrated passage:

"I shall entirely disregard the fact that the mental apparatus with which we are here concerned is also known to us in the form of an anatomical preparation, and I shall carefully avoid the temptation to determine psychical locality in any anatomical fashion. I shall remain upon *psychological* ground, and I propose simply to follow the suggestion that we should picture the instrument which carries out our mental functions as resembling a compound microscope or a photographic apparatus, or something of the kind. On that basis, psychical locality will correspond to a point inside the apparatus at which one of the preliminary stages of an image comes into being. In the microscope or telescope, as we know, these occur in part at ideal points, regions in which no tangible component of the apparatus is situated. I see no necessity to apologize for the imperfections of this or of any similar imagery. Analogies of this kind are only intended to assist us in our attempt to make the complications of mental functioning intelligible by dissecting the *function* and assigning its different constituents to different component parts of the apparatus. So far as I know the experiment has not hitherto been made of using this method of dissection in order to investigate the way in which the mental instrument is put together, and I can see no harm in it ... so long as we retain the coolness of our judgement and do not mistake the scaffolding for the building". (1900, p. 536, emphasis added)

This way of thinking about the mind was only made possible by the assumption of a causally independent sequence of mental processes which included unconscious mental events. The "functional" apparatus that Freud first postulated in his 1891 monograph on aphasia had now become a conceptually viable entity, one which was *legitimately* neither physiological nor conscious. Freud's mental apparatus was now *meta-*

psychological - it was an abstract entity that transcended consciousness and was *inferred* from the data of perception, like other natural things.

It is not often recognized that this new way of conceptualizing consciousness radically transformed Freud's conceptualization of the status of physical events. It was not simply a matter of two causal chains, the one physical and the other mental. Rather, both the physical and the mental were now subsumed under the heading of the 'metapsychological'. Let me explain. Freud conceptualized the causally continuous process of mental events that occurred within the mental apparatus as being *in themselves* unconscious, and in this respect they were no different from other natural events, which also occur independently of conscious awareness. In other words, the events that occur in the interior of the human subject were considered by Freud to be conceptually identical with the events that occur in the external object world. What distinguishes between these two great classes of events is not whether they are psychical or physical but rather whether they are *internal or external to the subject*, and therefore, whether they are *registered on the internal or the external surface of consciousness*. This conception at last enabled Freud to solve the essential problem of psychology, namely the relationship between mind and brain.

By conceptualizing consciousness as a sense organ with two perceptual surfaces, one of which was directed outward (toward the non-conscious processes occurring in the external object world) and the other of which was directed inward (toward the non-conscious processes occurring within the human subject), Freud had placed consciousness firmly where it belonged, right at the centre of our knowledge of the universe. Looking outward, our consciousness perceives the world in the formata of its various external sensory modalities, vision, sound, touch, smell, and taste, which represent the non-conscious (and therefore ultimately unknowable) reality that lies outside of us in the form of material objects. However the sight, sound, feel, smell, and taste of external things are not those things themselves; rather they are our external perceptual *representations* of those things. As a clinical neurologist Freud will have known only too well how readily our senses can deceive us.

In this we recognize a scientific application of the well-known philosophical insight of Immanuel Kant, to the effect that our knowledge of the world is determined by the limiting properties of our mental apparatus, as a result of which we can only ever know the world indirectly and incompletely. In accordance with this philosophy, Freud recognized that the human brain, too, like any other material object, is not the mental apparatus in itself. It is not something which exists - as such - behind or beneath our consciousness, and it can therefore not be looked upon as the explanatory bedrock of experience. The human brain is an external object like any other, in the sense that we can only know it indirectly, through the lens of external perception. The thing that lies behind our conscious image of the brain, like every other thing that we can ever perceive, ultimately remains unknowable.

To this insight Freud added a further profound notion. He suggested that when *the same unknowable thing* that we perceive externally as the brain is perceived *internally*, that is, when it is registered on the *internal surface of consciousness*, it is perceived as our subjective states of awareness - as our memories, beliefs and desires. Thus the underlying reality of the mental apparatus is represented twice in consciousness; on the external perceptual surface it is represented as the brain (or nervous system) and on the internal surface of consciousness it is represented as our thoughts and feelings - as our subjective states of awareness.

In this way the conventional distinction between mind and matter was shown to be spurious, *mind and matter (in their various manifestations) were simply different modalities of consciousness, pointing in different directions*. Therefore the underlying reality that these different modalities represented, was ultimately *one and the same reality* - the reality of the unconscious "mental apparatus". Thus Freud could later write in a letter to Georg Groddeck, in 1917, that "the unconscious is the proper mediator between the somatic and the mental, perhaps the long-sought 'missing link'" (Groddeck 1977, p. 38). This realization finally equipped Freud with the *unitary* causal matrix that he had been looking for, and he thereafter set about describing the internal reality of the mind as a natural sequence of events, which were no different in their essence

from external natural events, and were therefore ultimately subject to the same causal laws.

As Freud put it in his 1915 essay on 'The Unconscious':

"The psycho-analytic assumption of unconscious mental activity appears to us ... as an extension of the corrections undertaken by Kant of our views of external perception. Just as Kant warned us not to overlook the fact that our [external] 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 [internal] 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 be". (Freud 1915e, p. 171)

If we accept this conceptualization, we are in a position to study the mental apparatus from two completely different points of view simultaneously. We can study it in the form in which it is presented to our external sensory perception, that is as a physical object - the brain - or we can study it in the form in which it is presented to our internal sensory perception, that is as a reflective subject - as our personal thoughts and feelings.

As you all know, Freud spent the remaining years of his life studying the mental apparatus from the *internal* point of view, and he inferred its functional properties from the introspective data that were made available to him. On this basis, he proposed a succession of models of the internal workings of the mind - changing them as his unfolding clinical experience called for revisions of his previous inferences. And following Freud's death in 1939, this project was carried forward by others, and it continues to be carried forward to this day.

However, I need hardly remind you that the models arising out of this approach to mental life were never universally accepted, and many of Freud's most basic conclusions about the mind and its workings are

still vehemently disputed today. This brings me to the final section of my presentation.

Freud elected to study the mind from the internal viewpoint of subjective awareness because he was forced to conclude in 1896, following the failure of his 'Project', that knowledge of its functional properties had not yet yielded to physiological (or external) methods of observation. However, Freud always held out the hope that *some day* the workings of the mind *would* become accessible to physical methods. That is why he emphasized in his 1915 paper on 'The Unconscious', for example, that "our psychical topography has *for the present* nothing to do with anatomy" (p. 157, Freud's emphasis), but that "we must recollect that all our provisional ideas in psychology will presumably some day be based on an organic substructure" (Freud 1914 p. 78). In other words, Freud always hoped that some day it would be possible to study the mental apparatus from the viewpoint of *both* its perceptual realizations. This raises the possibility of thoroughly *correlating* our observations, arrived at through these two terminal points of our knowledge of the mental apparatus. And if one recalls the moral about the blind men and the elephant, it is obvious what an advantage that would be. Two indirect perspectives on something that cannot be perceived directly must surely be better than one.

There can be little doubt that the "some day" that Freud referred to has now arrived. Neuroscience has developed to such an extent in the decades since Freud's death that the situation that he confronted in 1895 has now almost completely reversed itself. Today, thanks largely to incredible advances in artificial observational technologies, we are in a position to construct a physiological model of the mental apparatus on the basis of detailed neuroscientific knowledge which is far more "perspicuous and free from contradiction" than are our psychoanalytic models of the mind, which are derived from introspective observation. In saying this I hasten to add that I make no apologies for the shortcomings of subjective observation in psychoanalysis; they are an inevitable consequence of the manner in which the mind is constructed. Introspective states of awareness are such fleeting and fugitive things, in comparison with our external awareness of objects. And yet subjective states of

awareness are no *less real* for that reason. Our visual and other objective images of the mental apparatus and its workings are no *more real* than are our emotional and other subjective experiences of it. The differences between these two perceptual realizations of the unknowable reality within us are simply artifacts of the manner in which the internal workings of the mind are represented on its different perceptual surfaces. Moreover, subjective awareness is where our patients locate the sufferings that they bring to psychoanalysis, just as visual awareness is the locality of the suffering that is taken to the ophthalmologist.

Subjective consciousness *exists*, and it would be a tragedy indeed if science were to exclude it once more from the natural order of things, simply because the manner in which the perceptual apparatus is constructed (and the scientific technology that has flowed from the manner of that construction) makes it is easier for us to study the mind as an object in the external world than as the inner experience of the living subject. Today, 100 years after Freud wrote the three texts that we have surveyed this evening, and stumbled upon his radical solution to the mind/body problem, we are at last on the brink of a truly scientific psychology which really is "perspicuous and free from contradiction". I, for one, hope that my colleagues both in psychoanalysis and in the neurological sciences will seize the historical moment.

I thank you for your attention, and for your generosity in awarding me this medal.

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