Freud's "Project", Distributed Systems, and Solipsism

Andries Gouws

Philosophy Programme, University of Natal
Durban 4041, South Africa
<gouwsa@nu.ac.za>

Paul Cilliers

Philosophy Department, University of Stellenbosch
Matieland 7599, South Africa
<fpc@akad.sun.ac.za>

Abstract

This paper discusses Freud's model of the psychical apparatus in the "Project", and concludes that it is a remarkably *sophisticated* work which even today is still highly relevant to neuropsychological theorising. Freud rejects the notion that what happens in the brain can be clearly localised in space and time. This anticipates the notion of a distributed system found in recent developments in computing ("neural networks") and in Derrida's conception of systems characterised by *différance*. Every part of such a system is constituted by its relation to the rest of the system. Although such systems are spatio-temporal, processes occurring in them cannot be pinpointed in space and time. Against the common charge that Freud has a passive hydraulic-reflex model of the psychical apparatus, the authors argue that Freud presents it as an open, complex, self-organising system. Ricoeur's (1972) claim that the model of the psychical apparatus in the "Project" is essentially solipsistic, is accordingly rejected.

In conclusion the authors explain why they prefer the model in the "Project" to the more linear model found in Ch. VII of the *Traumdeutung*.

Introduction : The Place of the "Project" in Freud's Oeuvre

In this paper we discuss Freud's controversial "Project for a scientific psychology" (Freud 1895), in which he develops a comprehensive model of "the psychical apparatus".

Many writers have argued or assumed that Freud's "Project" is fatally flawed, often charging that it embodies a hydraulic-reflex model, or otherwise relies on thoroughly discredited XIXth Century neurological assumptions (Amacher 1965; Andersson 1965; Derrida 1978; Holt 1965; Kitcher 1992; Ricoeur 1972). This article, building on previous work by the authors and others (Cilliers 1990; Cilliers 1998; Gouws 1998; Pribram & Gill 1976; Solms & Saling 1990) instead argues that Freud's "Project" is a highly sophisticated work with great contemporary relevance, anticipating as it does

the emergent transdisciplinary field of distributed processing, or "neural networks"[1], and the study of complex systems (Cilliers 1990, 1998).

One of the arguments often cited for disregarding or rejecting Freud's "Project" is the alleged fact that Freud himself abandoned the model developed in the "Project" directly after having formulated it. Two things seem to indicate that this was indeed the case. *Firstly*, the fact that he never asked Fliess to return the manuscript. However, even if there were proof that Freud did not have his own copy (which is unlikely, given the similarity between many of Freud's later formulations and those in the "Project"), it is not clear how decisive this argument would be. *Secondly*, Freud's letter of 29 November 1895, in which he says: "I no longer understand the state of mind in which I concocted the psychology ... it seems to me to have been a kind of aberration" (Freud 1954:134). But, as Sulloway (1992:123) emphasises, Freud was still refining his model long after this date, and in May 1896 reporting: "I am getting a higher and higher opinion of the chemical neurone theory" (Freud 1954:123). Moreover, when Freud says in the *Traumdeutung* (1900: 611) that the contents of the mind are located *between* the neurones, he is doing no more than take the distributed model of the cortex he presented in the "Project" to its logical conclusion.

We thus do not see any major break between the "Project" and (the final chapter) of the *Traumdeutung* – where the continuity admittedly often comes through mainly in the way Freud qualifies his initially strictly linear schema – nor between these works and his later metapsychology. Freud kept on transforming his theory throughout his career; the shifts occurring between 1895 and 1900 to us do not justify imposing a clear caesura in his thought during this period. Whatever the weaknesses of Sulloway's (1992) general thesis may be, we agree with him that the arguments with which some authors have isolated the "Project" from both Freud's later work and his previous neurological work are unconvincing.[2]

The Central Features of Freud's Model in the "Project"

Our exposition of the "Project" focuses on its first part, the "General Scheme", which contains, according to Freud, "what could be deduced from the basic hypotheses, more or less *a priori*, moulded and corrected in accordance with various factual experiences" (347). It is here that we find the most striking parallels with distributed computing, as well as with Saussure's and Derrida's theories of the sign.

In the "Project" Freud wished "to furnish a psychology that shall be a natural science: that is, to represent psychical processes as quantitatively determinable states of specifiable material particles" (1895:295). His dream was evidently to describe a "machine which ... would run of itself" (Freud 1954:129).[3]

1 The parallel between Freud's "Project" and distributed computing has also been worked out by Glymour (1991), doubtlessly independently of Cilliers (1990). For a brief evaluation of Glymour's views, see note 7, below.

2 We agree with Strachey (in Freud 1895:290) that "the Project ... contains within itself the nucleus of a great part of Freud's later psychological theories" and that "the Project, or rather its invisible ghost, haunts the whole series of Freud's theoretical writings to the very end".

3 Writing to Fliess a few weeks after completing the "Project", Freud (1954:129) enthuses: "Everything fell into place, the cogs meshed, and the thing really seemed to be a machine which in a moment would run of itself."

The basic components of Freud's model are "neurones" and "*Q*". The neurones are the material elements of the psychical apparatus, while Freud introduces *Q* (or *Qη*.[4]) – for Quantity – as follows: "What distinguishes activity from rest is to be regarded as *Q*, subject to the general laws of motion" (295). *Q* is thus something like the energy driving the psychical apparatus.

Freud, having described "neuronal excitation as quantity in a state of flow", formulates his *First Principal Theorem* – "the principle of neuronal inertia: that neurones tend to divest themselves of *Q*" and adds: "On this basis the structure and development as well as the functions [of neurones] are to be understood" (296).

A primitive neuronal system accordingly discharges any *Qη* acquired via sensory neurones directly through motor neurones leading to muscular mechanisms. "This discharge represents the primary function of the nervous system." A secondary function develops when it transpires that some modes of discharge lead to a "cessation of the stimulus: *flight from the stimulus*", so that they are retained and preferred (296). Now follows a crucial paragraph, in which a number of important notions are introduced – the existence of endogenous stimuli; the role of "the exigencies of life" (to which Freud keeps on referring in later writings, often as *Ananke*), the constancy principle, and the distinction between the primary and the secondary function:

> The principle of inertia is, however, broken through from the first owing to another circumstance. With an [increasing] complexity of the interior [of the organism], the nervous system receives stimuli from the somatic element itself – endogenous stimuli – which have equally to be discharged. These ... give rise to the major needs: hunger, respiration, sexuality. From these the organism cannot withdraw as it does from external stimuli; it cannot employ their *Q* for flight from the stimulus. They only cease subject to particular conditions, which must be realized in the external world. (Cf., for instance, the need for nourishment.) In order to accomplish such an action [*specific action*], an effort is required which is independent of endogenous *Qη* and in general greater, since the individual is being subjected to ... *the exigencies of life.* In consequence, the nervous system is obliged to abandon its original trend to inertia (that is, to bringing the level [of *Qη*] to zero). It must [*maintain*] a store of *Qη* sufficient to meet the demand for a specific action. Nevertheless, the manner in which it does this shows that the same trend persists, modified into an endeavour at least to keep the *Qη* as low as possible and to guard against any increase of it – that is, to keep it constant. All the functions of the nervous system can be comprised either under the aspect of the primary function or of the secondary one imposed by the exigencies of life (296-297).

The *Second Principal Theorem* concerns Freud's theory of the neurones. The nervous system consists of a network of interconnected neurones. A neurone may be *cathected* [*besetzt*] – filled with a greater or lesser *Qη* – or it may be empty. The principle of inertia leads to the hypothesis of a current that flows from the dendrites to the axon of the neurone. The dual structure of the nervous system – that it is geared toward both the reception and discharge of stimuli – is therefore replicated at the level of the single neurone. The postulated secondary function requires the possibility of an accumulation

4 Strachey (294) gives this gloss on these terms:
Q = Quantity (in general, or of the order of magnitude in the external world)
Qη = Quantity (of the intercellular order of magnitude)

of $Q\eta$. To account for this, Freud assumes resistances that oppose discharge; he presumes that these are located in the contacts between neurones, which therefore function simultaneously as contacts and as barriers: contact-barriers (298).[5]

Freud surmises that neurones become differentiated by acquiring a differential capacity for conduction, with "the process of conduction itself [*creating*] a differentiation in the protoplasm and consequently an improved conductive capacity for subsequent conduction" (298-299). This allows him to account for *memory*, which he opposes to *perception*:

> A main characteristic of nervous tissue is memory: ... a capacity for being permanently altered by single occurrences – which offers such a striking contrast to the behaviour of a material that permits the passage of a wave-movement and thereafter returns to its former condition (299).

Freud here gives his oft-to-be-repeated formulation of the dual demand that must be met by the psychical apparatus: an ability to retain permanent traces of previous stimuli (memory), linked to an ability to be ever-open to new stimuli (perception). In accordance with the theory of contact-barriers he then postulates two classes of neurones:

> *permeable* neurones (offering no resistance and retaining nothing) which serve for perception and *impermeable* ones (loaded with resistance, and holding back $Q\eta$), which are the vehicles of memory and so probably of psychical processes in general. Henceforward I shall call the former system of neurones ϕ and the latter ψ (300).

The passage of excitation leaves the permeable, ϕ-neurones unchanged, while each passage of excitation modifies the impermeable, ψ-ones, which "thus afford a *possibility of constituting memory*" (299; translation modified). More precisely, what is permanently modified in the ψ-neurones are their contact-barriers. In learning they become more permeable – their degree of *facilitation* increases (300). Facilitations serve the primary function, because through them the nervous system can avoid being filled up with $Q\eta$ (301).

"Every ψ-neurone must ... have several paths of connection with other neurones – that is, several contact-barriers. On this, indeed, depends the possibility of the *choice* that is determined by facilitation" (301). "*Memory is represented by the facilitations existing between the ψ-neurones*" (300). Facilitation determines which path is to be taken by excitations; if it "were everywhere equal, it would not be possible to see why one pathway should be preferred." It is therefore more correct to say that "*memory is represented by the differences in the facilitations between the ψ-neurones*. ... Facilitation depends on the $Q\eta$ which passes through the neurone ... and on the number of repetitions of the process" (300).

The ψ system is protected from large irruptions of Q by the nerve-ending screens and by the fact that it is connected to the external world only indirectly. This protection fails in the case of *pain*, which is "characterized as an irruption of excessively large Qs into ϕ and ψ, that is, of Qs which are of a still higher order than the ϕ stimuli"

5 The primary meaning of Freud's expression "contact-barrier" [*Kontaktschranke*] was probably "a barrier to contact", and not: "something that is both a contact and a barrier". Nevertheless we take the latter reading of the concept as permissible and illuminating. An idea close to that of the *Kontaktschranke* is developed in Derrida's (1982:ix-xxix) "Tympan".

(307). The mechanism that leads to the avoidance of pain and the mechanism that counters the raising of $Q\eta$ tension then coincide.

To Freud any psychological theory must address the twin problems of *quality* and *consciousness*. He postulates that neuronal processes will in the first instance not be conscious.

Previously, speaking only of *quantities*, Freud had treated *memory* in purely differential terms ("*memory is represented by the differences in the facilitations between the ψ-neurones*" (300)); now he subjects *qualities* to a similar treatment ("difference"; "series"):

> Consciousness gives us what are called *qualities* – sensations which are *different* in a great multiplicity of ways and whose *difference* is distinguished according to its relations with the external world. Within this difference there are series, similarities and so on, but ... no quantities (308).

Qualities cannot arise in the external world – where there are only quantities – nor in ψ – "reproducing or remembering ..., speaking generally, is *without quality*" (308). He thus assumes ω: "a third set of neurones ... which is excited along with perception, but not along with reproduction, and whose states of excitation give rise to the various qualities – are, that is to say, *conscious sensations*" (309).

Consciousness not only exhibits "the series of sensory qualities [*but also*] the series of sensations of *pleasure* and *unpleasure*". Freud now links the psychological trend to avoiding unpleasure with his "primary trend towards inertia"; *unpleasure* would involve

> a raising of the level of $Q\eta$ or an increasing quantitative pressure: it would be the ω sensation when there is an increase of $Q\eta$ in ψ. Pleasure would be the sensation of discharge. .. In this manner the quantitative processes in ψ too would reach consciousness, once more as qualities (312).

The constancy principle – the tendency to keep $Q\eta$ as low as possible – therefore coincides with something like an unpleasure principle – the tendency to avoid unpleasure whenever possible. Everything that the human nervous system has acquired in the course of evolution will be subjectively represented as unpleasure, which "remains the only means of education" (370).

This suggests that *all feedback is* ***negative*** *feedback*. However, much of Freud's "Project" anticipates Hebb's rule (Hebb 1949), which gives pride of place to *positive* feedback. Freud assumed, axiomatically, that if two neurones are simultaneously cathected, this increases the facilitation between them, if need be via intermediary uncathected neurones.

> [T]he quantitative cathexis of a ψ neurone, α, passes over to another, β, if α and β have at some time been simultaneously cathected ... A $Q\eta$ in neurone α will go not only in the direction of the barrier which is the best facilitated, but also in the direction of the barrier which is cathected from the other side (319).

This informs his account of how an experience of satisfaction gives rise to a wish (317ff). Hebb suggested that the connection strength between two neurones will increase the more the connection is used. Consider three neurones, A, B and C. Each time both A and B are active simultaneously, the strength of their interconnection (let us call it W_{ab}) will increase slightly, but when they are not active, W_{ab} will decay

slowly. In this way, if A and B are often active together W_{ab} will grow, but if A and B are only associated spuriously and A and C more regularly, W_{ab} will decay and W_{ac} will grow. In this way, a network will develop internal structure, i.e., learn, based only on the local information available at each neurone (Cf. Cilliers 1998:17-18 for more details).

Freud repeatedly indicates that brain processes do not simply reflect processes in the external world: a complex, non-linear, non-iconic transcription takes place between the point where a quantity in the external world impinges on the sense-organs and its psychic registration.[6] This partly happens in the transition from external quantity to quantity in ϕ, and partly in the transition from ϕ to ψ. Firstly, mental *qualities* have no analogue in the external world, which knows only *quantities*. Furthermore, the magnitude of a stimulus is not proportional to the corresponding external quantity. So, for instance, only quantities between certain boundary values lead to the registration of stimuli; above and below these boundaries no stimuli are effected. Also:

> a stronger stimulus follows different [neuronal] pathways from a weaker one ... the larger quantity in ϕ will be expressed by the fact that it cathects several neurones in ψ *instead of a single one. ... Thus quantity in* ϕ is expressed by *complication* in ψ. By this means the Q is held back from ψ, within certain limits at least (314-315).

To summarise the preceding section: in the "Project" Freud divides the psychical apparatus into three main subsystems

ϕ – the perceptual system. Nerves in this system have no resistance; they freely allow the passage of $Q\eta$, and then return to their original state.

ψ – this system consists of a network of richly interconnected neurones and is "the vehicle for memory and so probably of psychical processes in general" (300). Neurones in this system learn by having their interconnection strengths modified. Each time $Q\eta$ flows between two neurones, their interconnectedness is strengthened, making the subsequent flow of $Q\eta$ easier. Whereas neurones in the other two systems are completely subject to the primary function – they are permeable, i.e., divest themselves completely of any $Q\eta$ they receive – the (initially: impermeable) neurones in ψ, which (differentially) resist the discharge of $Q\eta$, are subject to the secondary function: they retain a charge, but strive to keep it at a constant, low level. The secondary function allows for both flight from exogenous stimuli and the specific action which modifies the world in order to discharge endogenous stimuli (such as hunger, respiration and sexuality).

ω – whereas ϕ and ψ only deal with quantities, ω allows the *consciousness* of *qualities*.

Freud's "Project" in the Light of Saussure, Derrida and Neural Networks

A new light is cast on the status of the "Project" if we regard its model of the cortex (or ψ?) as essentially that of a 'distributed system'. Following earlier work by Cilliers (1990; 1998) and Gouws (1998) we relate Freud's "Project" to the research field in computing and artificial intelligence ('AI') known as 'neural networks' (Rumelhart &

6 As Wittgenstein (1978:44) has remarked, the whole notion of representation becomes problematised in Freud, something in which Helmholtz was probably his predecessor (Makari 1994:558-559). Distributed computing is also incompatible with classical notions of representation.

McClelland 1986)[7], as well as to Saussurean linguistics (Saussure 1974) and the philosophy of Derrida (e.g. 1978:200-205).

What are neural networks?

- One can make a simple mathematical model of a neurone, interconnect a lot of them, and simulate this network on a computer (or build it out of electronic hardware). A "neural network" consists of large numbers of simple neurones that are richly interconnected.
- By inhibiting and enhancing the connections (synapses, contact barriers) between the different neurones, such a network can be made to recognise patterns. When a pattern is identified correctly, the connections between individual neurones are given more weight (the resistance of the connection decreases), while they are given less weight (the resistance of the connection increases) when the network misidentifies the pattern. As this process is repeated, the output of the neural network becomes more and more accurate; the network thus learns from its mistakes.
- The changes in the connections are not the result of a programme – the network "learns" through trial and error. For example, a network will be able to recognise a certain sound after it has been presented with a number of relevant examples. The information necessary to do this is not stored in the network in the form of specific data, but is distributed over all the connections in the network. Thus there is no separation between a "programme" and "memory" as in conventional programming. The memory of the network is a result of its history. (For more detail, see Cilliers 1998:16-21 and 25-36).

The parallels between this description and Freud's description of the psychical apparatus are striking. In Freud's model of the psychical apparatus in the "Project", memory and processing do not belong to different parts of the apparatus either. The differential resistance (impermeability) of the ψ neurones makes them the vehicle of both memory and psychical processes in general. (In contrast to this, Ch. VII of the *Traumdeutung*, will ascribe the memory systems to specialised modules, differentiated from the rest of the psychical apparatus and apparently only serving the memory function; in our view a retrograde step from the model found in the "Project").

In what follows, what we say of neural networks can be taken as paradigmatic of distributed systems generally.

- Some of the units (neurones) in the neural network may be taken as input units, and some as output units. A unit's status – input or output – is not fixed. There is

7 Glymour's essay "Freud's androids" (1991) in part also develops the parallels between Freud's "Project" and neural networks. We find Glymour's account especially interesting for his historical contextualisation of Freud's "Project". It differs somewhat from that given in Gouws (1998) on the basis of other, mostly secondary sources. (According to Glymour Freud's 1895 "Project" owes much to Exner's 1894 work of the same name). Glymour is conversant with late XIXth Century neurology and other relevant disciplines, and should be consulted for the historical perspective.

However, without wanting to enter into a detailed debate with Glymour in the context of this article, we differ from him on a number of important points: we think he underestimates the extent to which the Freudian model (which we have reconstructed here with the aid of Derrida and Saussure) is *at odds with* current mainstream computational cognitive science. He reads Freud in a way that is basically serial, functional, representational and computational and then claims that it is compatible with cognitive science. He thus misses out on the extent to which Freud's theoretical position, with its emphasis on the unconscious, can be used critically to show up some of the *limitations* of current cognitive science. Glymour also interprets Freud's model in the "Project" in the solipsistic way which we reject below.

no difference between normal units and input or output units, and if circumstances demand it, roles can be reversed.

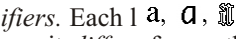
Compare the "Project" here, where the cortex is treated as consisting in essence of a huge network of similar, richly interconnected neurones. Freud sees all neurones as basically the same;[8] differences between various classes of neurones – e.g. sensory and motor neurones – are a function of the *context* in which the neurones find themselves. In comparing ϕ-neurones and ψ-neurones, Freud says: "A difference in their essence is replaced by a difference in the environment to which they are destined" (304). Freud's detailed knowledge of the gross anatomy of the brain does not seduce him into imposing further structure onto this network (Ostow 1990:xii). If the brain can rightly be regarded as a form of distributed system, this lack of hierarchical structure, paradoxically, makes the mental apparatus *more* powerful rather than less so – in computing, the less predetermined structure a neural network has (above a certain minimum), the more powerful it becomes.

- Each unit has a number of units connected to it, and is connected in turn to a number of other units that may include those that provided the input, and the unit itself. The connection between any two units is associated with a certain 'weight' that determines the strength of influence that the active unit will have on the units to which it is connected. The characteristics of the network are determined by the pattern of weights between the various units. A special weight, or a specific unit has no significance, it is always the pattern of activity over the whole system that bears meaning.

Compare Freud here on the differential degree of facilitation between various neurones: "*memory is represented by the* ***differences*** *in the facilitations between the* ψ*-neurones*" (300). Saussure and Derrida also immediately spring to mind:

First of all, Saussure. "In language [*langue*]" according to Saussure's (1974:120) famous formula, "there are only differences without positive terms." That is: in *langue* (language as a system), the terms between which differential relations obtain, are themselves purely differential. At no point does this differential system abut upon terms that are themselves simply positive, that is, constituted non-differentially.

In Saussure's conception, language is differential both at the level of the *signifier* (speech sounds or written words) and at the level of the *signified* (meaning).

- *Signifiers.* Each l  intrinsic nature, but because it *differs* from other letters. In fact it can be realised in totally different materials (wood, ink on paper, images on a computer screen, television or film) – and take utterly different shapes. The following divergent versions of the 'same' letter *a*: 

are not identical with each other, but they (usually) differ sufficiently from the numerous variants of other letters, such as *g*:

to avoid being confused with them. Phonemes, too, do not function through having a fixed acoustic nature (in fact the 'same' phoneme can show enormous acous-

8 Current neuroscience distinguishes between *inhibitory* and *excitatory* neurones.

tic variation), but through their differences from each other. The same principle applies to

- *signifieds* (concepts, meanings): 'pretty' acquires meaning through differing from similar words like 'beautiful', 'handsome', 'sexy', as well as from dissimilar words like 'red', 'kitchen', 'walk', 'but', 'than', 'understanding' etc. In the end each element in language depends for its value on its differential relations to all the other elements in language.

Derrida's notion of *différance* extends and radicalises Saussure's notion of *différence*[9]: in any discourse

> spoken or written ..., no element can function as a sign without relating to another element which itself is not simply present. This interweaving results in each 'element' – phoneme or grapheme – being constituted on the basis of the trace within it of the other elements of the chain or system. ... Nothing, neither among the elements nor within the system, is anywhere ever simply present or absent. There are only, everywhere, differences and traces of traces (Derrida 1981:26).[10]

Neither what is represented in such a system (*contents*), nor what happens in such a system (*function*) can be equated with the state of, or events in, a particular part of that system at any particular moment. The cortex, the mind and language can all be conceived of as such distributed systems and profitably described using similar vocabularies. Neural networks are a useful exemplar of distributed systems:

- An important characteristic of neural networks is that knowledge is not represented locally in an iconic fashion, but that it is distributed over the whole system. Information concerning a specific object is also not identified with the connection strengths associated with a particular unit but is distributed over the connections between many units. Every aspect of the functioning of a neural net is purely relational. "All the knowledge is in the connections" (Rumelhart & McClelland 1986, vol. I:75).

Freud only reaches similar conclusions gradually. For simplicity's sake, he initially speaks as if mental contents are located in single neurones. Eventually he introduces a first correction: "Perceptual cathexes are never cathexes of single neurones but always of complexes. So far we have neglected this feature" (327). He realises that the whole process thereby becomes far harder to represent:

> If we put complexes instead of the neurones and complexes instead of the ideas, we come up against a complication of practical thought which it is no longer possible to describe (378).

It is only in Ch. VII of the *Traumdeutung* that Freud takes his model of the psychical apparatus as a distributed system to its logical conclusion:

9 To distinguish crudely between Derridean *différance* and Saussurean *différence*; Saussure believes in the possibility of a purely synchronic study of the differences in language, whereas Derrida doesn't: every apparently synchronic difference in fact refers to a past and a future, and thus involves *différance*.

10 Derrida (1978) gives a detailed analysis of how, both in the "Project" and in subsequent texts, Freud analyses consciousness and the psychical apparatus as essentially *differential* in their structure and function. According to Derrida (1978:197-198), Freud's struggle to create a differential discourse using concepts traditionally interpreted in a non-differential way, is only partly successful.

> ideas, thoughts and psychical structures in general must never be regarded as localised in organic elements of the nervous system but rather, as one might say, between them, where resistances and facilitations provide the corresponding correlates (1900:611).

This passage may offer an essential clue as to why Freud refrained from formulating his theories in neurological terms after the "Project": the translation of psychological processes to neurological ones in later sections of the "Project" assumed that mental contents could be localised in specific neurones or groups of neurones. The relations between contents can then be pictured in straightforward spatial terms. The moment the neurological correlate of mental contents becomes something wholly relational and distributed, that cannot be clearly located or represented spatially,[11] it becomes impossible to specify neural equivalents (in terms of cathexes of neurones or neurone complexes and facilitation of contact-barriers) for semantic relations between mental contents. Or, supposing such correlates could be provided (e.g. by a device producing a detailed and sophisticated imaging of neural events), to make the relation between such neurological events and the conscious or unconscious mental processes with which they are correlated *perspicuous* and *informative*. Freud is here confronted with difficulties similar to those he expresses in the *Traumdeutung*: his model stretches his powers of exposition to their limit, because it is by its very nature at odds with the demands of representability.

The language of the "Project" still contains important vestiges of the localisationist neuropsychology from which Freud had progressively distanced himself over the preceding years. If we accept this argument, it is possible that Freud in later years *both* maintained the *general* model of the cortex as a distributed system, *and* was convinced that no detailed neurological account of *specific* psychological processes could (yet?) be given in terms of such a model. When dealing with neural networks we are in much the same position: we do not really know or understand what steps occur where, when, and in what sequence when such networks generate their results. For such self-organising systems there is no Programmer, no Scientist can uncover the full Truth and the final significance of each element.

Freud's model of the psychical apparatus is a *developmental* model – the apparatus can *learn*. Again neural networks offer a parallel. Whereas conventional computers learn through being *programmed*, neural networks learn through *experience.*

- Networks can be implemented in such a way that weights can be changed automatically. In this way, a network can learn. If a certain input and the desired out-

11 The complex spatiality involved in this model should not be confused with a *denial* of the spatiality of the psychical apparatus à la Descartes. Derrida (1978:204) says that Freud's topographical description is one

> which external space, that is, familiar and constituted space ... cannot contain. [*Freud's descriptions deal in*] pure differences, differences of situation, of connection, of localization, of structural relations more important than their supporting terms; and they are differences for which the relativity of outside and inside is always to be determined. *The thinking of difference can neither dispense with topography nor accept the current models of spacing.*

Compare this with Freud's comparison, in the *Traumdeutung*, of the objects of internal perception with virtual images in an optical instrument: "Everything that can be an object of our internal perception is *virtual*, like the image produced in a telescope by the passage of light-rays" (1900:611).

> put is provided, the network will shuffle the weights in such a way that the two are matched.

Freud makes much the same point as the last sentence – where we speak of *shuffling*, he speaks of (a sort of random) *experimental displacement*. "The aim ... is reached by means of an experimental displacement of $Q\eta$ along every pathway" (329). (Similar formulations are to be found in the *Traumdeutung*[12]).

His way of saying that the "desired output" is provided, is to speak of the cathexis of a "wishful idea" or "aim" – and aims are always intimately connected with the effects of previous experiences of satisfaction, unpleasure or pain. When the wishful idea is cathected, "travelling is dominated not by the facilitation but by an aim" (329). This shows that Freud's psychical apparatus is *teleological* – aim-directed – even if it ultimately works according to mechanistic principles.

If neural networks function in a purely relational way:

> the system cannot be rule-based on a first level ... The network may *appear* to follow rules, but these are emergent properties that are abstracted from the functioning of the network, and not principles that determine the functioning (Rumelhart & McClelland 1986, vol. I:24).

Such a system is self-organising, i.e. it develops internal structure without the intervention of an external agent. Here we have a "machine which ... run[*s*] of itself" (Freud 1954:129). If the system is not rule-based, it is of course non-algorithmic. The method of calculation itself can be seen as a process of 'relaxation'. Instead of following a series of logical steps, a solution is reached by finding the optimal compromise between a number of constraints. 'The system should be thought of more as settling into a solution than calculating a solution' (Rumelhart and McClelland 1986, vol. I:135). In the "Project" the neurones also "settle into a solution," simply by striving to divest themselves of energy.

It is clear that the general features of Freud's model in the "Project" are the same as or very similar to the features of neural networks in computing we have described above. It deserves note that computers built on this principle can duplicate the results of rule-based computers. This fact belies the apparently unbridgeable gap between a biological description of the cortex and the higher intellectual capacities like logic and rationality.

There is therefore no reason to think that a brain structured according to the broad principles guiding the "Project", would be incapable of intellectual functions that require the manipulation of formal systems (or that can typically be modelled on formal systems such as conventional computer programmes). If Freud's "Project", and neural networks, for that matter, hark back to associationist psychology in many ways, this does not imply that they are incapable of accounting for rule-following behaviour – a

12 In discussing the genesis of dreams in the *Traumdeutung*, Freud (190:576) repeatedly qualifies the linear implications of his basic schematic representation of the psychic apparatus, which suggests that its components are traversed in a fixed temporal sequence:

> it seems to me unnecessary to suppose that dream-processes really maintain ... the chronological order in which I have described them [W]hat happens in reality is no doubt a simultaneous exploring of one path and another, a swinging of the excitation now this way and now that, until at last it accumulates in the direction that is most opportune and one particular grouping becomes the permanent one.

This evokes the functioning of a neural network, rather than the linear execution of something like a computer programme.

charge often levelled against associationist psychology. The structure of a network of neurones (or part thereof) can be as rigid as is necessary, and it will then respond to a certain input as if it is following a rule.

Conversely, there is no computer system that can hold a normal conversation, understand a joke, devise a new recipe or distinguish between a Burgundy and a claret. These and many other forms of intelligent behaviour (or typically human forms of behaviour, including irrational ones) in our opinion require, among other things, the integration of a vast amount of experiences or pieces of knowledge, rather than the application of rules. Rules probably form only a subset of what is involved in human mental processes, even those of the most intellectual sort. If intelligence would stop where rules end, the possibilities of intelligent behaviour would be very limited indeed. Connectionism seems to offer more hope of modelling forms of intelligence that are (apparently) not reducible to the application of rules. Admittedly, there is as yet no proof that neural networks will be any more successful than conventional computers in modelling these behaviours; they have, however, outperformed them in certain simpler tasks of a similar nature. (And modelled some not so simple patterns as well: a neural network trained to generate the past tense from the present mimicked the pattern of mistakes children make in the process of acquiring this competence (Rumelhart & McClelland 1986, Vol. 2:216-271)).

How could Freud have been so prescient? Are we not forcibly reading our own ideas, of apparently recent origin, back into a text written more than a century ago? We doubt it. Perhaps Freud's prescience is less enigmatic than one would think. Not being mathematically oriented, and being necessarily innocent of Chomskyan linguistics as well as late XXth Century paradigms in computer science and AI, he was not inclined to take operations in formal systems (rule-based systems) as *the* paradigm for mental processes. Conversely, his whole *Bildung* in basically non-mathematical science: biology, medicine, neurology, psychopathology – in all of which qualitative observation and description play a major role – inclined him in a very different direction, in which it is very natural to take seriously the micro-structure of nervous tissue, as that could be empirically ascertained in his day: richly interconnected neurones. Given his materialism, *this* had to be, in some way, wholly or in part, the material substrate of mental functions. Moreover, the functions that interest him form a variegated collection, much of which had received scant attention in models of mind to whom man the scientist and logician was paradigmatic: perception, memory, pleasure and unpleasure, wishes, dreams, language, jokes, mechanisms of defence and psychopathological phenomena. To him, the manipulation of formal systems, such as we find in mathematics and symbolic logic, was therefore neither the essential mental *explanandum* nor the paradigmatic mental *explanans*.

Of course, the striking parallels between the mental apparatus in the “Project” and neural networks by no means prove the validity of Freud's model. However, they do show a number of things. Firstly, they show how close to some of the most recent developments in AI and computing Freud's approach is. This is a far cry from the charge that the limits of Freud's “Project” are basically identical to those of outdated XIXth Century paradigms such as associationist psychology or mainstream Viennese neurology. Secondly, they underline the holistic, non-linear nature of Freud's network model of the mental apparatus in the “Project”. Thirdly, they confirm that Freud was highly perspicacious in seeing “what can be deduced from [*his*] basic hypotheses” (347).

Freud's "Project" models both the brain and the mind in connectionist terms, i.e. as *distributed systems*. In Descartes' account mind and body indeed represented two totally different orders. Importantly, the body was spatial, while the mind was not. In contrast, XIXth Century neuroscience typically thought that mental contents and functions could be mapped onto the brain in a simple and direct way: they could be *localised* in the brain. This attempt to relate mind and brain was built on atomistic, overly simplistic spatial notions.

The notion of *distributed systems*, however, offers a different avenue of approach. Although a distributed system is always realised spatially, this is not space as a philosophy of presence conceives it. Above, we said that Derrida's words (1981:26) were especially relevant here; in such a system "nothing ... is ever simply present or absent. There are only, everywhere, differences and traces of traces." We remarked that neither what is represented in such a system (*contents*), nor what happens in such a system (*function*) can be equated with the state or the events in a particular part of that system at any particular moment. Both the brain and the mind can be conceived of as such distributed systems, which can be described using similar vocabularies. As such, it is less obvious that mind-descriptions and brain-descriptions *must* be incommensurable *in principle.* (This is not to say that there is any simple way of translating *specific* mental descriptions into *specific* brain descriptions – but then the point is: it is notoriously difficult to describe exactly what happens in a distributed system, anyway).

In the place of Descartes' division between a *sui generis* non-distributed mental substance and a *sui generis* non-distributed bodily substance (which he admitted to be mysteriously interrelated), we now have minds and brains (cortices), both conceived of as distributed systems, so that a text (especially one concerned with the *most general features* of the system) can simultaneously be a 'literal' neurological description and a 'metaphoric' psychological description – and in a piece of theorising like the "Project" it will be hard, and perhaps not even very crucial, to say exactly when a description is 'neurological' and when it is 'psychological'.

If we can accept the desirability, or even inevitability, of metaphor for cognition and for science, should it surprise us that certain informed neurological descriptions can offer us a powerful language for talking about the mind? Is the *prima facie* likelihood of a parallelism not greater here than between minds and clocks, minds and machines, or minds and conventional computers? (Of course we would have to know *at what level* such a parallelism is to be discerned, so as not to fall back into the naive habits of XIXth Century localisationism). Wollheim (1985:44) is probably right in attributing to Freud the quite reasonable conviction that "psychological phenomena exhibit many of the same characteristics and characteristic patterns as the neuro-physiological phenomena on which they are causally dependent."

Is the "Project" Basically 'Solipsistic'? I. The Role of the Other in the "Project"

According to Ricoeur the Freudian 'topography' in the "Project" is basically solipsistic. He finds

> that it does not account for the intersubjective nature of the dramas forming its main theme [*e.g.*] the parental relation [and] the therapeutic relation ... what nourishes analysis is always a debate between consciousnesses. [I]n the Freudian topography that debate is projected onto a representation of the psychical

> apparatus in which only the 'vicissitudes of the instincts' within an isolated system are thematized. *Stated bluntly, the Freudian systematization is solipsistic, whereas the situations and relations analysis speaks of and which speak in analysis are intersubjective* (Ricoeur 1972:61 – our italics).[13]

If this charge were justified, its implications would be devastating for Freud's "Project". But *is* it? Does Freud in the "Project" indeed give a solipsistic model that makes the very intersubjective phenomena he is trying to illuminate become impossible?

To be sure, most of Freud's descriptions in the "Project" do indeed refer (or seem to refer) to a *single* mental apparatus, which *could* therefore sound like an "isolated system". (Moreover, some passages in the "Project" do indeed have a solipsistic ring.[14]) The other person does however explicitly make her or his appearance, albeit in a limited number of guises: as (first) *helping* object (331); as *attractive* other; *frustrating* other, and thus *occasion for thought*; *repulsive* other; (first) *hostile* object (331); *speaking* other (367) and *source of* language; *object of moral sentiments*, such as remorse (352) and sympathy (333-334); object of *imitation* (333-334); and, finally, "thing" evading judgement (334).

Freud treats *sympathy* and *imitation* (at least in their most primitive form – as species of "primary judgment") as mental acts in which the non-identity of self and other is not yet recognised. If solipsism is the idea that the own existence is evident, but not that of the (human or non-human) other, then the situation of "primary judgment" is rightly not *solipsistic*, but rather *symbiotic.* The problem confronting Freud's model is not: 'how does the isolated, lone subject overcome solipsism?', but rather: 'how does an organism that initially does not distinguish between self and non-self develop into one that has a sense of itself as different and separate from the non-self?' (Let us for the moment remark that illusion and delusion can attach to both positions: in identifying with the other, differences and non-identity are denied, whereas similarity and non-separation can be denied by a subject who sees himself as different and separate). Sympathy for the pain of another is initially not distinguished from (the memory of) one's own pain, and it therefore cannot yet be called 'sympathy for the other'; similarly the imitation Freud describes here does not yet know itself as imitation.

Such are thus the explicit guises the other takes in the "Project". But does the basic model of the mental apparatus as a distributed system not in itself doom the subject to solipsism? Fair enough: in the "Project" Freud does not devote much space to the relation with other people; the role of language is indicated only in broad outlines; we hear nothing about the role of groups, society, culture, institutions, rules, and so on. (None of this can reasonably count as an objection to a text as programmatic as this one). *Any* neurological model of the psychical apparatus or brain, however unsolipsistic in its in-

13 Rollins (1967:487) distinguishes between three forms of solipsism: 'reality solipsism' – "the notion of the self as the supposed totality of existence"; 'knowledge solipsism' – "the notion of the self and its states as the only object of real knowledge and the origin of any problematic knowledge of other existence"; and 'ethical solipsism' – an ethical doctrine favouring self-seeking or egoism. Ricoeur seems to be using the term 'solipsism' in a far looser sense, to indicate an approach in which the psychical apparatus is treated as an "isolated system" that does not essentially interact with other psychical apparatuses. We argue that Freud is not a solipsist in Ricoeur's or any of Rollins's senses.

14 An example would be the following:

> The system ψ is out of contact with the external world; it only receives Q on the one hand from the ϕ neurones themselves, and on the other from the cellular elements in the interior of the body (304).

tention, is likely to have a solipsistic ring to it, because its (inescapably technical) language will not be the everyday language in which the existence of others is axiomatic.

The problem of solipsism and its Siamese twin – the problem of other minds – usually presuppose an ontological gulf separating self and outer world (social or material), with continuity on either side of the gulf, but the gulf itself representing radical discontinuity. The self is sufficiently homogeneous that all its parts have contact with each other, or free access to each other. But this continuity is interrupted going to the outside world.

Freud's model could in many ways not be further from classical solipsism. The problem is not how to establish some sort of tenuous contact across an ontological gulf separating the internal space of the subject from the outer space of the social and material world, but rather the reverse. Impulses coming from the outside world commonly have a far greater magnitude than the internal impulses by which the psychical apparatus functions, so that they have to be damped down. To ascribe a solipsistic position to an apparatus that is constantly battling so as not to be overwhelmed by impulses from outside would be rather perverse. Far from the subject being a lone intelligence having to scan the heavens with a radio telescope in the hope of discovering that it is not alone in the universe, or by dint of endless inventiveness communicating with other intelligences, the other constantly and insistently bears down upon him, bearing the threat of pain and disruption – qualitative and quantitative overload – as well as the promise of satisfaction of needs or wishes. From the perspective of Freud's model the doctrine of solipsism appears in a very different light: as a piece of wishful thinking in which an organism that is completely subject to *Ananke* and constantly in danger of being engulfed by its environment, dreams that it is essentially insulated from it.

Not that Freud's alternative replaces absolute discontinuity with a unity between everything and everything; his alternative to a radical discontinuity between subject and world, subject and subject, is neither purely continuist, nor purely discontinuist. Neurones, the microscopic elements of the psychical apparatus, are separated from, *and* connected to each other by 'contact-barriers' with variable degrees of permeability.

Freud's model of the mental apparatus makes the very substance of the psychical apparatus consist of *barrier-apertures,* instead of working with a dichotomy between *boundaries* and *that which is separated by boundaries*, and a dichotomy between *barriers* and *apertures.* This forms a marked contrast with Breuer's (1895:193) dichotomy between "complete internal connections" and "[*total*] severance of connections between the psychical elements" in the *Studies on Hysteria*,[15] which appeared in the same year in which Freud was penning his "Project".

Neurones "have contact with one another through the medium of a *foreign substance*, [*and*] terminate upon one another as they do upon portions of *foreign tissue*" (298). Instead of a homogeneous mind only abutting on something other at its outer limits, we find a microscopic, fractal-like distribution of otherness throughout the very fabric of the psychical apparatus.

15 Breuer there postulates a dichotomy between the waking state, in which

> the brain functions as a unit with complete internal connections [and] deepest sleep, [*where the*] severance of connections between the psychical elements ... becomes total. [I]n sleep the paths of connection and conduction in the brain are not traversable by excitations of the psychical elements (? cortical cells), whereas in waking life they are completely so traversable (1895:193).

In the "Project" the 'inner nature' of the psychical apparatus is very similar to its 'outer surface': something differentially *allowing* the passage of *Q*, and *resisting* it. Everything in the psychical apparatus has the status of *interface*.[16] The mind-substance is traversed by discontinuities both microscopically (the contact-barriers) and macroscopically (e.g. between systems such as ϕ, ψ and ω, or between what is repressed and the rest of the psyche). These discontinuities are not absolute breaks: they simultaneously *connect* ("contact") and *separate* ("barriers"). Everything is interconnected, but partially and differentially. Nothing is totally separate (or, in Derrida's phrase: totally absent). Instead of a dichotomy "interconnected/separate", there are differences in *degree* – of facilitation – that determine the degree or ease of interaction. These differential resistances are not obstacles to thought, but constitute the very *mechanism* and *content* of memory, and thereby, indirectly, of thought. Freud finds a way to navigate between the Scylla and Charybdis of 'monism' and 'pluralism', absolute continuity and absolute discontinuity.

The impulses by which neurones communicate with each other do not differ essentially from the impulses whereby the nuclear neurones communicate with the interior of the body, and ϕ/ψ communication takes place; the only significant difference with impulses coming to ϕ from the external world is one of magnitude. It is even possible for the nerve-ending apparatuses to be bypassed, so that ψ is exposed unprotected to quantities of far greater magnitude than the intra-ψ order of magnitude. *Pain* then occurs.

In the "Project" the pleasure and unpleasure (to the point of pain) that go with the appearance of the other are depicted as such elementary, *ur*-psychic realities that it would again sound perverse to say that in this model the reality of the other is anywhere ever in question for the subject. An organism that has the avoidance of pain as its most pressing concern ("pain ... is the most imperative of all processes" (307)) can hardly be a solipsistic creature.

Is the "Project" Basically 'Solipsistic'? II. The Role of Language

The psychical apparatus is also spared a solipsistic fate because of the role Freud ascribes to *language*. Nothing indicates that the psychical apparatus is closer to "its own words" than to those of the other. Because the importance of consciousness is sorely reduced, a consciousness accompanying the own words cannot privilege these above the words of others. (In fact words are the medium of consciousness – this is not a model in which consciousness may or may not be added to words). If we may suspect that language is 'distorted', transformed or processed when it passes the boundary between the subject and the outside world, we should also bear in mind that the same will happen constantly as it passes barriers in the interior of the mental apparatus. (The very functioning of the apparatus – the flow of $Q\eta$-consists in such a passing of barri-

16 In Freud there is a very strong tendency to think as a *surface* (and thus: *interface*) what might otherwise be conceived as an *entity*. We find it back much later in his conception of the ego in *The ego and the id:*

> The ego is first and foremost a bodily ego; it is not merely a surface entity, but is itself the projection of a surface (1923:26).

In classical metaphysics, entities tend to be thought of as having a minimal, and uninteresting, surface. In classical ontology, the paradigmatic entity is conceived of as a sphere, or analogous to a sphere. Today fractal geometry helps us to think of surfaces (and entities) in a very different way.

ers). Linguistic signs are always being *processed*, whether intrasubjectively or intersubjectively.

In the "Project", the self (to use a term Freud avoided) is neither an atom nor composed of atoms. In Derridean terms we could put it as follows: in a differential field the boundaries of selves, units, entities or systems are not pre-given. Both the subject and the outside world are networks (this is what is at stake in Derrida's metaphors of "text" and "writing") in which nothing is ever entirely present or absent, and in which past, present and future are paradoxically intertwined. If the psychical apparatus is in itself a network, there is nothing in Freud's model in the "Project" preventing us from seeing it as part of a larger network, on the model of a network of neural networks. If the solipsistic psyche is a stand-alone PC, the psyche in the "Project" is networked from scratch.[17] For such an enlarged neural network, the impossibility of *localisation* will repeat itself in an even more pregnant form: it will again be hard or impossible to say what happens where. Social and cultural phenomena cannot be reduced to localisable events in specific individuals – not even large numbers of specific individuals. (The general notion of distributed systems thus gives a rationale for the rejection of methodological individualism in social science). If we accept Freud's materialist stance, and maintain that there is no second world next to the material world of space and time, we must bear in mind that our notions of space and time have become very strange and complex.

Even if we were to think in terms of a barrier between subject and object, barriers are not impermeable or uncircumventable. (A barrier, generally, does not *absolutely prevent* the passage of what it is a barrier to, rather the barrier only allows it passage in a transmogrified form, or once a certain threshold of force has been exceeded). In Freud's conception, barriers are not an *obstacle* to thought/cognition, but *the very medium* of thought/cognition[18] At many different levels of the Freudian text, the duality of 'paths' and 'barriers' is replaced by what amounts to a middle term: path/barriers, i.e.: contact-barriers.

17 Although Freud does not here work out this possibility, we see no *a priori* reason why parts of the psychical apparatus may not be more intimately connected with – and dependent on – parts of other psychical apparatuses than with other parts of themselves. (Cf. Freud's later remark: "The *Ucs*. of one human being can react upon that of another, without passing through the *Cs*." (1915:194)). An implication of this would be that 'wishes' and 'memories' (Prager 1998) will not necessarily derive from 'the subject's own experience', as assumed in the "Project".

18 When Freud sees a resistance as simultaneously a facilitation, this move is not unique to the "Project". In his technical writings he similarly presents apparent *obstacles* to analysis as the very *medium* of analysis. These obstacles are linked to the following: the fact of amnesia; the fact that not everybody is hypnotisable; the fact that Freud was not very good at hypnosis; the patient's resistance to treatment; and the phenomenon of transference.
In Wittgenstein and Kant friction (resistance) also *enables* that which it at first sight might seem to *hinder*:

> We have got on to slippery ice where there is no friction and so in a certain sense the conditions are ideal, but also, just because of that, we are unable to walk. We want to walk: so we need *friction*. Back to the rough ground! (Wittgenstein 1968:§107)
> The light dove, cleaving the air in her free flight, and feeling its resistance, might imagine that its flight would be still easier in empty space. [Plato] did not observe that with all his efforts he made no advance – meeting no resistance that might, as it were, serve as a support upon which he could take a stand, to which he could apply his powers, and so set his understanding in motion (Kant 1982:47 [A5]).

Solipsism is premised on the self being an immediate evidence to itself, as unified and separate (it is evident that certain ideas are *the property of the self*, and of no-one else). If we take Freud's view to its logical conclusion, we cannot sustain this belief: for any individual subject, it will be hard or impossible to say exactly to what extent an idea or wish is or is not the subject's "own" idea or wish. In the "Project", far from the self being a discrete unit trying to find its way back to the world, social and otherwise, there is very little indication that there is a self having a spontaneous sense of itself as unified and separate.

Why we Find the Model of the Psychical Apparatus in the "Project" Richer than that in the *Traumdeutung*

The model presented in the "Project" is that of the mental apparatus as a *network:* simultaneously a network of *neurones*, and a network of *ideas.* Compared to this, the basic account given in the metapsychological chapter (Ch. VII) of the *Traumdeutung* is much more *linear:* the mental apparatus as a *series* of more or less simple, more or less discrete and internally homogeneous systems. Self-organisation requires *recurrence* – the existence of loops in a system, so that the output of a unit leads to changes in its input. A linear system therefore cannot be self-organising (Cilliers 1998:134).

In Ch. VII of the *Traumdeutung* Freud arguably gives a *modular* rather than a *distributed, holistic* model of the mind's structure. (Or, alternatively, pictures its functioning as the passage of excitations through a series of vicissitudes that typically display a fixed temporal sequence). The repeated qualifications that Freud attaches to this basically linear model do not succeed in turning it into a model as essentially or evidently non-linear as that found in the "Project".

Scattered remarks indicate that Freud still imagines the physical basis of this apparatus to be a network of neurones – now with the explicit proviso that ideas cannot be clearly located in neurones or groups of neurones. However, the model itself is presented in simple spatial terms. (Again with a proviso: that this is just scaffolding, a model that should not be interpreted *literally*. But even if we do not take this scaffolding literally, it continues to guide our reception of the text).

We find the model presented in the "Project" preferable to that of the *Traumdeutung* for a number of reasons:

Firstly, it emphasises a multiplicity of elements, of differences, and of heterogeneous relations, far more than does the model presented in the *Traumdeutung*. The "Project" makes it clear that the psychical apparatus is truly *complex*, rather than just *complicated*. The information in complex systems can only be compressed to a very limited extent. "To describe a complex system you have, in a certain sense, to repeat the system" (Cilliers, 1998:10; see xiii & 2-5 for more on the distinction between complexity and complication). This fits in neatly with the psychoanalytic conviction that there is no short route (no route shorter than an extended psychoanalysis or something similar) to gain any real understanding of how an individual's mind functions. Simultaneously, if the mind of the individual were not complex, it would be unable to deal with the complexity of the environment in which he or she wishes to survive and thrive.

Secondly, it is more evidently of a piece with the network model found in Freud's hermeneutics and semiotics – a network of ideas related to each other through complex associative webs, whose non-linearity Freud expresses in concepts like 'condensation'

and 'displacement'. It is therefore more conducive to the integration of Freudian hermeneutics and semiotics with Freudian metapsychology.

In the *third* place, it is more consistent with a differential semiotics (and, we would add: a differential ontology) à la Saussure and Derrida, and thereby

(the *fourth* reason) more consistent with a neural network computer model, which gives an independent confirmation – from the hard-nosed world of information science – that the type of model found in Freud's "Project", Saussurean linguistics and Derridean deconstruction is coherent and convincingly describes real-world complex systems. Importantly, in the "Project" memory and thinking are not ascribed to separate systems or modules, as in the *Traumdeutung*. This is more compatible with Freud's clinical awareness of the dialectic between (the retrieval of) memory and other mental processes, while being less compatible with his (probably unsustainable) convictions concerning the completeness and permanence of memory (as opposed to its retrieval).

Finally, being non-dualistic,[19] non-atomistic and non-solipsistic in its basic assumptions, Freud's model of the psychical apparatus in the "Project", more than that in the *Traumdeutung*, provides a basis for a non-Cartesian approach to questions of intersubjectivity; it helps us not to read Cartesian presuppositions back into Freud, so that subjects again become discrete, monolithic entities, that are closed in upon themselves. (Inasmuch as Freud's discourse is still a mix of differential and older, substantialistic notions, a study of the "Project" can advance our ongoing task of distinguishing between those aspects in Freud which represent an advance over the tradition, and those in which he still lags behind the implications of his own discoveries).

Freud's notions regarding the most general, constitutive relations between the subject and others get a very different complexion if we take the network model as essential to his view of the psychical apparatus. The individual subject is a network that is part of a network of networks. Language and culture are themselves networks that help to network individual subjects together. The question is not how isolated individuals can overcome their isolation to make contact with other individuals and external reality, but rather how some parts of an interconnected network can constitute themselves as relatively independent units vis à vis the rest of the network. The distinction self/other is not a clear and unproblematic given, but something that has to be constituted, and reconstituted from moment to moment. It is a minefield of illusions and delusions, in which it is highly unlikely that the true interconnectedness between various subjects will be acknowledged and correctly perceived, and as unlikely that acts and agency will be attributed correctly or impartially to the various subjects distinguished.

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19 We are undecided whether Freud's view of the mind-brain relation should be classified as a species of dual-aspect monism, as found in Helmholtz – a major influence on Freud, if Makari (1994:555-556) is to be believed.

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