The International Journal of Psychoanalysis

Int J Psychoanal (2011) doi: 10.1111/j.1745-8315.2011.00458.x

On neuropsychoanalytic metaphysics

Vesa Talvitie and Juhani Ihanus

Institute of Behavioural Sciences, Psychology, University of Helsinki, PO Box 9, FI-00014 Finland – vesa.talvitie@alumni.helsinki.fi, juhani.ihanus@helsinki.fi

(Final version accepted 24 January 2011)

Neuropsychoanalysis focuses on the neural counterparts of psychoanalytically interesting phenomena and has left the difference in the metaphysical presuppositions between neuroscience and psychoanalysis unexamined. The authors analyse the logical possibilities concerning the relation between the brain and the mental unconscious in terms of the serial, parallel, epiphenomenalist and Kantian conceptions, and conclude that none of them provides a satisfactory ground for neuropsychoanalysis. As far as psychoanalytic explanations refer to the mental unconscious, they cannot be verified with the help of neuroscience. Neither is it possible to form a picture of how a neuro-viewpoint might be of help for psychoanalytic theorizing. Neuropsychoanalysis has occasionally been seen as a reductionist affair, but the authors suggest that neuropsychoanalysts themselves lean on the hybrid conception, which combines neuroscientific and psychoanalytic viewpoints. The authors state arguments in favour of the interfield conception of neuropsychoanalysis that takes seriously the metaphysical tensions between neuroscience and psychoanalysis.

Keywords: interfield theory, mentalism, metaphysics, neuropsychoanalysis, neuroscience, psychoanalysis, reduction, unconscious

Introduction

Perhaps it was Rachel Blass's and Zvi Carmeli's (2007) paper *The case against neuropsychoanalysis: On fallacies underlying psychoanalysis' latest scientific trend and its negative impact on psychoanalytic discourse*, having been published in this Journal some years ago, which gave a clear voice to the uneasiness some clinicians have felt about neuropsychoanalysis. The paper has been republished several times, translated into Spanish, French and German, often cited and discussed on numerous websites. In 2008, it served as the basis for the opening event of the biannual conference of the British Psychoanalytical Society (with the participation of Rachel Blass and Mark Solms). Blass and Carmeli reminded us of the age-old gap between the natural sciences and the humanities by stating that we cannot find the value of van Gogh's works through the chemical analysis of the paintings and, likewise, we cannot analyse human experience in neuroscientific terms (Blass and Carmeli, 2007, p. 36).

In general, psychoanalytic criticism of the neuro-viewpoint has been rather mild, restricted to showing the limits and clinical insignificance of neurophysiology for psychoanalysis (for example, Boesky, 1995; Edelson, 1986; Pulver, 2003; Smith, 1997; Vivona, 2009). For Blass and Carmeli,

however, neuropsychoanalysis is not only useless, but "… the application of neuroscience to psychoanalysis rests on unwarranted inferences that may have a significant negative impact on the way psychoanalysis will evolve in future years" (Blass and Carmeli, 2007, p. 20). In this article we extend Blass and Carmeli's effort at making sense of this trend.

Claims concerning the relevance and objectives of neuropsychoanalysis emerge from (often implicit) presuppositions concerning the relation between the psychoanalytic/psychological and the neuroscientific viewpoints. One could argue that the latter is more foundational, or that the practical relevance of interventions emerging from each one determines the relation, or that the disciplines are so distant that the relation is multifaceted and complicated. Below, we call these views the *reductionist*, the *hybrid* and the *interfield conceptions of neuropsychoanalysis*. Our claim is that its critics have considered it a reductionist affair (although it is not), that some neuropsychoanalysts seem to lean on the hybrid conception (although it does not promote the development of psychoanalytic theorizing), and that neuropsychoanalysis should lean on the interfield conception.

The interfield conception directs our attention to the metaphysical presuppositions of each discipline. We will show that the confusion around neuropsychoanalysis originates from the tensions between these presuppositions.

The reductionist and the hybrid conceptions of neuropsychoanalysis

Blass and Carmeli claim that neuropsychoanalysis is part of a broader concept they call 'biologism', according to which (and thus also according to neuropsychoanalysis) "only what is biological is real" (Blass and Carmeli, 2007, p. 19). They assign the following agenda to neuropsychoanalysis: "The theory of mind upon which psychoanalytic theory rests is outdated and should be replaced by a neuroscientific model" (Blass and Carmeli, 2007, p. 30). These citations suggest that they are advocating a *reductionist conception* of its essence and objectives: neuropsychoanalysts aim at reducing psychoanalytic theories to neuroscientific models.

Reductionism implies that scientific disciplines are organized hierarchically, and thus that neuroscience is more foundational than psychology or psychoanalysis. The notion of the hierarchical structure of scientific disciplines and theory reduction originates from the works of Rudolf Carnap (1938), C. G. Hempel (Hempel and Oppenheim, 1948), Hilary Putnam (Oppenheim and Putnam, 1958), and Ernst Nagel (1961). Scientists and philosophers of science hold that beyond biology, for example, are the more foundational disciplines of physics and chemistry. As for psychology and its relation to the neurosciences, however, the 'classical reductionism' is commonly considered outdated. 'New-wave' reductionists and neuroscientists interested in mechanistic explanations have created a more relaxed atmosphere around the old reductionist lines of thought: reduction and autonomy of psychology are not seen as necessarily contradictory any more, explanatory pluralism is favoured, and a non-reductivist approach that is

neither reductive nor anti-reductive has been developed (Barendregt and van Rappard, 2004; Schouten and Looren de Jong, 2007; Talvitie and Ihanus, 2010; see also Koons and Bealer, 2010).

Thus, in the domain of the behavioural sciences only a few researchers – Nancy Andreasen (2001) and John Bickle (2003), for example – advocate the reductionist conception, and the leading neuropsychoanalytic authors *are not among them*. Instead, they lean explicitly on the psychoanalytic view of mind: Mark Solms and Oliver Turnbull (2002) follow Freud's idea that consciousness is like perception, and advocate dual-aspect monism; Howard Shevrin argues in favour of the psychological unconscious against the view of cognitive science (Shevrin *et al*., 1996, pp. 264–6); Mauro Mancia (2004, p. 47) talks about the unconscious psychic reality; and Westen and Gabbard (2002, p. 58) state: "The aim of an integrative effort of this sort thus should not be to replace psychoanalytic metapsychology with that of cognitive science".

The case is clear, and it is needless to continue with additional examples. As far as we know, no neuropsychoanalyst has ever argued that psychoanalytic models will be reduced to the neuroscientific ones, and the leading proponents are not throwing away the Freudian cornerstone(s). Thus, neuropsychoanalysis does not contain a hidden reductivist agenda. Nevertheless, if the relation between the psychoanalytic and the neuroscientific models is not reductive, how do neuropsychoanalysts approach it?

Like neuroscientists and psychoanalysts, neuropsychoanalysts do not form a monolith, and thus the question cannot be given a definitive answer. Perhaps some advocates of neuropsychoanalysis have not even thought of it. We confine ourselves to stating that at least some of them represent *the hybrid conception*: some phenomena should be explained through neurophysiological concepts (by referring to the neural, 'cognitive' unconscious, i.e. implicit memory and procedural knowledge, for example), and others through psychoanalytic theories (referring to the dynamic unconscious, for example). Let us mention some books and articles that appear to us to represent the hybrid conception: Palombo (1999), Mancia (2004), Scalzone (2005) and Pugh (2006).

The hybrid conception is characterized by a fascination with promising perspectives that have recently opened up and have given rise to neuropsychoanalysis. We claim that most authors in the field of neuropsychoanalysis do not possess a hidden agenda, and that they try to 'get it both ways', that is, aim at integrating the views of neuroscience and psychoanalysis without challenging the basic assumptions of either. The hybrid conception is a diplomatic affair.

However, it also implies that neuropsychoanalytic viewpoints are of only minor significance to psychoanalysis. If neuroscientific models do not provide a more foundational view of psychological/psychoanalytic issues, how could neuropsychoanalysis benefit psychoanalysis in terms of creating better models?

Let us mention an issue in which neuroscience might factually verify or falsify a psychoanalytic assumption: if dreams are wish-fulfilments, the

higher-level motivational centres of the brain should be active while one is dreaming (see Solms, 1997a, 2000).

While concluding that the writings of neuropsychoanalytic authors do not (mainly) have a reductive agenda (contrary to the claims of some opponents of neuropsychoanalysis), we must also add that they do not open up any royal road to the verification/falsification of psychoanalytic theories either (contrary to the claims of some advocates of neuropsychoanalysis). Such a relaxed state of affairs should keep intrapsychoanalytic controversies at bay.

However, the brain and neuroscience surely have something to do with the phenomena in which psychoanalysts are interested, and thus we should be able to determine the relation between the two viewpoints. We believe this could be done if neuropsychoanalysis were to be treated as an *interfield theory*.

The interfield conception

The idea of an interfield theory was introduced by Lindley Darden and Nancy Maull (1977), and it was meant to provide an alternative to reductionist views. By way of illustration they refer to cytology and genetics, both of which "investigated hereditary phenomena but asked different questions about it" (Darden and Maull, 1977, p. 142). Walter Sutton and Theodor Boveri developed chromosome theory independently in 1903 and 1904. Darden and Maull (1977) posited that it should be considered an interfield theory that (1) unified the knowledge of heredity common to both fields, (2) focused attention on previously neglected items, and (3) predicted new items for the domains of each field. Could neuropsychoanalysis – in a similar manner – unify the neurosciences and psychoanalysis?

Darden and Maull apply the interfield concept to theories of biology, and their ideas do not directly transfer to other domains. An interfield theory cannot be created to unify any theories whatever – it would not make sense to try to connect the fields of, say, botany and linguistics. While cytology and genetics approach hereditary phenomena within the shared framework of biology, neuroscience and psychoanalysis (or, more generally speaking, psychology) are separated by the gap between the natural sciences and the humanities. Consequently, if neuropsychoanalysis is to succeed as an interfield theory, it surely operates on a much more general level.

The first question to ask is why one should think that two particular fields might be connected by an interfield theory. In the case of psychoanalysis and neuroscience the answer is that both have succeeded in explaining certain kinds of disorders and problems (depression and compulsive behaviour, for example), and have developed methods for curing them (talking cure and drugs). There is no doubt that this is a good-enough reason to begin to sketch an interfield theory. However, it is not self-evident that neuroscience would have something important to say about psychoanalytic explanations and methods. Let us briefly study the essence of the explanations of each discipline.

Consider a disorder caused by a trauma. In the domain of the philosophy of biology, Ernst Mayr has created a model of different kinds of reasons/causes. From that perspective, a disorder could be studied as follows

(for references and a more detailed study, see Talvitie and Ihanus, 2006). There are, firstly, distal reasons, and here the distal reason for the disorder is the trauma. We could distinguish between a distal *psychological* reason and a distal *neurophysiological* reason: the former is the traumatic *experience*, and the latter should be considered in terms of how the traumatic situation changed the brain in such a way that the disorder later emerged.

Secondly, there are proxal reasons which refer to the matters that exist at the time when the phenomenon under scrutiny (here the disorder) takes place. The proxal psychological reasons for the disorder are things such as the perception of the triggering stimuli, the feeling of anxiety, horrifying fantasies linked to recurring stressors, and so on. The proxal neurophysiological reasons are the present-day neural structures and functions that give rise to the disorder.

Only the psychological reasons enable us to *make sense* of phenomenal experiences and behaviour, and only the neurosciences can present the *causes* (in the strict sense of the term) *of behaviour*. Thus, just as we cannot determine the meanings of van Gogh's paintings through chemical analysis, neuroscientific models will not replace psychological explanations. Still, it is difficult to conceive of how neuroscience might be of help when we wonder why talk about the weather does not cure anything, but talk about one's feelings does – neuroscience has nothing to say about meanings. Thus, psychological and neurophysiological explanations are different in kind, and only a reductionist would even think of replacing the former by the latter. It is even hard to see how neuroscience might help in creating better psychological explanations: which neural facts have a bearing on whether an unresolved oedipal conflict may be a cause of psychic problems?

Peter Godfrey-Smith claims: "... Different scientific fields will establish definite criteria for what will pass as a good explanation. The standards for a good explanation in field A need not suffice in field B" (Godfrey-Smith, 2003, p. 197). He continues: "If an 'ism' is required, the right analysis of explanation is a kind of contextualism – a view that treats the standards for a good explanation as partially dependent on the scientific context" (Godfrey-Smith, 2003, p. 197). Godfrey-Smith's contextualism characterizes the interfield conception of neuropsychoanalysis.

The hybrid conception and the interfield conception (of neuropsychoanalysis) share the anti-reductionist stance, but the former is more optimistic. An advocate of the interfield conception is not convinced generally and in advance that the neuro-perspective will give fruitful insights into psychoanalysis: the possible benefit has to be weighed up case by case. The interfield conception is sensitive not only to the limits of integration, but also to the asymmetries of the viewpoints. Clinicians surely consider the aims and success of psychotherapy in humanist and lay-man terms (suffering, anxiety), and the level of serotonin, for example, should never be the reason to begin or end a course of therapy. The natural sciences are based on determinism, but both a psychotherapist and his or her clients presuppose some kind of 'free will' – at least they presume that each participant is able to choose to follow the agreement concerning the practical framework of the

therapy. The above question on whether dreams are wish-fulfilments carries an implication for this issue, too: scientific theories aim to describe the state of affairs in the world, but psychoanalytic theories are also 'tools' guiding the clinician's work, and this restricts the relevance of neuroscience (Talvitie, 2009, pp. 111–33; Talvitie and Ihanus, 2005).

Russell Barkley's (1997) hybrid/interfield model of ADHD "provided a framework for understanding how different treatments may be combined and how they may interact" (Barendregt and van Rappard, 2004, p. 469). Similarly, the viewpoint of neuropsychoanalysis is surely reasonable in terms of combining psychotherapy and medication. However, there are also many asymmetries between neuroscience and psychoanalysis, which sets limitations for the relevance of neuropsychoanalysis. During its first decade neuropsychoanalysis has remained enthusiastic but it has not produced a single contribution that clinicians admit have made a difference to their work. It is therefore time to move from generalized enthusiasm to a detailed and critical study of the preconditions of integration.

We will not go further into these matters here since there is a notable general issue that has to be taken into account. Blass and Carmeli state: "… This biologist perspective that underlies neuropsychoanalysis runs counter to the essence of a psychoanalytic *worldview* ..." (Blass and Carmeli, 2007, p. 36, our italics). Given the differences in the aims and the historical backgrounds of the disciplines there must be tensions, but the prevailing hybrid view is perhaps too biased toward neuropsychoanalysis to sense them. These things, however, belong on the agenda of the interfield conception. Let us therefore take a certain notable metaphysical tension and put it under the microscope.

Which metaphysics does neuropsychoanalysis lean on?

Metaphysics concerns ultimate reality. All disciplines aim to study reality, and the word 'ultimate' in this sense means that metaphysics focuses specifically on the fact that appearances may be something different from the reality – our methods of study, our species-specific ways of seeing things, the limits of cognitive capacity, and the conventions of the surrounding culture may distort the true state of affairs. The metaphysicist's question 'What is the world like?' is approached through more specific questions such as 'Does God exist?' and 'Is the world made only of matter, or are there also entities that are mental in essence?' (Van Inwagen, 2002, pp. 1–4).

Ever since the age of positivism and behaviourism the term 'metaphysics' has often been used in a pejorative sense, but we must note that there are metaphysical presuppositions beyond each discipline. Quantum physics, for example, has given rise to metaphysical problems that could be considered 'fresh' in the temporal context of metaphysics. Do microparticles of matter (electrons and photons, for example) exist, or are they just physicists' abstractions?

Unlike our forebears, we lean on the metaphysical assumption concerning magnetic fields. Phlogiston and ether are 'archaic' examples of metaphysical suppositions that once were shared by scientists but nowadays fall within the domain of pseudo-science. All in all, it is not a question of avoiding

metaphysical presuppositions at all costs, the point being to study which ones are reasonable.

Because the existence of the unconscious part of the mind (or the unconscious) has not been empirically proven (and many think that it is not even worth trying to do so), it should be taken as a metaphysical assumption. The mental unconscious is an *unobservable* – or we might say that the Freudian unconscious contains several kinds of unobservables: the psychic apparatus, drives, unconscious fantasies, repressed desires and memories.

Unlike the 'Freudian' unconscious, neuroscience recognizes only the neural unconscious and talks about it in terms of implicit memory and implicit knowledge. Thus, there is considerable – or perhaps we should say remarkable – tension between the metaphysics of neuroscience and of psychoanalysis. One might even ask whether neuropsychoanalytic research makes sense before the tension has at least been articulated in some detail and its significance assessed. However, we live in times of strict empiricism, and neuropsychoanalysis has rushed straight ahead into the realm of interdisciplinary studies.

We could draw a clear picture of this metaphysical tension if we think of the cognitive conception of the mind/brain as the *two-sphere view* (the brain – conscious/phenomenal states), and the psychoanalytic conception as the *three-sphere view* (the brain – the mental unconscious – conscious/phenomenal states). There is a consensus that there is the brain and there are conscious/phenomenal states. The two are intimately related but, as far as the relation between neuroscience and psychoanalysis is concerned, it is not necessary to study here whether or not the brain should be held to cause phenomenal states, or whether the mind (or the brain) is an epiphenomenon, and so on. The 'middle sphere', the mental unconscious, is the crucial issue.

The reader is undoubtedly acquainted with the Freudian middle sphere. It is conceptualized in a variety of ways in psychoanalytic circles, but let us take just one example. Gomez (2005, pp. 9–10) states that the middle sphere "... has no language of its own. It cannot be broken down into mental and physical components, yet it can only be thought of as though it were mental, or as though it were physical". She thus expresses the psychoanalytic presupposition of the existence of certain unobservables. The question of whether, and, if so, how, the current views concerning the existence of the unconscious are related to those held by Freud falls outside the scope of this article. However, let us mention that, according to Ludwig Binswanger, Freud's friend for three decades, Freud equated the unconscious with Immanuel Kant's *Das-Ding-an-sich* (Fichtner,1992, pp. 233–34, 237; for a study on Freud's Kantianism, see Tauber, 2010). *Das-Ding-an-sich* is a metaphysical presupposition which refers to a reality that cannot be reached through the senses or by means of scientific study.

There is no room in the world of cognitive neuroscience for things such as unconscious ideas and latent meanings: the brain is supposed to give rise to phenomenal states, and there is no mental unconscious 'between' or 'beyond' it and phenomenal consciousness. Neuropsychoanalysts tend to neglect the fact that academic folks who are closely related to cognitive neuroscience are averse to the three-sphere conception: James Uleman states

that the psychoanalytic unconscious is "... widely acknowledged to be failure as a scientific theory because evidence of its major components cannot be observed, measured precisely, or manipulated easily", and that it "does not provide an influential framework for understanding unconscious processes in academic or scientific circles ..." (Uleman, 2005, p. 5). O'Brien and Jureidini (2002, p. 141) conclude that, "far from supporting the dynamic unconscious, recent work in cognitive science suggests that the time has come to dispense with this concept altogether".

What about the cognitivist idea of the neural unconscious, and terms such as implicit memory and procedural knowledge? Are they not just cognitive counterparts to the Freudian "middle sphere"? No, they are not. Terms such as implicit memory and procedural knowledge refer to certain competencies or behavioural dispositions, on the one hand, and to certain (more or less distributed) neural structures, on the other. Thus they do not contain metaphysical presuppositions. They should rather be seen as theoretical concepts or as abstracting neural matters.

This being the case, we might think that, as far as one's psychoanalytic thinking (or, as Blass and Carmeli put it, 'worldview') is based on the metaphysical assumption concerning the Freudian middle sphere, one should seriously question whether present-day neuroscience might have something to offer to psychoanalysis. Let us nevertheless take a closer look at how the cognitivist neuro-approach fits in with psychoanalytic middle-sphere thinking.

The topical challenge to neuropsychoanalysis: How do the spheres interact?

In the earlier section on the interfield conception we hinted that gathering data on the neural correlates of psychoanalytically interesting phenomena is not necessarily the most urgent task of neuropsychoanalysis and that one should study the significance of the metaphysical differences between psychoanalysis and neuroscience. A reasonable start to such a study would be to determine what one should think about the interaction between the spheres of the brain, the mental unconscious and the phenomenal states. There are four logical alternatives:

1. The serial conception

When affecting behaviour and the phenomenal states, the effects of the brain and the mental unconscious take place one after another. This view may be illustrated as follows:

[the mental unconscious →] the brain → (the mental unconscious →) behaviour and the phenomenal states

The serial conception can be sketched in two ways. In the first, the unconscious, or an impulse of the id, may be seen as the starting point of neural activity. From the point of view of materialism/physicalism, the idea of mental causation contains an intolerable implication (see Kim, 2005), and we find it here, too: if a (non-material) impulse of the id triggered neural processes, then neurons would fire for no neurophysiological reason.

Secondly, it might be thought that neural activity comes first. It is transformed into unconscious mental activity, which – either directly or after having been transformed back into neural activity – causes behaviour and the phenomenal states. In other words, neural activity somehow 'goes through' the mental unconscious, which may or may not intervene. Thus, the mental unconscious is like a loop in the middle of the neural processes.

This implies that there are discontinuities or gaps in neural processing: those processes would proceed in one way, but the unconscious steps in, and so the processes go in another way. Again, neurons fire without any neurophysiological reason (or the activity of the neural networks becomes inhibited without any neurophysiological reason).

Owing to the huge number of neurons, neuroscience has not been able to create a complete map of neural activity behind any given complex psychological phenomenon, and thus there are gaps. The question is to show that the gaps do not reflect our restricted knowledge but are due to the existence and power of the unconscious.

When placing the serial conception into a larger context, we get the following picture. A materialist/physicalist cannot accept the causal power of phenomenal matters, and even less can he or she accept the causal power of unconscious mental matters. Both an 'ordinary' mentalist (an advocate of the two-sphere view) and a 'psychoanalytic' mentalist (three-sphere view) accept the causal power of conscious mental matters, but only the latter accepts the existence and causal power of unconscious matters. An ordinary mentalist and a materialist would require a psychoanalytic mentalist to explain how we know that there is such a thing as the mental unconscious (through which neural activity goes) and to pinpoint the gaps in the neural processes.

This alternative fits well with traditional psychoanalytic intuitions: psychoanalysis focuses on the unconscious which forms a distinct sphere functioning according to 'primary process' rules of its own. On this basis it is difficult to see the need or the relevance of neuropsychoanalysis: as long as the causes of psychic disorders lie in the unconscious, how can the perspectives of neuroscience have any real significance?

2. The parallel conception

The brain and the mental unconscious affect behaviour and the phenomenal states independently:

the mental unconscious →

behaviour and the phenomenal states

the brain →

In order to comprehend the second alternative, let us think of little Hans who becomes fearful when seeing a horse. An ordinary mentalist holds that Hans's fear (and perhaps also the meaning of the sense-data) is a non-material phenomenon, but otherwise the process goes on in neurophysiological ways. The perception of the horse begins with photons of light detected by the cells in Hans's retina. The cells send neural impulses to the visual cortex from which the activation spreads to the other parts of the brain. Hans becomes fearful, and the feeling has neural correlates. If Hans's fear were caused by unconscious functioning in parallel with the brain, the picture would be different.

The parallel conception implies that behaviour and the phenomenal states normally possess neural counterparts, but when behaviour and phenomenal states are caused by the unconscious, there are no neural counterparts – because it was the mental unconscious that caused little Hans to be afraid, it is not possible to find neurophysiological reasons for his fear. In the case of a slip of the tongue, the parallel conception implies that, when one says in German *Versuchungen* [temptations] instead of *Versuche* [attempts], the neural processes of the brain indicate that the latter should be uttered, but the mental unconscious makes the lips, tongue and vocal cords speak the former. The lack of the neural correlates should be seen as a special case of gaps in neural processing: a gap takes place at the end of the brain processes, before behaviour or a phenomenal state.

Ordinary mentalism contains the problem of how the mental and neural processes interact: "how can mind, without spatial existence or extension, act on and influence a physical brain, a material object extended in space?" (Meissner, 2003a, p. 287). In other words, mind and matter are different substances, and it is difficult even to conceive of how mind might 'understand' neural signals (and, likewise, how the brain might 'understand' the signals of the mind). Nevertheless, such 'understanding' actually takes place, and it is as astonishing as if an electronic device worked on being connected to a water pipe. Psychoanalytic mentalism faces that problem, as well: Hans's mental unconscious is informed of the presence of a horse only through Hans's sense organs and brain, and we have no idea what the interface between the mental unconscious and the neurophysiological processes might be.

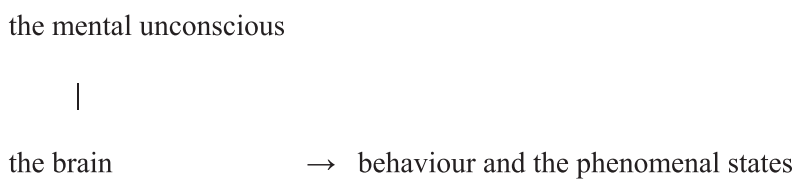
The concepts of implicit memory and procedural knowledge emerging from the neural unconscious paradigm have been widely applied to psychoanalytic issues (Mancia, 2004; Solms and Turnbull, 2002; Talvitie and Ihanus, 2002; Tutté, 2004). In those writings the question of the relationship between the mental and the neural unconscious has usually been left open. The implicit assumption seems to approach what we called the hybrid conception: there is both a mental and a neural unconscious, and psychoanalysis should

take both into account. The parallel conception is a more natural framework for the hybrid conception than is the serial conception.

The big picture with the parallel conception is quite similar to the serial one: it fits neatly with conventional psychoanalytic intuitions, and it is difficult to see how the perspectives of neuroscience might possess other relevance for psychoanalysis than helping to determine the scope of psychoanalytic models and interventions (as, for example, Edelson [1986] suggests). From the perspectives of materialism, neuroscience and ordinary mentalism (two-sphere view), both the serial conception and the parallel conception are impossible to accept. The assumption that the mental unconscious caused the gaps in the neural processes contradicts the foundational presuppositions of neuroscience and even implies that the unconscious is able to overrule the laws of nature.

3. The epiphenomenalist conception

The contents, impulses, and processes of the mental unconscious possess neural correlates.



In terms of both the serial and the parallel conceptions, the mental unconscious and the brain are detached systems. However, one might be tempted to think that, just as conscious mental matters possess neural counterparts, so everything that lies in the mental unconscious and happens there also has neural correlates. According to this line of thinking, the brain is the substrate of the mental unconscious, and the repressed contents are represented by the brain. In short, this means that the neural unconscious is the neural correlate of the mental unconscious. Actually, there are hints that some neuropsychoanalysts find this kind of logic appealing. For example, Mauro Mancia states: "We can speculate that the *repressed unconscious* is located in the [neural] structures of the explicit, autobiographical memory" (Mancia, 2004, p. 47, original italics).

In terms of both the serial and the parallel conceptions, the mental unconscious functions on its own, occasionally intervening in the physical processes of the brain and the body. When we assume that the mental unconscious has neural correlates, the mental unconscious is continuously present in the functioning of the brain. Serial and parallel conceptions imply gaps in the continuity of the neural processes but, when one is committed to the idea of the neural counterparts of the mental unconscious, there is no such implication.

For neuropsychoanalysis, the conception sketched above would provide a plausible rationale: owing to the one-to-one relationship between the mental and the neural unconscious, neuroscientific findings always contain, at least in principle, relevance for psychoanalytic models. From the perspective of

neuroscience, this conception appears more appropriate than the two earlier ones since it does not challenge the basic premises of the discipline. Insofar as the psychoanalytic explanations are presented by referring to the neural unconscious without supposing gaps in the neural processes, a neuroscientist might just settle on wondering about the reasons for postulating the mental unconscious.

The epiphenomenalist conception seems to imply that the mental unconscious is merely a side effect of the neural processes, or a shadow of the neural unconscious, which lacks causal power. The brain is commonly thought to cause phenomenal and behavioural matters and, when one admits that certain neural structures and processes are correlates of the mental unconscious, it follows that those correlates must possess causal power and explanatory relevance. The idea that the mental unconscious has causal power and that it possesses neural correlates does not seem to fit into the same picture.

Thus, it is appropriate to call this conception *epiphenomenalist*: the mental unconscious does not possess causal power, and everything that takes place within its scope is wholly determined by the brain. In terms of the epiphenomenalist conception, the powerless mental unconscious is only a non-necessary postulate, which could be abandoned without violating the explanatory power of a theory. Perhaps paradoxically, as the mental unconscious is found, or is supposed, to have neural correlates, the presupposition itself becomes useless. However, it has been argued that, although the unconscious is neural, in clinical situations it is necessary to treat it as if it were mental (Talvitie and Ihanus, 2005; Talvitie, 2009).

Ordinary mentalism makes the above supposition in its own realm: conscious mental matters are believed to possess causal power and to contain neural correlates. This supposition is one of the manifestations of the mind–body problem, and it does not fit into the materialist/physicalist frame of reference. Thus, if it were suggested that the mental unconscious has neural correlates and possesses causal power, this statement would be nothing less than the introduction of another mind–body problem.

Ultimately, the epiphenomenalist conception is not appealing at all. From the perspective of neuroscience, it is more tolerable, but most psychoanalysts probably believe that it does not recognize the real power of the mental unconscious.

4. The 'Kantian' conception

Beyond both the conscious states and the brain there is a common reality (the Kantian *Das-Ding-an-sich*/human mental apparatus/mental unconscious), which causes both neural and phenomenal matters:

→ the neural processes and the behaviour caused by them

Das-Ding-an-sich

→ the phenomenal states

Mark Solms (Solms, 1996, 1997b; Solms and Turnbull, 2002) has argued in favour of this view, calling it dual-aspect monism. Wikipedia (2008) describes it as 'the theoretical base' of neuropsychoanalysis. Normally, dual-aspect monism means that there is one substance that appears, separately, or differently, as mind and matter, or that mind and matter are two aspects of the same substance. In the current context, it is extremely important to be aware that Solms has an idiosyncratic version of dual-aspect monism. Contrary to the general view, Solms thinks that there is a foundational entity or sphere that gives rise both to mind and matter: "... but the underlying entity that *lies behind* those perceptual images will never be directly observable. Scientific observation has its limits" (Solms and Turnbull, 2002, p. 57; original italics).

By way of illustration, let us imagine that the heart is an unobservable *Das-Ding-an-sich*. Its existence and functioning have two aspects: the heartbeat and the circulation of the blood. Owing to their common origin, these aspects are intertwined: a change in one means a change in the other. It is possible to study the heart and its functioning through the stethoscope or by making notes about the circulation of the blood. Similarly, in terms of Solms's model, both the neural processes and the phenomenal states are supposed to reflect the properties and structure of *Das-Ding-an-sich*, and thus *Das-Ding-an-sich* is the common object in the study of neuroscience and psychoanalysis.

Solms is not trying to reduce the psychoanalytic concepts to neuroscientific ones. Perhaps surprisingly, his Kantian conception actually sets strict limits on the relevance of neuroscience for psychoanalysis. A psychoanalyst who is sceptical of the neuro-viewpoint might remind us that the properties of the heart are not fully revealed either by the heartbeat or by the circulation of the blood: the sound does not indicate the amount of blood being pumped, for example. Similarly, it may be the case that some properties of *Das-Ding-an-sich/*the mental apparatus appear in the phenomenal states, but not as neural processes (and vice versa). In such cases, the neuro-viewpoint is irrelevant to psychoanalysis. Let us examine the situation through the claim that dreams are not wish-fulfilments because higher-order motivational areas of the brain are not active during REM sleep.

If this claim were found to be true, one might argue that neuroscience has revealed something about *Das-Ding-an-sich/*the mental apparatus, and this will promote the development of psychoanalytic theories through abandoning the faulty idea that dreams are wish-fulfilments. However, a sceptic might argue the contrary: In the realm of clinical psychoanalysis, it has been found that behind dreams always (or at least sometimes) lie wishes. If we have even the slightest trust in the psychoanalytic method, then we should believe that this notion reflects the structure and essence of *Das-Ding-an-sich/*the mental apparatus.

Thus a sceptic might state that, when neuroscience contradicts clinical findings in this way, a certain property of *Das-Ding-an-sich/*the mental apparatus is being reflected in an aspect of phenomenal consciousness (the logic of analysands' associations, for example), but not in any aspect of the brain (in the activation of the neural structures responsible for motivation).

Given that the Kantian conception enables this kind of thinking, how does Solms, a central figure in neuropsychoanalysis, see the fruits of neuroscience for psychoanalysis? According to Solms, *Das-Ding-an-sich/*the mental apparatus sets the rules or algorithms for the dynamics of both the mind and the brain. By combining psychoanalytic and neuroscientific perspectives, it is possible to arrive at a more comprehensive conception of the mental apparatus. Thus, Solms holds that neuropsychoanalysis may provide firm ground for metapsychology that remained speculative in Freud's thinking (Solms, 1996, 1997b).

Solms is eager to cite Freud in order to show that the Kantian conception is the foundation of all psychoanalysis – disagreement with Solms would mean disagreement with Freud. However, Solms's fellow psychoanalysts have been very critical of his metaphysical position. Not surprisingly, his reading of Freud has been challenged, and his Kantian metaphysics have not been accepted (Brakel, 1997; Cavell, 1997; Olds, 1997; Shapiro, 1996; Shevrin, 1997; Meissner, 2003b; Whitehead, 2005).

The two-sphere view of cognitive neuroscience rests on the assumption that phenomenal states are caused by the brain. The assumption does not fit into Solms's Kantian metaphysics, as Solms, of course, is aware:

> If I am correct in my suspicion that most psychoanalysts accept that assumption [that conscious experiences are caused by the brain processes], then you will perhaps be surprised to learn that I reject it. It is, I believe a statement to which no psychoanalyst should ever assent, as it flatly contradicts the fundamental assumption on which the whole of our discipline rests. I am aware that in saying this I am implying that our discipline is very much out of step with contemporary research.
>
> (Solms, 1997b, pp. 681–2)

Linda Brakel makes clear the significance of that fact:

> I fear, however, that if psychoanalysts embrace Solms's view, with its implication that we need not worry about the dissynchrony between psychoanalysis and the findings and methods of current cognitive/neuroscientific research, our discipline will never be enriched by, or contribute to, explorations of the relationship between mind and brain.
>
> (Brakel, 1997, p. 720)

Jaak Panksepp, another central figure in neurospychoanalysis, also leans on dual-aspect monism. He states:

> In short, the present view will be a reductionistic one where we shall seek the sources of emotionality within the evolutionary shared neurodynamics of the older parts of the mammalian brain. The traditional distinction between bodily and psychological processes becomes blurred as we come to increasingly appreciate that mental abilities are bodily functions of the brain.
>
> (Panksepp, 1998, p. 20)

Later he claims that: "The mental complexities... have encouraged some thinkers to advocate dualistic views in which brain functions and mind

functions are considered distinct entities... Most investigators now accept that they are not ...” (Panksepp, 1998, p. 20). Panksepp seems to represent a conventional form of monism that is compatible with physicalism, and thus he rejects ordinary mentalism, not to mention psychoanalytic mentalism.

Thus, Solms's (Kantian) and Panksepp's (physicalist) dual-aspect monism are wholly different. The former holds that there is an underlying reality that 'will never be directly observable', and that has two reflections, mind and brain/body. The latter holds that there is just one material substance (and nothing 'behind' it), and considers mental matters an aspect of matter. As far as dual-aspect monism is 'the theoretical base' of neuropsychoanalysis, the theoretical base is incoherent.

We might conclude that, in a similar way with the serial and the parallel conceptions, the Kantian conception works for a clinician, since it accepts psychoanalytic mentalism. However, many psychoanalysts interested in collaboration with neuroscience cannot accept Kantian metaphysics. Even less can it be accepted by neuroscientists, and thus Solms's dual-aspect monism does not provide the basis for real collaboration between psychoanalysis and neuroscience.

Discussion

The study of metaphysical issues is often seen as useless speculation. We hope that the above discussion demonstrates that metaphysics is the key issue when the relevance of neuroscience to psychoanalysis is considered. In this situation it is very important that neuropsychoanalytic studies are explicit in their metaphysical commitments: do they rest on psychoanalytic mentalism or the two-sphere view of cognitive neuroscience, and do they accept Solms's Kantian monism or Panksepp's physicalist monism?

For a practising psychoanalyst, the serial, parallel or Kantian conceptions introduced above do not cause any problems. For neuropsychoanalysis, the commitment to each conception is problematic in similar ways. Firstly, insofar as neuropsychoanalysis operates in the realm of psychoanalytic mentalism, it is not able to falsify psychoanalytic models and theories. If a theoretical claim, for example, 'behind a dream there is always a wish', appears unlikely from the viewpoint of neuroscience, then it may always be claimed that 'if the brain does not make such things happen, then the unconscious will make them happen'.

Secondly, neuroscience or neuropsychoanalysis may verify psychoanalytic insights on a general level, but then they also challenge the conventional psychoanalytic explanation. Currently, there is a vast body of empirical and neurobiological research that validates Freud's notion concerning the significance of unconscious matters (for a comprehensive review, see Westen, 1999). Nevertheless, this fact is often expressed in a misleading manner. For example, in his introduction to the special issue of the *Journal of the American Academy of Psychoanalysis*, Samuel Slipp states: “Thus, empirical neurobiological research validates Freud's discovery that traumatic memories are stored in the unconscious. When

perceptions threaten survival, they bypass consciousness and directly go into the unconscious implicit memory" (Slipp, 2000, p. 194). However, Freud talked about the mental unconscious, and neurobiologists are discussing the neural unconscious. Thus, as far as neurobiologists are right, their research verifies Freud's general idea, but the Freudian unconscious has been replaced by the neural unconscious. Arnold Modell states that: "... The unconscious mind can be nothing other than neurophysiological processes ..." (2003, p. xii), but most of his fellow analysts are not willing to abandon the mental essence of the unconscious.

Because metaphysical presuppositions contain such significance, we cannot avoid asking on what grounds we might know which metaphysical position is more accurate than another. As noted previously, every branch of study must rest on some metaphysical presuppositions, which cannot be verified empirically. This does not mean, however, that a researcher could pick whatever metaphysical presupposition he or she happens to like; for example, astrology, religion, new-age philosophies and theosophy fall outside the scope of science owing to their metaphysical assumptions.

Occam's razor is a well-known device for addressing the issue. According to its terms, we should avoid non-necessary presuppositions and, if there are two models that explain a phenomenon equally well, then we should favour the one that makes fewer metaphysical postulates (Loux, 2006, pp. 51–2; for a more sophisticated approach, see, for example, Wimsatt, 2007, pp. 193–200). This leads us to the question of whether it is possible to explain the phenomena that psychoanalysis is interested in without postulating the mental unconscious. The answer, of course, depends on who answers: a neuroscientist would say 'yes' (usually without knowing very much about psychoanalytic phenomena); a psychoanalyst would say 'no' (usually without knowing very much about the competencies of the brain). If one wants to resolve the disagreement, mutual discussion between the psychoanalysts and the neuroscientists about psychoanalytic phenomena and the competencies of the brain seems to be the only way.

After all, it has to be borne in mind that psychotherapy is a practical affair dealing with words, memories, feelings and fantasies. It is hard to see how its curative power might depend on a therapist's metaphysical assumptions.

Discussions on the subject of neuropsychoanalysis often wander aimlessly, devoid of clear points and arguments. Its supporters are used to rehearsing neural facts related to psychoanalytically interesting phenomena, and sceptics such as Blass and Carmeli persist in questioning the clinical relevance of such neural facts. We have given above one reason – which we consider to be the main one – for this confusing state of affairs: differing metaphysical presuppositions create a substantial obstacle to the integration of neuroscience and psychoanalysis. What should be done in order to proceed with neuropsychoanalysis is to divert for a moment from exclusively gathering neurophysiological data and to consider whether, and if so how, metaphysical controversies can be resolved.

Translations of summary

Über die Metaphysik der Neuropsychoanalyse. Die Neuropsychoanalyse fasziniert zwar viele Wissenschaftler, doch die Relevanz neurowissenschaftlicher Studien für die Psychoanalyse ist umstritten. In diesem Beitrag betrachten wir die Neuropsychoanalyse unter dem Blickwinkel der Metaphysik. Die dominierende metaphysische Lehre der Neurowissenschaft ist ein Materialismus oder Physikalismus, der – so unsere These – für keinen Zweig der Psychiatrie oder Psychotherapie akzeptabel ist. Kliniker müssen sich auf eine metaphysische Sichtweise stützen, die wir als gewöhnlichen Mentalismus bezeichnen. Diese Sichtweise erkennt die Existenz und die Kausalwirkung bewusster Inhalte der Psyche an. Darüber hinaus ist die Psychoanalyse einer Haltung verpflichtet, die hier als psychoanalytischer Mentalismus bezeichnet wird; sie setzt die Existenz und Kausalwirkung unbewusster Inhalte der Psyche voraus. Aufgrund der unterschiedlichen metaphysischen Grundannahmen von Psychoanalyse und Neurowissenschaften vertreten wir die These, dass die Neuropsychoanalyse einer plausiblen Rationale entbehrt. Wir zeigen, dass der von einigen ihrer Hauptvertreter befürwortete duale Monismus fragwürdig ist und nicht als Basis für interdisziplinäre Studien dienen kann.

Acerca de la metafísica del neuropsicoanálisis. El neuropsicoanálisis ha fascinado a muchos investigadores pero, a la vez, la relevancia de los estudios neurocientíficos para el psicoanálisis ha sido cuestionada. En este artículo estudiamos el neuropsicoanálisis desde la perspectiva de la metafísica. La doctrina metafísica prevalente en la neurociencia es el materialismo o fisicalismo, el cual, sostenemos, no puede ser aceptado por ninguna rama de la psiquiatría o la psicoterapia. Los analistas deben depender de una visión metafísica, a la que llamamos mentalismo ordinario, que presupone la existencia de las cuestiones mentales conscientes y su poder causal. Debido a diferencias entre los presupuestos metafísicos del psicoanálisis y la neurociencia, se considera que el neuropsicoanálisis carece de una fundamentación plausible. El ensayo demuestra que el monismo de doble aspecto, defendido por algunas de las figuras centrales del neuropiscoanálisis, se halla en una posición controvertida y, por ende, no puede servir de base para estudios interdisciplinarios.

Sur les métaphysiques de la neuropsychanalyse. La neuropsychanalyse a passionné de nombreux érudits, cependant la pertinence des études neuroscientifiques pour la psychanalyse a aussi été remise en question. Dans cet article, nous nous adressons à la neuropsychanalyse dans la perspective métaphysique. La doctrine métaphysique dominante en neuroscience est le matérialisme ou le physicalisme, ce que nous sountenons qu'aucune branche de psychiatrie ni de psychothérapie puissent accepter. Les cliniciens doivent dépendre d'une perspective métaphysique que nous appelons mentalisme ordinaire. Une telle perspective admet l'existence et le pouvoir causal des questions mentales conscientes. En plus, la psychanalyse se consacre à une position ici appelé mentalisme psychanalytique, ce qui suppose l'existence et le pouvoir causal des questions mentales inconscientes. A cause des différences dans les présuppositions métaphysiques entre la psychanalyse et la neuroscience, la neuropsychanalyse est considérée comme manquant d'une raison plausible. Le monism d'aspect double, défendu par quelques uns des figures centrales de la neuropsychanalyse, est démontré être une position controversée, qui ne peut pas fournir la base pour des études interdisciplinaires.

Sulla metafisica della neuropsicoanalisi. La neuropsicoanalisi ha al contempo riscosso l'interesse da parte di molti studiosi e suscitato un certo scetticismo per quanto riguarda la questione se per la psicoanalisi vi sia una reale pertinenza della ricerca neuroscientifica. In questo lavoro viene indagata la neuropsicoanalisi da una prospettiva metafisica. La dottrina metafisica predominante nella neuroscienza è il materialismo o il fisicalismo, dottrina che non può essere accettata da nessuna corrente in psichiatria o psicoterapia. Gli esperti di queste discipline prendono infatti le mosse da una prospettiva di ciò che viene definito 'mentalismo ordinario'. Questa prospettiva riconosce l'esistenza e l'impatto causale di fenomeni mentali consci. Inoltre, la psicoanalisi rispetta un concetto, qui definito mentalismo psicoanalitico, che presuppone l'esistenza e l'impatto causale di fenomeni mentali inconsci. A causa di queste differenze fra psicoanalisi e neuroscienza nei loro assunti metafisici di base, viene teorizzato in questo lavoro che la neuropsicoanalisi sia priva di razionale plausibile. Si dimostra come il monismo duplice, proposto da alcune delle figure centrali in neuropsicoanalisi, sia una posizione opinabile, che non può costituire una base per studi interdisciplinari.

References

Andreasen NA (2001). *Brave new brain: Conquering mental illness in the era of the genome*. New York, NY: Oxford UP.

Barendregt M, van Rappard JFH (2004). Reductionism revisited: On the role of reduction in psychology. *Theory and Psychol* **14**:453–74.

Barkley RA (1997). *ADHD and the nature of self-control*. New York, NY: Guilford.
Bickle J (2003). *Philosophy and neuroscience: A ruthlessly reductive account*. Dordrecht: Kluwer.
Blass RB, Carmeli Z (2007). The case against neuropsychoanalysis: On fallacies underlying psychoanalysis' latest scientific trend and its negative impact on psychoanalytic discourse. *Int J Psychoanal* **88**:19–40.
Boesky D (1995). Commentaries. *J Am Psychoanal Assoc* **43**:356–60.
Brakel LA (1997). Commentaries. *J Am Psychoanal Assoc* **45**:714–20.
Carnap R (1938). Logical foundations of the unity of science. In: Neurath O, editor. *International encyclopedia of unified science*, vol. 1, 42–62. Chicago, IL: U Chicago Press.
Cavell M (1997). Commentaries. *J Am Psychoanal Assoc* **45**:721–6.
Darden L, Maull N (1977). Interfield theories. *Philos Sci* **43**:44–64. [(2000). Reprinted in: Schick T, editor. *Readings in the philosophy of science: From positivism to postmodernism*, 138–47. Mountainview, CA: Mayfield Publishing.]
Edelson M (1986). The convergence of psychoanalysis and neuroscience: Illusion and reality. *Contemp Psychoanal* **22**:479–519.
Fichtner G, editor (1992). *The Sigmund Freud–Ludwig Binswanger correspondence*. New York, NY: Other Press.
Godfrey-Smith P (2003). *Theory and reality: An introduction to the philosophy of science*. Chicago, IL: U Chicago Press.
Gomez L (2005). *The Freud wars: An introduction to the philosophy of psychoanalysis*. London: Routledge.
Hempel CG, Oppenheim P (1948). Studies in the logic of explanation. *Philos Sci* **15**:135–75.
Kim J (2005). *Physicalism, or something near enough*. Princeton, NJ: Princeton UP.
Koons RC, Bealer G, editors (2010). *The waning of materialism*. Oxford: Oxford UP.
Loux M (2006). *Metaphysics: A contemporary introduction*. 3rd edition. New York, NY: Routledge.
Mancia M (2004). *Feeling the words – neuropsychoanalytic understanding of memory and the unconscious*. London: Routledge.
Meissner WW (2003a). Mind, brain, and self in psychoanalysis II: Problems and attempted solutions. *Psychoanal Contemp Thought* **26**:279–320.
Meissner WW (2003b). Mind, brain, and self in psychoanalysis III: Psychoanalytic perspectives after Freud. *Psychoanal Contemp Thought* **26**:345–86.
Modell A (2003). *Imagination and the meaningful brain*. London: MIT Press.
Nagel E (1961). *The structure of science: Problems in the logic of scientific explanation*. New York, NY: Harcourt, Brace & World.
O'Brien G, Jureidini J (2002). Dispensing with the dynamic unconscious. *Philos Psychol and Psychiatry* **9**:141–53.
Olds DD (1997). Commentaries. *J Am Psychoanal Assoc* **45**:704–07.
Oppenheim P, Putnam H (1958). Unity of science as a working hypothesis. In: Feigl H, Scriven M, Maxwell G, editors. *Concepts, theories, and the mind–body problem*, 3–36. Minneapolis, MN: U Minnesota Press.
Palombo S (1999). *The emergent ego: complexity and coevolution in the psychoanalytic process*. Madison: International UP.
Panksepp J (1998). *Affective neuroscience: The foundations of human and animal emotions*. New York, NY: Oxford UP.
Pugh G (2006). Cooperation not incorporation: psychoanalysis and neuroscience. In: Mancia M, editor. *Psychoanalysis and neuroscience*, 33–61. New York, NY: Springer.
Pulver SE (2003). On the astonishing clinical irrelevance of neuroscience. *J Am Psychoanal Assoc* **51**:755–72.
Scalzone F (2005). Notes for a dialogue between psychoanalysis and neuroscience. *Int J Psychoanal* **86**:1405–23.
Schouten M, Looren de Jong H (2007). Mind matters: The roots of reductionism. In: Schouten M, Looren de Jong H, editors. *The matter of the mind: Philosophical essays on psychology, neuroscience, and reduction*, 1–28. Malden, MA: Blackwell.
Shapiro T (1996). Discussion of the structural model in relation to Solms's neuroscience–psychoanalysis integration: The ego. *J Clin Psychoanal* **5**:369–79.
Shevrin H (1997). Commentaries. *J Am Psychoanal Assoc* **45**:746–53.
Shevrin H, Bond JA, Brakel LAW, Hertel RK, Williams WJ (1996). *Conscious and unconscious processes: Psychodynamic, cognitive, and neurophysiological convergences*. New York, NY: Guilford.
Slipp S (2000). Introduction to neuroscience and psychoanalysis. *J Am Acad Psychoanal* **28**:191–201.
Smith HF (1997). Creative misreading: Why we talk past each other. *J Am Psychoanal Assoc* **45**:335–7.
Solms M (1996). Reply to Dr Shapiro. *J Clin Psychoanal* **5**:381–404.

Solms M (1997a). *The neuropsychology of dreams: A clinico-anatomical study*. Mahwah; NJ: Erlbaum.
Solms M (1997b). What is consciousness? *J Am Psychoanal Assoc* **45**:681–703.
Solms M (2000). *The interpretation of dreams* and the neurosciences. Available from: http://www.psychoanalysis.org.uk/solms4.htm/
Solms M, Turnbull O (2002). *The brain and the inner world: An introduction to the neuroscience of subjective experience*. New York, NY: Other Press.
Talvitie V (2009). *Freudian unconscious and cognitive neuroscience: From unconscious fantasies to neural algorithms*. London: Karnac.
Talvitie V, Ihanus J (2002). The repressed and implicit knowledge. *Int J Psychoanal* **83**:1311–23.
Talvitie V, Ihanus J (2005). Biting the bullet: The nature of unconscious fantasy. *Theory Psychol* **5**:659–78.
Talvitie V, Ihanus J (2006). The psychic apparatus, metapsychology and neuroscience: Toward biological (neuro)psychoanalysis. *Neuro-Psychoanal* **8**:85–98.
Talvitie V, Ihanus J (2010). On the relation between neural and psychological mechanisms: neuropsychoanalysis and the "new mechanists". *Scand Psychoana Rev* **33**:130–41.
Tauber AI (2010). *Freud, the reluctant philosopher*. Princeton, NJ: Princeton UP.
Tutté JC (2004). The concept of psychical trauma: A bridge in interdisciplinary space. *Int J Psychoanal* **85**:897–921.
Uleman JS (2005). Introduction. In: Hassin RR, Uleman JS, Bargh JA, editors. *The new unconscious*, 3–15. Oxford: Oxford UP.
Van Inwagen P (2002). *Metaphysics*. 2nd edition. Oxford: Westview Press.
Vivona JM (2009). Leaping from brain to mind: A critique of mirror neuron explanations of countertransference. *J Am Psychoanal Assoc* **57**:525–50.
Westen D (1999). The scientific status of unconscious processes: Is Freud really dead? *J Am Psychoanal Assoc* **47**:1061–106.
Westen D, Gabbard G (2002). Developments in cognitive neuroscience: I. Conflict, compromise, and connectionism. *J Am Psychoanal Assoc* **50**:53–98.
Whitehead CC (2005). Toward a 'new' paradigm of therapeutic action: Neuro-psychoanalysis and downward causation. *J Am Acad Psychoanal* **33**:637–56.
Wikipedia (2008). Neuro-psychoanalysis. Available from: http://en.wikipedia.org/wiki/Neuro-psychoanalysis/; 25 December 2008.
Wimsatt W (2007). *Re-engineering philosophy for limited beings: Piecewise approximations to reality*. Cambridge, MA: Harvard UP.

