

UNDERSTANDING METAPSYCHOLOGY WITH THE COMPUTER PARADIGM

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Abstract

Understanding Metapsychology with the Computer Paradigm.

In this article we want to assail the task of providing an answer to the much-disputed question whether psychoanalysis is, as Freud claimed, a natural science or not. We want to argue in favour of Freud's view, but at the same time break out of the polarization that emerged around the assumption that the only way to develop a natural scientific approach to the human mind is the neuroscientific approach. We will do so by explaining the basis of our understanding of metapsychology: the computer paradigm and why it is not only a valid natural scientific paradigm but also in line with Freud's thinking. Based on this paradigm we shall provide an explanation of how we interpret the concept of the mental apparatus and why it is that metapsychology is the only psychological theory that allows for experimental testing and refinement. We will illustrate our understanding of metapsychology by providing an interpretation of Freud's Project for a Scientific Psychology that tries to overcome the usual polarization in the discussions of this text. The core thesis of this interpretation is that the Project cannot be seen as a metapsychological text. Keywords: *mental apparatus, psychoanalysis and science, mind-brain relation, scientific psychology, metapsychology, artificial intelligence.*

1. Introduction: Psychoanalysis and the question of natural science

Freud made at the end of his life the assertion that psychoanalysis is a natural science.^{3,4} This assertion is to this date the cause for major controversy within psy-

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³ Cfr. Freud, S. (1940), *An Outline of Psycho-Analysis*, p. 158.

⁴ The German word «Wissenschaft», which is how Freud usually qualified psychoanalysis, can be translated with «science». However, it encompasses both broad academic areas, which in the English-speaking world are called «sciences» and «arts». The «sciences», in this narrow sense, are in German called «Naturwissenschaften» (literally: «natural sciences» or «sciences of nature»), while the «arts» are called «Geisteswissenschaften» (literally: «spirit sciences» or «sciences of spirit»). Since «science» can be a correct translation of «Naturwissenschaft» as well as of «Wissenschaft» misunderstandings can emerge with translation. To avoid misunderstandings, we decided to use the word «natural science» as

choanalysis. The reason is, as we think, that to this date there is one assumption that is generally agreed on within the established natural sciences since Freud's time:⁵ that the brain (or rather: the entire nervous system) is the organ of the mind, and what we call mind is the result or another form of appearance (depending on one's philosophical stance) of the processes within the brain. Derived from this assumption is the fundamental thesis of neuroscience: that an understanding of the physiological processes within the brain would disclose to us how the mind functions. Hence, Freud's assertion, that psychoanalysis is a natural science, could be understood in such a way that psychoanalysis can ultimately be subjugated to neuroscience, since this is the typical natural scientific approach to mind. But since subjugating psychoanalysis to the methodology of neuroscience is for most psychoanalysts unacceptable, Freud's assertion of psychoanalysis being a natural science is often dismissed as erroneous. In contrast to that, some psychoanalysts, who are faithful to Freud's natural scientific basis and aspirations, precisely try to link and sometimes even try to theoretically subjugate psychoanalysis to neuroscience.

This is the typical form of the polarization around the question, whether psychoanalysis is a natural science or not. On the following pages we shall develop a position that breaks out of this polarization by providing a different natural scientific approach to the nervous system. This is crucial since this polarization relies on the assumption that following a natural scientific approach to the human mind necessitates to accept the fundamental thesis of neuroscience as valid. We precisely reject this assumption and claim that, on the contrary, we need to understand the mind in order to understand the nervous system. The ground on which we defend our view is the paradigm that the nervous system is a (biological) computer.

This paradigm for a scientific approach to the nervous system, that shall be discussed in more detail later on (see sections 2.1 and 2.2), allows for an understanding of metapsychology that enables both to link metapsychology with computer technology as well as to better understand the concept of the mental apparatus. We shall therefore elaborate our position as a specific stance with regard to metapsychology that shall be elaborated in light of the controversial discussions surrounding Freud's *Project for a Scientific Psychology*, since it is here where the polarization, that we claim to be able to overcome, finds its most distinct expression.

2. The Project for a Scientific Psychology in psychoanalytic reception

Freud's *Project for a Scientific Psychology*, or simply Project, can without doubt be called one of Freud's most intriguing texts. It often has spawned heated

translation for «Naturwissenschaft» and «soft sciences» for «Geisteswissenschaft».

⁵ Cfr. *ivi*, p. 144.

discussion on the question how this text is to be valued and what its implications for metapsychology are. As the goal of this article is to explain our understanding of metapsychology we cannot provide a comprehensive summary of its reception. We shall therefore mostly rely on Sulloway's discussion of the *Project*.⁶ We recommend the reader this discussion, since it provides a more comprehensive overview than we can provide here. Although Sulloway's summary is from 1979 we claim that the form of the polarization between the authors that he describes still is present today. And it is the form of the polarization that is relevant for our argument. Beyond the authors summarized by Sulloway we also take into account the positions of Pribram, Gill and Schmidt-Hellerau.

2.1 Typical polarizations in the discussion of the Project

Sulloway pointed out that the debate over the *Project* quite often took the form of a political debate between the «true believers of psychoanalysis», who see psychoanalysis as a «soft science», and the «tough minded champions of a “hard science” approach to mind».⁷ Sulloway mentions Stratchey and Jones as two Freud scholars who have been spokesmen of the former view, who played down the importance of the *Project*. As evidence for this view Stratchey mentions that Freud did his best to destroy it when he was presented with it in his old age.⁸ Moreover, according to Sulloway, both of them, as well as Kris,⁹ Erikson,¹⁰ Bernfeld¹¹ and Brierley¹² were «all in essential agreement [...] in concluding that Freud did not allow the *Project* to languish without extremely good psychoanalytic cause».¹³

An author who opposed the tendency of these authors to downplay the importance of the *Project* is M. Kanzer. He defended the view that the seemingly neurological models from the *Project* were induced from clinical observations Freud had made before. Kanzer went as far as making the following claim: «The [model in the *Project*] is no more an exercise in neurology than the [model in *The Interpretation of Dreams*] is an exercise in photography».¹⁴ Thus he argued that

⁶ Sulloway, F. (1979), *Freud, Biologist of the Mind: Beyond the Psychoanalytic Legend*, pp. 113-131.

⁷ *Ivi*, pp. 120-121.

⁸ Stratchey, J. (1966), *Editor's Introduction to "Project for a Scientific Psychology"*, p. 290.

⁹ Kris, E. (1954), *The Origins of Psychoanalysis, Letters to Wilhelm Fliess, Drafts and Notes: 1887-1902*.

¹⁰ Erikson, E. H. (1955), *Freud's "The Origins of Psycho-Analysis"*.

¹¹ Bernfeld, S. (1955), *Sigmund Freud: The Origins of Psychoanalysis*.

¹² Brierley, M. (1967), *Review of The Standard Edition of the Complete Psychological Works of Sigmund Freud*.

¹³ Sulloway, F. (1979), p. 119.

¹⁴ Kanzer, M. (1973), *Two prevalent misconceptions about Freud's "Project" (1895)*, p.

Freud used in the *Project* a neurological model in order to illustrate the mental apparatus. According to Kanzer both models (the one from the *Project* as well as the one from *The Interpretation of Dreams*) conform to Freud's dictum «that we are justified [...] in giving free rein to our speculations so long as we retain the coolness of our judgement and do not mistake the scaffolding for the building».¹⁵ Yet, according to Kanzer, commentators have made precisely this mistake, when they argued that the *Project* displays a neurological model.

Another author who holds a similar view is Schmidt-Hellerau.¹⁶ According to her the *Project* was the first metapsychological work of Freud. She furthermore claims that the chapter 7 of *The Interpretation of Dreams* is an adapted and published version of the *Project*. But in order to defend this thesis, she has to ignore the neurophysiological speculations that Freud makes especially in the beginning of the *Project*. She explicitly states that one can read the text as an attempt to develop a theory that describes the functioning of the nervous system and acknowledges that Freud meant with «neuron» a cell of the nervous system. But, so she explains, one can read the text in a way that focuses more on the general functional structure that Freud sketches out. From such a perspective a «neuron» in the *Project* must not to be understood as a cell in the nervous system but as a purely logical abstraction that allows to sketch out in the general model. She makes clear that she favours the latter perspective and rejects the former as a reading, which, according to her, is based on obsolete neurological ideas of the 19th century.

As an example of the «hard science» fraction Sulloway mentions Holt who held the view that the *Project* proves that many seemingly arbitrary aspects of Freud's theory had their roots in «hidden biological assumptions».¹⁷ On the change that took place between the *Project* and chapter 7 of *The Interpretation of Dreams*, Holt wrote, that the mental apparatus described in chapter 7 was «a convenient fiction [that] had the paradoxical effect of *preserving* these [biological] assumptions by hiding their original nature, and by transferring the operations of the apparatus into a conceptual realm where they were insulated from correction by progress in neurophysiology and brain anatomy».¹⁸ This view is echoed by Pribram and Gill, who wrote that «[...] the *Project* [...] not only introduces but also suggests neurobiological mechanisms for such major psychoanalytic concepts as the primary and secondary processes, the ego, reality testing, drive, and defence. While these concepts are also developed in later writings on essentially

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¹⁵ Freud, S. (1900b), *The Interpretation of Dreams*, p. 536.

¹⁶ Cfr. Schmidt-Hellerau, C. (1995), *Lebenstrieb & Todestrieb, Libido & Lethe*, pp. 62-65.

¹⁷ Holt, R. R. (1965), *A review of some of Freud's biological assumptions and their influence on his theories*, p. 94.

¹⁸ Holt, R. R. (1968), *Beyond Vitalism and Mechanism: Freud's Concept of Psychic Energy*, p. 208.

psychological grounds, the *Project* reveals some of the hidden neurobiological assumptions with which they remain intertwined». ¹⁹ The *Project* is thus the key to unveil the hidden truth that «the psychoanalytic metapsychology is truly a neuropsychology». ²⁰ And they claim that that has to be done in order to achieve the goal of making metapsychology a natural science. They otherwise hold the view that: «[...] Freud's [metapsychological] model has degenerated into a metaphor». A metaphor that, according to them, is «no longer formulated in testable terms». ²¹ The clearest form, in which the clash between the «soft»- and «hard science» fractions is expressed, is between those who see the *Project* as evidence that metapsychology was all along a disguised neuropsychology (Holt, Pribram & Gill) and those who, contrary to this view, claim that the *Project* is not to be seen as a neurological text at all (e.g. Kanzer, Schmidt-Hellerau). At this point we must point out that the latter view faces one serious problem: the fact that Freud's neurological speculations about the basic functioning of neurons, that he developed in *Project*, turned out to be to a large extent correct. ²² It is highly unlikely that Freud, whilst writing without any intention to develop a neurological speculation, by mere chance should have correctly anticipated neurological mechanisms. However, this does not necessitate that therefore the former fraction is correct, but it proves that a correct assessment of the *Project* cannot possibly ignore that the *Project* was, at least also, intended as a neurological text.

With regard to this controversial polarization Stratchey and Jones take a view, which affirms that the *Project* is a neurological document but at the same time they hold the view that it is, if at all, of little relevance for the understanding of metapsychology. Stratchey even went as far as claiming that Freud demanded the *Project* to be destroyed, when he was told that it had been found. But Stratchey failed to provide any evidence for the validity of his claim. When we checked the reference that Stratchey provided, we discovered that the reference makes no mention of the *Project*. ²³ Hence we must note that Stratchey made an unverified claim, from which one can surmise that he had a personal motive to belittle the *Project*'s importance. ²⁴ Ironically enough it is against this stance that the otherwise opposed

¹⁹ Pribram, K. H., Gill, M. M. (1976), *Freud's 'Project' Re-Assessed: Preface to Contemporary Cognitive Theory and Neuropsychology*, p. 15.

²⁰ *Ivi*, p. 82.

²¹ *Ivi*, p. 160.

²² Cfr. Centonze, D., Siracusano, A., Calabresi, P., & Bernardi, G. (2004), *The Project for a Scientific Psychology (1895): a Freudian anticipation of LTP-memory connection theory*.

²³ Cfr. Jones, E. (1953), *The Life and Work of Sigmund Freud* (Vol. 1), pp. 316-318.

²⁴ The edition of the correspondence between Freud and Marie Bonaparte, that is currently under work (see: <https://www.freud-edition.net/biblio/briefe-marie-bonaparte-brief>, last checked on 30th of August 2022), will either confirm Stratchey's claim, in which case Stratchey committed a slip when providing a reference for his claim, or it will confirm our

authors are united: Holt, Kanzer, Pribram & Gill and Schmidt-Hellerau all hold the view that the *Project* is a metapsychological text and that it contains the first model of the mental apparatus. This consensus between otherwise opposed views is striking, if one considers the fact that Freud never calls the model developed in the *Project* «mental apparatus», he just calls it «apparatus» or «apparatus constituted by $\phi\psi\omega$ ».²⁵ Since ϕ , ψ and ω are defined in the *Project* as neurological systems,²⁶ the apparatus of the *Project* is, if one wishes to qualify it in any way: a neuronal apparatus. Against this background we state the thesis, which shall be elaborated in the main part of this article: the *Project* does not contain a model of the mental apparatus and therefore it is, strictly speaking, not a metapsychological text. It is precisely Sulloway who never speaks of «mental apparatus» with regard to the apparatus of the *Project* and breaks out of this polarization between the hard- and the soft science fractions. On the one hand he affirms that Freud's thinking in general is to be understood as being rooted in the hard sciences, but on the other hand he claims that with the turn from the *Project* to *The Interpretation of Dreams* there actually was a change in Freud's thinking: Freud abandoned, along with the *Project*, the goal of finding a mechanical physiological reduction of mental processes and adopted the evolutionary one in its stead.²⁷ In so doing Sulloway provides a stance that should be counted to the hard science fraction, but which does not agree with Holt, Pribram and Gill. Thus, we will refer to this group of authors as the «neuropsychology in disguise»-fraction. After this analysis Sulloway goes on to develop in detail, how Freud through his entire work relied on evolutionary biological thinking when developing his theories, and how this perspective contributes to the understanding of Freud's thinking. Although Sulloway thus provides an illuminating interpretation of Freud's thinking, he also ascertains that Freud never abandoned the assumption that a mechanical physiological reduction was possible, but, so Sulloway claims, Freud from then did not pursue this goal.

2.2 Preliminary discussion of the *Project*

To begin our discussion we must draw attention to the often unaccounted fact that the *Project* was never published by Freud and never got his approval for publication. Therefore, it cannot possibly be seen as a publication of Freud, but rather

conclusion, thus unmasking this claim as the starting point of a myth.

²⁵ Freud, S. (1950), *Project for a Scientific Psychology*, p. 312.

²⁶ Cfr. *ivi*, pp. 302-309.

²⁷ «It is often assumed, erroneously, that there is only one form of reductionism in science – to the laws of physics and chemistry. But in certain sciences, particularly in the life sciences, there are two major forms of reductionism – physical-chemical and historical-evolutionary; each supplements the other and explains attributes of living organisms that the other cannot [...]». Sulloway, F. (1979), p. 131.

as a sketch of ideas. And a correct interpretation of the text also has to provide an explanation, why Freud never published it. Puzzling enough this is hardly ever taken into account in the discussions of the text, with the exception of those who have the motive to belittle its importance, who tend to ignore the text altogether or claim that it has no importance for metapsychology at all. This cannot possibly be a convincing exegetical argument, since there can be no doubt and there was never any dispute about the fact that many concepts as well as functional laws of the system that are written in the *Project* reappear in later metapsychological texts and models. Therefore, we consider it a fact that there is a conceptual continuity between the *Project* and metapsychology. Hence, the *Project* is part of the theoretical endeavour that ultimately lead to metapsychology. And if one understands metapsychology as this theoretical endeavour, one can call it a metapsychological text. Yet, if one conceptualizes metapsychology in this way, one must acknowledge that this endeavour can be traced back to at least Freud's monograph on aphasia, which would in turn make *On Aphasia* the first metapsychological text, since it is in that text where Freud describes the concept of the linguistic apparatus and expresses the view that elementary mental operations cannot be located in anatomical localities that serve that specific task²⁸ – a view that should become the bedrock of metapsychology. It goes without saying that the *Project* was a crucial text in the endeavour that brought about metapsychology as scientific field of inquiry, and it was the text where the goal of metapsychology was first spelled out: to develop a psychology that «shall be a natural science».²⁹ A goal that ultimately was reached, as Freud claimed at the end of his life.³⁰

While we agree with Freud that metapsychology did accomplish this goal, we also claim that the model in the *Project* did not and could not possibly have achieved this goal, even if Freud had completed the text. The reason is, as we will show, that the *Project* has a fundamental theoretical flaw that makes it impossible to develop a natural scientific psychology. Therefore, it cannot be considered a proper metapsychological text, if one understands metapsychology as the theoretical field, which is a natural scientific psychology, as we do. In the remaining part of this article, two things shall be shown.

1. Why it is that metapsychology, as it was worked out in *The Interpretation of Dreams* and onwards, is a natural scientific psychology.
2. Why the model of the *Project* does not suffice standards for a natural scientific psychology.

²⁸ Cfr. Freud, S. (1891), *Zur Auffassung der Aphasien*, p. 69.

²⁹ Freud, S. (1950), p. 295.

³⁰ Cfr. Freud, S. (1940), p. 158.

3. Our proposal for a natural scientific approach to mind and its implications for metapsychology

If one wants to assail the task of developing a natural scientific theory of the mind, one needs a fundamental assumption, a conceptual paradigm as we want to call it, on which the theory relies and which also provides the possibility for experimental validation. The approach we defend relies on the fundamental assumption that the brain or rather the entire nervous system is a biological (in contrast to an artificial) computer and therefore the laws and theories that have been validated in the development of artificial computers have to be adhered to.

3.1 *Explanation of the computer paradigm*

We shall now explain what this paradigm means and shall start by addressing a typical misunderstanding: we do not defend the computer metaphor for understanding the brain. To use computers as metaphor would mean to use a computer in the sense of a technical artefact as illustration for one aspect or to answer one question about the object of inquiry. A metaphor never implies that the illustrating object is identical with the inquired object, nor does it imply that all laws from the former apply to the latter. On the contrary it mandates that at some point both objects are not identical, which allows to pick and choose aspects from computers to make arguments about the nervous system at will without having to abide to all. This we strongly oppose.

We use computers as a paradigm, which means that we hold the view that the nervous system is an information processing system, i.e., an entity that needs to be mathematically described by means of information theory just like artificial computers are. Artificial computers are thus just a concrete form, in which the abstract concept of a computer, as it is defined by information theory, finds realisation. We therefore make the following judgement: *the nervous system is an entity to which the mathematically formulated models of information theory must be applied, i.e., it is a system that is able to process, store and transfer information and hence the laws displayed by these models also apply to the brain.* It is only in this abstract way that we want our paradigmatic stance to be understood. Since the term «computer» is too closely associated by many with artefacts from everyday life, we from here onwards switch to the formulation of information processing system (IPS for short) instead of «computer», to make clear that we refer to the abstract concept of information theory.

At this point we must address an obvious question. If we say that the brain is an IPS, it is of crucial importance to clarify how «information» is understood. Here we must be transparent. Although the term «information» is the term which designates the fields of information theory and of information technology, it nonetheless is itself not axiomatically defined. What is defined is the term: «information

content», but not «information». Therefore, we shall explain our understanding of it, since what follows from asserting the computer paradigm crucially depends on this understanding.

Wiener famously wrote: «Information is information, not matter or energy. No materialism which does not admit this can survive at the present day».³¹ He thus introduced a fundamental distinction between information and the realm of physical description of the world. Note that Wiener was far from being somebody who would claim that information is some kind of substance that is not physical matter or energy or that it is unrelated to the latter. At that point he merely stressed out the fact that the concept of information is itself not identical with matter or energy, in the sense that it cannot be described by means of physical laws or values. Hence his judgement is to be understood in the following way: he stresses the fact that the concept of information designates something that as such is not part of the conceptual realm of physics, but that it is a conceptual realm of its own – albeit it can be related to a physical description. And it was precisely Wiener who was very keen on finding a way to relate information to physical entities and events.³²

What is information then? Information is a concept that designates the fact that there is a person, who by means of a specific event acquires a certain knowledge. An information machine (i.e., a device built by information technology) therefore is a machine that provides knowledge to the person using it. Information, as a concept, thus presupposes somebody who is informed (i.e. acquires knowledge), as well as a signal or content that provides this moment of being informed, which is called «information content». «Information content» had to be axiomatically defined in order to physically built technological systems, which process those signals and thus provide information to humans (see below for further elaboration). The concept of «information» had not to be axiomatically defined, since it refers to the form in which an IPS is used by a user, of which there are many. One could identify «information» with «knowledge», but just like «information» is not axiomatically defined, neither is «knowledge». All that can be said is that the conceptual realm of information is a realm that presupposes a user who uses the IPS, to gather, store and transfer knowledge. Accordingly, the literal verbal translation of the Finish word for computer («tietokonen») is: knowledge machine.

At this point it should become understandable to the reader that our paradigmatic stance is actually almost trivial since the nervous system, insofar as we speak of another person, is also a system that by means of specific events can

³¹ Wiener, N. (1948), *Cybernetics or Control and Communication in the Animal and the Machine*, p. 132.

³² Pribram and Gill, who also refer to information technology, but made, with regard to this question, one crucial mistake. Incorrectly identifying «information» with «information content», they used Shannon's formalization of «information content» to present «information» as an entity that can be placed in the realm of physics. Cfr. Pribram, K. H., Gill, M. M. (1976), p. 25.

make us acquire knowledge. The nervous system is therefore an IPS. And note that knowledge – just like information – is not a physical or physiological concept, but a mental one.

Precisely this last assertion poses to natural science to this date a fundamental problem: how can something, that does not belong in the realm of physical or physiological description, like knowledge or mind, be in this realm or at least related to this realm? And it is precisely here where the computer paradigm can provide us solutions to this problem, since computer technicians faced a problem that is uncannily similar to the problem that natural science faces with regard to the nervous system. When engineers started to develop computers, they had to design machines that could be used as a tool for mental work³³ in their everyday-life (therefore connect with personal experience) and were thus not subjugated to physical laws but personal judgement.³⁴ And at the same time the machines needed to have a physical description in order to be reliably realised as a physical entity and hence within the constraints of physical laws. The technical problem has, however, been solved and we today have mathematical models that axiomatically describe this solution. And we claim that these models can also be applied to the nervous system and thus can solve the problem of bringing the psychological description of human mind and the physiological description of the human nervous system into a systematic relation.

3.2 Freud and the computer paradigm

After defending the validity of our paradigmatic stance as a natural scientific approach, we shall now – since we are aware that we are defending a view that may arise strong opposition between psychoanalysts – provide evidence that not only is this a valid natural scientific paradigm, but that Freud most likely would not have rejected it either.

To start with this argument, we want to cite the famous quote from *The Interpretation of Dreams*, where Freud first elaborated how the relation between the mental apparatus and the physiological brain is to be conceived.

What is presented to us in these words is the idea of *psychical locality*. I shall entirely disregard the fact that the mental apparatus with which we are here concerned is also known to us in the form of an anatomical preparation, I shall carefully avoid the temptation

³³ When we speak of mental work, we mean tasks that otherwise would be performed by our mind (e.g. calculations).

³⁴ This means that the question, whether a computer is performing its job correctly or not, cannot be generally judged according to physical parameters that measure its technical output, but by the judgement of one or several persons who acknowledge that the given result meets the expectation.

to determine psychical locality in any anatomical fashion. I shall remain upon psychological ground, and I propose simply to follow the suggestion that we should picture the instrument which carries out our mental function as resembling a compound microscope or a photographic apparatus, or something of the kind. On that basis, psychical locality will correspond to a point inside the apparatus at which one of the preliminary stages of an image comes into being. In the microscope and telescope, as we know, these occur in part at ideal points, regions in which no tangible component of the apparatus is situated. I see no necessity to apologize for the imperfections of this or any similar imagery. Analogies of this kind are only intended to assist us in our attempt to make the complications of mental functioning intelligible by dissecting the function and assigning its different constituents to the different component parts of the apparatus.³⁵

It must be highlighted that Freud makes clear that this metaphor is somehow unclear (we will return to this point later, see: 3.4), so one should be cautious when interpreting it. When looking at the wording itself it is striking that Freud enumerates a microscope, a telescope, a camera and then adds the phrase «or something of the kind», indicating that neither the enumeration is complete nor, more importantly, the category of artefacts in question is named. The three artefacts in question could be categorized as optical apparatuses, and in fact this metaphor is sometimes understood in this way. But if this had been Freud's intention, why didn't he then write «optical apparatuses» instead of using the un-specific formulation «something of the kind»? The answer might be found in the other passages, where Freud repeats this metaphor. The more famous one is in *An Outline of Psycho-Analysis*, where he just mentions the micro- and telescope, and repeats the wording «something of the kind».³⁶ There is however another instance where Freud enumerates the three optical artefacts mentioned above and provides a fourth object, thus shedding some light on what might be meant with «something of the kind».

With every tool man is perfecting his own organs, whether motor or sensory, or is removing the limits of their functioning. Motor power places gigantic forces at his disposal, which, like his muscles, he can employ in any direction; thanks to ships and aircraft neither water nor air can hinder his movements; by means of spectacles he corrects defects in the lens of his own eye; by means of the telescope he sees into the far distance; and by means of the microscope he overcomes the limits of visibility set by the structure of his retina. In the photographic camera he has created an instrument which retains the fleeting visual impressions, just as a gramophone disc retains the equally fleeting auditory ones; both are at bottom materializations of the power he possesses of recollection, his memory.³⁷

³⁵ Freud, S. (1900b), p. 536.

³⁶ Freud, S. (1940), p. 145.

³⁷ Freud, S. (1930), *Civilization and Its Discontents*, pp. 90-91.

It strikes the eye that here the series is continued with the «gramophone disc», which is not an optical apparatus at all. He then names the commonality between the gramophone disc and a photograph with the expression: materializations of memory. From here it is just a small step to find the expression that names the commonality of all named objects: materialisations of mental faculties. In this regard the micro- and telescope improve our vision, which is part of perception, a camera produces a materialization of a visual memory and is itself therefore a materialization of a mnemonic system. «Materialisations of mental faculties» is most likely to be understood in the way of: material objects (i.e., objects that can be described physically and thus be technically realized) that by virtue of their structure support parts of our mental faculties. And it happens to be the case that this is what computers are; so much so that the artefacts enumerated by Freud appear as primitive materialisations of mental faculties, since modern computers cannot just support one of our mental faculties but several of them and in part they can even replace our mental work (most prominently the work of performing calculus tasks, i.e., computing, which they were originally designed for and what gave them their name in English).

And it doesn't stop here. It is not only the case that artificial computers fit into the deduced category of «materialisations of mental faculties». It is also a matter of fact that today most of the photographs we make and store as well as the most materially stored songs are stored on: computers or devices that have to be read out by computers. So even if one does not follow our deduction of the category of «materialisations of mental faculties», it is a matter of fact that the tasks that were performed by the artefacts used by Freud as illustrations today are performed by computers. And the explicitly used category of «materialisations of memory» today also contains hard- and flash-drives, i.e., artefacts that are part of computers.

Taken together Freud's statements make clear that he was using a technical metaphor that comes very close to computers. We are therefore proposing just a small step, when we propose to go a step further and accept the computer paradigm. A small step that makes it possible to bring metapsychology into the realm of natural sciences and test its models and refine them by means of replicable experiments (see next section). We are convinced that Freud would welcome this step, given that by making it one can show that his claim, that psychoanalysis is a natural science «like any other», was correct. In other words: The artefacts that served him to develop an imagery, that has «imperfections» for which Freud considered it to be superfluous to apologize for, have evolved into artefacts for which tried and tested methods and models exist, which make it possible to systematize and test his metapsychological theories. We therefore think we owe thanks to Freud for developing this imagery with its «imperfections».

3.3 How computers are described – the theory of Mealy

After having clarified the meaning of the computer paradigm and having shown that it is compatible with Freud's thinking, we now want to present a concrete approach, which is based on the computer paradigm. Since the question whether the brain is to be seen as a computer or not is usually heatedly debated, it is often forgotten that the question of how exactly the brain should be methodologically tackled, if one accepts the computer paradigm, is itself a highly complicated question. Accordingly, there are different approaches, and we defend a specific one that shall be sketched out here.

The general line of approach, that is often favoured, is to reconstruct (e.g., by simulating) the physiological structure of the nervous system or its behaviour and thus try to figure out how the mind works, as it is often done in the Blue-Brain-Project.³⁸ The problem this approach faces is, that the task of inferring the way in which the mental processes function from merely studying the processes within the physiology of the system or its behaviour is far too complicated for this approach to be viable. In fact, this approach is usually not used in computer design and is thus at odds with the standards of computer technology. The approach that we defend and which has been realised in the project SiMA (Simulating the Mind and Applications),³⁹ by which its validity has been shown⁴⁰ (both for clinical⁴¹ as well as technical,^{42,43} applications) relies on the fundamental principles of computer design, which we shall explain in a moment. Before we dive deeper into this topic, we shall for the moment just sketch out the general idea of our approach, which is to develop an IPS that has the same abilities as the mental organ⁴⁴ of humans. The way to approach this is to start with a very abstract model

³⁸ <https://www.epfl.ch/research/domains/bluebrain> (last checked on 30th of August 2022).

³⁹ Dietrich, D. (2021), *Simulating the Mind II – Psychoanalyse, Neurologie, Künstliche Intelligenz: ein Modell*.

⁴⁰ Brandstätter, C., Dietrich D., Doblhammer, K., Fittner, M., Fodor, G., Gelbard, F., Huber, M., Jakubec, M., Kollmann, S., Kowarik, D., Schaat, S., Wendt, A., Widholm, R., Bruckner, D., & Muchitsch, C. (2015), *Natural Scientific, Psychoanalytical Model of the Psyche for Simulation and Emulation Scientific Report III*.

⁴¹ Löffler-Stastka, H., Dietrich, D., Sauter, T., Fittner, M., & Steinmair, D. (2021), *Simulating the mind and applications – a theory-based chance for understanding psychic transformations in somatic symptom disorders*.

⁴² Zucker, G., Wendt, A., Habib, U., Schaat, S., Siafara, L. C., & Blöchle, M. (2015), *Building Energy Management and Data Analytics*.

⁴³ Pongratz, M., Mironov, K. (2015), *Accuracy of positioning spherical objects with a stereo camera system*.

⁴⁴ At this point a definition of terminology is necessary. The theory of Mealy describes an IPS with two layers. The physical layer and the information layer, and the IPS consists of both, thus both layers are, so to speak, subjugated models. In terminology of information

that resembles just in a very general and simple way a mental organ of a human. This model then needs to be refined by means of experimental iterations so that it comes ever closer to the mental organ of a human. The way to do this is by running simulations of concrete scenarios (so called: use cases) to test whether the system really behaves as expected. If it does not, the model must be adapted until it does, and when it does the next step in direction of refinement can be taken. This is the standard iteration between prediction, experiment, observation, adaption of theory, prediction and so on, on which natural sciences rely or at least which they try to develop.⁴⁵

Why is this of relevance for metapsychology? To answer this question, we must explain the fundamental principles of computer design. These principles are relevant for the simple reason that the project SiMA is about developing a simulation of an IPS that emulates the mental organ of humans. Therefore, it is a necessity for this approach to apply the existing principles of the development of IPS. To help the reader understand these tools we shall explain in a general way the information theory that became fundamental for information technology: the theory of Mealy.⁴⁶

Mealy dealt with the problem we mentioned before: having to design a system that can process information and at the same time can be described physically. He solved the problem by developing a model that consists of two layers of description (i.e., subjugated models). In one of the two layers the methods of physics are used, in the other one those of information theory. The overarching model thus defines two modes of description that both are, regarding the laws and methods of description employed, independent from each other. However, while the modes of description are independent the layers of the overarching model are not totally independent: they are connected via the (elementary) information contents, that

technology the overarching model corresponds to the term «computer» or «IPS». Just think about your everyday-life use of the word «computer»: you probably never imply that you are exclusively talking about the hardware or the programs and applications running on it respectively, you always refer to the totality of both.

If we apply Mealy to the question of mind and brain the term for the physical layer is «nervous system», since a nerve is an entity defined by microbiology and anatomy (the brain being part of the nervous system). The information layer is the mental apparatus, as it was conceptualized by Freud. (We will show the validity of this apprehension in the following part of this article.) What is missing is a term that refers to the totality of mental apparatus and nervous system. The word chosen by us is «psychisches Organ», «mental organ» in English. It has an associative link to the biological understanding, since organisms consist of organs, as well as to the psychological understanding: both due to the word «mental» and the fact that the mental functioning is what constitutes its apprehension as one organ – anatomy dissects the nervous system into different organs.

⁴⁵ Please note that, in our understanding, all natural scientific models always are just approximations to reality, they cannot possibly display reality itself.

⁴⁶ Mealy, G. (1955), *A method for synthesizing sequential circuits*.

need to be defined in the physical block by means of physical laws and values, and in the information block as elementary information contents.

The result of this solution is that a description of a computer consists of two layers. The first layer describes the computer as a physical entity and the second layer as an information entity. The description of the second layer is, with regard to applied laws and entities, independent from the first layer, i.e. it is not based on physical laws but on logical laws; but it is not totally detached from it, since the elementary information contents provide a link to the physical description. These logical laws of the information layer can be chosen more or less freely as long as the following constraints are respected:

1. the description has to be formulated in an axiomatic manner and has to be free of contradictions;
2. the description has to describe the information system in a functional manner, i.e. as a system consisting of functions (function in the mathematical sense, i.e., an input-output relation, the most general form being: $f(x) = y$; not «function» in the sense of «role» or «purpose», or «functional» in the sense of «of value for adaptability» or «practical»);
3. the input and output structures (i.e. sensors and actuators) into the system have to be defined;
4. the information contents have to be defined, so that the translation from the information layer into the physical layer is possible;
5. the information-layer has to be described in its entirety, i.e., as one functional unity, from which follows that for every possible state in which the system can be placed, the model has to provide a prediction of how it will react.

As long as these constraints are respected, any form of description for the information layer is viable. Thus, it is possible to make an arbitrarily high number of layers. This made it possible to use Mealy's theory to develop the model that today is a basic model for the description of all computers (ISO/OSI-model).⁴⁷

The detail about the theory of Mealy, which is of crucial importance for metapsychology, is that this theory dictates, that it is indeed mandatory, when designing an IPS, to begin the description with the information layer and its application in everyday life. Only after the information layer is fully described, it is possible to deduce from this description how the system can be realised physically (in other words: how the hardware is to be designed). This approach is called top-down approach and has become the standard approach for designing IPS.⁴⁸

⁴⁷ Dietrich, D. (2021), pp. 133-138.

⁴⁸ In contrast to this, the approach of first trying to figure out how the hardware is structured and functions, before one develops the information layer, is called bottom-up approach.

3.4 Consequences of the computer paradigm and Mealy's theory for metapsychology

If one applies the theory of Mealy to the mental organ, it becomes a necessity to follow the top-down approach and hence to first develop a description of the mental organ exclusively as a functional information-system which comes in simulations sufficiently close to the mental system of humans. To put it in a trenchant way: *Mealy shows that, to understand the brain, we first need to understand the mind.* Hence, one first needs a description of the mind as an information processing system, which abides to the 5 constraints mentioned above.

*It turns out that the only psychological theory, that is known to us, that comes close to fulfilling those constraints is Freud's metapsychology, especially the structural model of the mental apparatus, since only this model describes the mental apparatus entirely as a functional unity that operates exclusively following mental laws.*⁴⁹ The elementary information contents were defined in the course of Freud's metapsychological works as well as the input- and output-structures of the mental apparatus. Notwithstanding these strengths, metapsychology just *comes close* to fulfilling these constraints, because Freud's metapsychology is not written with an axiomatic language. But Freud's terminology in the metapsychological texts is a far more logically refined than in other texts, which makes it possible to work out an axiomatic formulation of the metapsychological models and theories; this task is one of the tasks that need to be solved in SiMA.

Some readers might have noticed that this way of approaching the task of describing the mental organ makes the above quoted passage of *The Interpretation of Dreams*, where Freud first introduces the concept of the mental apparatus, understandable. Freud is there fully in line with the constraints dictated by Mealy's theory, when he writes that «[he] shall entirely *disregard the fact* that the mental apparatus with which we are here concerned is also *known to us* in the form of an anatomical preparation, [he] shall carefully avoid the temptation to determine psychical locality in any anatomical fashion».⁵⁰ What makes Freud's stance so difficult to understand, and is probably the main cause of controversial discussion of this passage, is that within the same sentence he acknowledges as a *fact*, that the mental apparatus is also *known to us* as an «anatomical preparation», but at the same time mandates that this fact is to be *disregarded*. This seemingly paradoxical formulation allowed authors to interpret metapsychology in two ways

⁴⁹ Note that it is everyone's scientific freedom to provide an alternative model and test it according to the standards of Mealy's theory. Up to this date we did not encounter any other theory that suffices the constraints of Mealy's theory as Freud's metapsychology does. The value of Freud's metapsychology does not rely on personal taste but on the rules of Mealy's theory.

⁵⁰ Freud, S. (1900b), p. 536. [our highlights.]

that are in contradiction with each other – and in fact also with Freud’s writing. On the one hand, some interpret metapsychology as an attempt to describe a system that is also physiologically describable, since Freud asserts that the mental apparatus is also known as an anatomical preparation – the «neuropsychology in disguise»-fraction. On the other hand, others understand metapsychology as an attempt to develop a purely mental system that either has no relation to neurophysiology or this relation is irrelevant, like Kanzer or Schmidt-Hellerau. Their opposition can be basically expressed by which of the two words («disregard» and «fact») is stressed.

What both sides get wrong is that Freud uses both words, i.e., he makes both assertions, and both are to be given full weight. This at first sounds contradictory: how can a scientist disregard something when it is a fact? How can something be scientifically relevant when it is to be disregarded? This seeming contradiction becomes straightforwardly understandable as a consistent position when reading it with Mealy’s theory in mind. The anatomical preparation and the mental apparatus are two ways in which one and the same thing is known to us, i.e., two different descriptions that make use of different laws in order to make the same thing intelligible to us. From the perspective of somebody who follows the computer paradigm, this is exactly what must be done in order to understand the mental organ. In other words: Freud had the right approach of how the object of inquiry of a natural scientific psychology is to be conceived in relation to the object of inquiry of physiological research.

Hence, the two above mentioned interpretations of metapsychology end up with either having to ignore or at least to downplay the importance of certain passages of Freud; in any case, they end up in contradiction with central tenets of Freud. Most psychoanalysts either hold the latter view or even go as far as negating the importance of metapsychology altogether. One author, who stands out in this regard and had, at least in the German speaking world, a strong influence on Freud exegesis, is Jürgen Habermas, who famously claimed that Freud had misunderstood himself, when he had claimed that metapsychology is a natural science.⁵¹ To which we can now respond that it was not Freud who misunderstood himself, it was Habermas who did not understand metapsychology. In contrast to this position, the «neuropsychology in disguise»-fraction, the members of which correctly emphasize that Freud must be seen as a natural scientist, draw the incorrect conclusion that the mental apparatus is identical with providing a description of the brain-function-landscape like neuropsychology does. Had the mental apparatus been a speculative model of the brain-functions-landscape, Freud would have made that explicitly clear. But instead, he precisely emphasized that this conclusion is to be avoided.

⁵¹ Cfr. Habermas, J. (1968), *Erkenntnis und Interesse*, pp. 300-332.

Having this clarification in mind, let us return to the before quoted passage from *The Interpretation of Dreams* and see how it is continued:

These comparisons are designed only to assist us in our attempt to make intelligible the complication of the psychic performance by dissecting it and referring the individual performances to the individual components of the apparatus. So far as I am aware, no attempt has yet been made to divine the construction of the psychic instrument by means of such dissection. I see no harm in such an attempt; I think that we should give free rein to our conjectures, provided we keep our heads and do not mistake the scaffolding for the building.⁵²

Thus, the idea of a spatial organization is a concept that serves the goal of making intelligible the complication of the psychic performance. The formulation that we shall «not mistake the scaffolding for the building» can thus be understood in the following way: the building would be the sum of all physical processes that happen within the nervous system of the mental organ, that we cannot possibly comprehend as humans without support of another form of description, while the scaffolding is: the mental apparatus. The relation between scaffolding and the building being that one needs a scaffolding to construct a building, expresses Freud's conviction that we can only possibly reach knowledge about the sum of *all* physical processes and the logic of their interaction within the mental organ (i.e., full understanding of the nervous system), if we first develop a sufficiently detailed model of the mental apparatus. This conviction of Freud can be, thanks to Mealy, regarded to be a scientifically correct approach.

Mealy also allows us to reconcile the two above mentioned misunderstandings of Freud's metapsychology. One group emphasizes Freud's repeated stance that psychology is a science in its own right, which cannot be replaced by an anatomical inquiry. While the other side emphasizes that in Freud's view the mental apparatus ultimately consists of physiological processes within the nervous system and can thus be subjugated (at least to some extent) to neuroscientific inquiry. Both camps pick out one side of the truth and ignore the other side, probably because they believe that both sides of the truth contradict each other. Mealy showed us that this is not the case. Precisely in order to understand a physical system that can process information, it is necessary to treat its information layer as a sovereign object of inquiry. Hence, any approach of developing such a system is to be seen as an independent science. It happens to be the case that this is exactly what metapsychology does, and as a consequence metapsychology is a natural science that is in line with the tenets of materialism, first and foremost the conviction that its object investigation in some way exists in the world that is described by physics. Therefore, the sovereignty of metapsychology is precisely backed by the natural

⁵² Freud, S. (1900b), p. 536.

scientific presupposition that the nervous system is the physiological description of the mental organ, it is not challenged by it.

Another concept in this passage, for which Mealy provides clarification, is the concept of «psychical locality», which Freud took over from Fechner.⁵³ Freud makes clear that these localities are to be seen as purely ideal localities and must not be confounded with anatomical ones. In the text that follows, Freud will eventually work out in ever greater detail the model of the mental apparatus as a system where different sub-systems are organized in a spatial way, i.e., one after another. This use of spatial relation provokes to locate these systems within the brain, which is not totally impossible, since in some way they must exist physically. However, it is incorrect to transpose the spatial relations from within the mental apparatus into spatial relations within the nervous system. Space serves within the description of the mental apparatus only as a way to describe functional relations. Accordingly, Freud at the end of chapter 7 of *The Interpretation of Dreams* drops this mode of picturing the apparatus and switches to a processual form of description.⁵⁴ To make clear how radical the ideal space of metapsychology differs from the real space of anatomy: It is not only wrong to identify different systems from the mental apparatus with anatomical structures, but it is also wrong to assume that the different systems of the mental apparatus cannot share a physiological structure. In fact, one and the same brain structure can be part of the physiological realization for many different systems of the mental apparatus.

3.5 Freud's stance as an author and the question of scientific truth

Before we continue, we must address one important point. Namely the fact that Freud himself was not always fully consequent in describing the mental apparatus in accordance with the rules dictated by Mealy's theory. For example, he confused mental space with anatomical space in his first description of the structural model.⁵⁵ Thus, one could call our interpretation of Freud's metapsychology into question since Freud does not adhere always to this view or, as it could also be put, our view does not bring all of Freud's statements into one coherent stance.

Here it must be emphasized that Freud saw himself as a natural scientist. And as such he was during his entire psychoanalytic career developing the model of the mental apparatus further and changing different aspects (e.g., the conceptualization of consciousness⁵⁶), as he gained new psychological insights, which for

⁵³ Freud, S. (1900b), refers on page 536 to Fechner, G. Th. (1889), *Elemente der Psychophysik*, pp. 520-521.

⁵⁴ Cfr. Freud, S. (1900b), pp. 609-611.

⁵⁵ Cfr. Freud, S. (1923), *The Ego and the Id*, p. 24.

⁵⁶ Cfr. Hartmann Cardelle, V. A. (2019), *Metapsychological consequences of the conscious brainstem: A critique of the conscious id*, p. 9.

him were the empirical knowledge the metapsychological model has to be subjugated to.⁵⁷ For this reason, it is impossible to bring all of Freud's statements into one coherent view and therefore this cannot be the ultimate criterion for judging the validity of an interpretation of Freud. On the contrary we believe that in Freud exegesis one has to work out a logical structure of Freud's thought, which was the basis for the developments he made, and show where Freud committed, based on his own standards, a mistake or where, how and why he changed his models of the mental apparatus or his stance on a specific question. Apart from this, we argue that our interpretation is valid based on two main arguments.

First, our interpretation gives Freud the strongest position versus any kind of critique from the realm of natural sciences. In doing so we adhere to the standards Freud set for himself, since Freud called himself a natural scientist and thus, subjugated himself to critique from this realm.

As we said, Freud at times violates the theory of Mealy. We think that this is forgivable as well as understandable. After all Freud developed a way of thinking about an object of inquiry that was radically new – and, insofar it is related to the question of the human mind and its relation to the nervous system, still is. A mathematically systematized version of this thinking should not be developed until the middle of the 1950s, i.e. more than 50 years after the first publication of *The Interpretation of Dreams*. Thus, it is much more than forgivable that Freud did not always adhere to the fundamental principles of this view – after all he was still wrestling with the task of developing this way of thinking, which is still hard to grasp today and even harder to adhere to. However, these instances are not merely a violation of Mealy's principle of separating the physical and information layer, they have a theoretical value not to be ignored, which shall be briefly explained.

Metapsychology deals with two main tasks. The first of these is to develop a model of the mental apparatus. The second is to deal with the question of the relation between the mental apparatus with physiological processes as well as with anatomical structures. Hence, whenever Freud speculates or makes arguments regarding the latter question, this must be differentiated from the former task. To use Mealy in order to illustrate this: Metapsychology not only deals with the task of developing a model of the information layer, it also deals with the question that is solved with the introduction of the information layer and the rules that dictate how the information layer has to be described and how it is connected with the physical layer. The solution of the latter question is the precondition for the former. Consequently, one finds arguments and speculations about the relation between physiology/anatomy vs. the mental apparatus, as well as arguments on how to conceive the mental apparatus in relation to anatomy. These two kinds of arguments must be differentiated.

⁵⁷ Cfr. Freud, S. (1914), *On Narcissism: An Introduction*, p. 77.

The second main argument we bring forward to defend the validity of our interpretation is that our interpretation allows to use Freud's metapsychology to develop a model of the human mind that can be experimentally tested. Therefore, the discussion whether our interpretation of metapsychology is correct or not is in so far irrelevant to us as – irrespectively of whether we succeed in convincing other people of the validity of our view or not – our understanding of Freud's metapsychology was and is helpful for using Freud's texts to develop *experimentally testable models of the mental apparatus*. So even if our understanding were not to be in line with Freud's intentions, it is nonetheless useful for our scientific goal. And as natural scientists, at the end of the day we care more about our goal of developing models that describe parts of reality than adhering to an intention of an author. Albeit we are convinced that precisely in so doing we are adhering to Freud's intentions.

4. Metapsychological critique of the Project and analysis of its reception

Having now clarified the problems surrounding the computer paradigm and having explained how we understand the concept of the mental apparatus as well as metapsychology, we turn to the task of judging the model that Freud worked out in the *Project*.

It should now have become transparent where the fundamental flaw of this model lies: Freud tried to describe the mental organ as physiological system and as a system performing mental processes in one single description, instead of separating the description of the mental apparatus from the neuronal apparatus. Thus, the model of the *Project* and with it the *Project* as a text was bound to fail, i.e., it could not have achieved its own set goal of developing a psychology that is a natural science. No matter how much effort Freud had put into it, he could not have possibly succeeded in working this problem out; his approach in the *Project* was a theoretical dead end. In contrast, when he changed to the approach of *The Interpretation of Dreams*, i.e., describing the mental apparatus purely as an ideal system that processes mental content, he took a stance that is in line with the demands of the theory of Mealy and thus, he developed a psychology that is a natural science: metapsychology. Therefore, the model of the *Project* is not yet a proper metapsychological model because in it the physiological and mental layer are not separated. Neuroscience to this day has not made this separation and thus lags behind Freud's progress.

We believe that Freud somehow sensed that he had run into a dead end and that the approach he eventually published solved this conundrum. This, we believe, is the «extremely good psychoanalytic cause» for dropping the *Project* that was supposed by the authors enumerated above by Sulloway (see: chapter 2.1). Hence Kanzer is wrong, when he accuses them of having mistaken the «scaffolding for the building». On the contrary: Kanzer did not realise that Freud had at that point

not yet made a distinction between the «scaffolding» and the «building».

This of course does not mean that the *Project* has no value; we will enumerate the valuable aspects of the *Project* in a moment. It merely means that the *Project* does not contain a model of the mental apparatus and therefore is, strictly speaking, not a metapsychological text. Therefore, the *Project* is not the text that answers the riddle how the relation between the mental apparatus and the nervous system is to be understood. This riddle can and must be solved by reading closely the published metapsychological texts. It is all written in those texts and Mealy can provide exegetical guidance to better understand the rationale that at first sight might seem contradictory. Just by thinking for a moment about Freud as an author this should become obvious. Freud was a scientist and believed in the progressive forces of science down to the anthropological level.⁵⁸ Why should he have withheld crucial information that is required to understand his concepts and models, as the authors of the «neuropsychology in disguise»-fraction claim, when he put so much effort into making his thinking and his models understandable and popular in the first place? For this goal he even went as far as using technological metaphors that were difficult to comprehend. Had he really held the position attributed to him by this fraction, it would have been much easier to simply write in *The Interpretation of Dreams* that he is referring to the conceptual model of imagining the brain as a landscape of mental functions and that he now is not trying to isolate a singular function, as it had been done before by means of clinical studies, but instead to sketch out a possible general structure of this landscape. That he would have done so is even more obvious when one considers that Freud addressed the first edition of *The Interpretation of Dreams* precisely to neurologists,⁵⁹ who were familiar with the approach of figuring out the functions of different parts of the brain – as was Freud himself. If this had been Freud's idea behind the mental apparatus, why should he have hidden it behind metaphors, as Holt put it, that at the time must have made an extremely dubious impression on the audience? What gain was there for him, when he hoped to get well received by precisely this audience?⁶⁰ The only answer, that does not suppose that Freud was unable to properly articulate his thinking to the targeted audience or that he wilfully wanted to alienate himself from natural science, is that he wanted to introduce a totally new conceptual approach, which was distinct from the mental function landscape of neurology. And he was right to do so because it is precisely the conception of the mental apparatus as an entity that is detached from neurophysiology, which allows for experimental testing and development. While the neuronal apparatus of

⁵⁸ Freud, S. (1927), *The Future of an Illusion*, pp. 50-56.

⁵⁹ «I have attempted in this volume to give an account of the interpretation of dreams; and in doing so I have not, I believe, trespassed beyond the sphere of interest covered by neuropathology.» Freud, S. (1900a), p. XXIII.

⁶⁰ Sulloway, F. (1979), pp. 452-453.

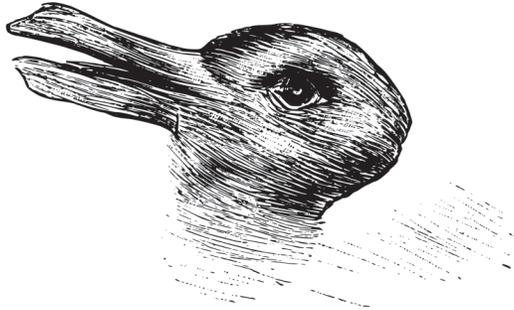
the *Project*, into which Pribram and Gill want to transform the mental apparatus to make it testable, is actually unsuitable for empirical testing and experimental research.⁶¹ Therefore, it is incorrect to assume that we find in the *Project* the hidden truth of metapsychology. There is no hidden truth of metapsychology, the truth is merely difficult to understand.

This being said, we want to state that the *Project* has at least the following utilities:

1. If one puts aside the erroneous way of conceiving the relation between the mental system and the neurological system, and reads the apparatus from the *Project* as if it were a description of the mental apparatus, it provides a series of different conceptualizations of processes within the mental apparatus that can be used for the development of proper metapsychological models.
2. It also contains valuable speculations on the way in which neurons function that have proven to be correct to a large extent. The text thus proves that Freud was in 1895, i.e., several years after starting to work clinically, still an active thinker in the realm of cutting-edge neurological research. Which counters the myth of Freud conceiving psychoanalytic theory purely from psychological clinical work.
3. As an erroneous attempt it gives us insight into how Freud's metapsychological thinking evolved out of the neurological thinking that we know from *Conceptualizing the Aphasias*.
4. Precisely the error that Freud committed when trying to work out this system makes the exegetical discussions on the *Project* a melting pot for all the diverging views on Freud's metapsychology, since it provokes different scholars to figure out how this model could be understood, thus displaying their stance towards Freud as an author.

⁶¹ Cfr. Jonas, E., Kording, K. P. (2017), *Could a Neuroscientist Understand a Microprocessor?*

Welche Thiere gleichen ein- ander am meisten?



Kaninchen und Ente.

Figure 1: Kaninchen und Ente⁶²

If we keep in mind that the model of the *Project* was a scientific dead end, it becomes better understandable how there can be so extremely diverging views on the *Project*. Freud scholars are accustomed to the fact that Freud's texts are logically coherent. Consequently, they try the impossible: they seek a coherent interpretation of a text that is incoherent. This gives the *Project* the quality, to use a metaphor, of a flip-flop image. Just like in the case of a flip-flop image it is valid to say that one sees a rabbit just like it is valid to say that one sees a duck, one can say that the *Project* contains the first description of the logical structure of what should later become the mental apparatus, and one can say that it contains a speculative description of the functioning of the nervous system at the cellular level. These two descriptions arise as a result of trying to read the incoherent text in a coherent manner. However, just like saying that a flip-flop image is only an image of a duck (or a rabbit respectively) is incorrect it is equally incorrect to claim that it only contains a model of an otherwise purely abstract mental apparatus, or conversely that it shows that the mental apparatus is to be understood as a neuronal system. Is it then correct to say that the *Project* contains both? Strictly speaking: no, since both readings are not coherent readings of the text and there are passages, which violate principles of neurology or metapsychology respectively – it is equally incorrect to say that a flip-flop image contains both a rabbit and a duck. The truth of a flip-flop image is that, depending on the focus

⁶² Anonymous author (1892), *Zeitschrift Fliegende Blätter*, p. 145. (downloaded the 2nd of September 2022 from: https://de.wikipedia.org/wiki/Kaninchen-Ente-Illusion#/media/Datei:Kaninchen_und_Ent.svg) Translation of the caption: “Which animals are most alike? Rabbit and duck.”

of attention (or the expectation), it displays a duck or a rabbit to the viewer, and consequently it makes apparent to the viewers the active role they play in the formation of a consciously perceived image. Hence, we argue that the *Project* can either be read as an attempt to model the physiological processes within the nervous system or as a first description of the mental apparatus, depending on the scientific preference the reader has. It thus displays to the reader the stance he or she has with regard to Freud's thinking. In addition to that the inconsistency of the text displays the very problem Freud, as a materialist,⁶³ was wrestling with: to conciliate the fundamental assumption, that everything that is mental ultimately has somehow to be relatable to the physical-chemical description of the world,⁶⁴ with the conviction that the mind is a sovereign object of inquiry that demands an independent scientific description. This is only possible by separating the physical from the mental description as he later did with the mental apparatus. To condense both descriptions into one model makes the model necessarily inconsistent.

Schmidt-Hellerau came very close to understanding this, when she asserted that the *Project* can be read in two ways. But her scientific prejudice towards neurology made her dismiss one of the two perspectives as erroneous and not only favour the perspective, which reads the model of the neuronal apparatus as if it were a model of the mental apparatus, but to claim that this is the truth of the text.

To conclude, we want to pick up Sulloway's judgment that Freud's change from the *Project* to *The Interpretation of Dreams* marked a point where Freud stopped orienting his thinking by the reduction of mental processes to mechanical physiological ones. It is tempting to object to Sulloway's assessment on the grounds that it is precisely the mental apparatus, which allows to make such a reduction. Hence, Freud precisely provided the basis to make such a reduction. However, there is nuance to be respected: Sulloway's point is that Freud did not orient his thinking by it, not that he did not contribute to this scientific reduction. And the irony of Mealy's theory is that one precisely needs to leave physical (i.e., also mechanical-physiological) considerations aside when making a model of the information layer. Thus, Sulloway's assessment is not incorrect; not to mention the fact that the remainder of his book makes an extremely good case on how Freud in the development of his psychological theories (from which metapsychological theories draw)⁶⁵ oriented his thinking by evolutionary biology; a thesis which we consider to be correct and of high value for the understanding of Freud's thinking. Nevertheless, there remains one riddle: did Freud conceive the mental apparatus in the way he did, because he had given up on providing a way

⁶³ Cfr. Freud, S. (1941), *Psycho-Analysis and Telepathy*, p. 179.

⁶⁴ Freud, S. (1940), p. 182.

⁶⁵ See for our general understanding of the distinction between psychological and metapsychological theories of psychoanalysis: Brook, A. (1998), *Neuroscience versus Psychology in Freud*.

for a physiological mechanical reduction, or was he convinced that he was providing the scientific basis for such a reduction? If the latter were to be true, then Sulloway would, strictly speaking, be wrong on that point, albeit he correctly understood that the mental apparatus does not directly provide a conceptual reduction to the physical-chemical realm of thought. However, we must admit that we cannot prove the latter answer to be true. And we assume that this answer might appear improbable to many. We, however, think that it is possible that it is true. The reason being that in order to reduce one object of inquiry to another object of inquiry, one needs a properly worked out conception of the thing to be reduced in the first place. Hence, a reduction to the physical and physiological realm necessitates a metapsychological model, or at least something like it. To understand this, one does not need Mealy, one needs Mealy to show that it is a scientific fact. But this is just our intuition, we must admit that this question cannot be conclusively answered. Either way: Sulloway got on this point far more correct than he might have gotten wrong.

To conclude, we can firmly state that, irrespective of Freud's personal view on this question, he provided us through metapsychology with the conceptual material that allowed us to develop in SiMA a natural scientific model of the human mind that can be further developed by means of simulation experiments. And via the conception and methodology of psychoanalysis, he provided us with the means to further develop this model through psychological investigation. Therefore, we can concur with Freud's judgement: psychoanalysis is a natural science – a natural science that, unlike others, is able to form a bridge to the soft sciences.

Bibliography

- Anonymous author (1892). *Zeitschrift Fliegende Blätter*, 2465, 145. Braun & Schneider.
- Bernfeld, S. (1955). Sigmund Freud: The Origins of Psychoanalysis; a Book Review. *The Psychoanalytic Quarterly*, 24, 37-49.
- Brandstätter, C., Dietrich, D., Doblhammer, K., Fittner, M., Fodor, G., Gelbard, F., Huber, M., Jakubec, M., Kollmann, S., Kowarik, D., Schaat, S., Wendt, A., Widholm, R., Bruckner, D., & Muchitsch, C. (2015). *Natural Scientific, Psychoanalytical Model of the Psyche for Simulation and Emulation Scientific Report III*. Vienna University of Technology.
- Brierley, M. (1967). Review of The Standard Edition of the Complete Psychological Works of Sigmund Freud. *The International Journal of Psycho-Analysis*, 48, 323-326.
- Brook, A. (1998). Neuroscience versus Psychology in Freud. *Annals of the New York Academy of Sciences*, 843, 66-79.
- Centonze, D., Siracusano, A., Calabresi, P., & Bernardi, G. (2004). The Project for a Scientific Psychology (1895): a Freudian anticipation of LTP-memory

- connection theory. *Brain Research Reviews*, 46(3), 310-314.
- Dietrich, D. (2021). *Simulating the Mind II – Psychoanalyse, Neurologie, Künstliche Intelligenz: ein Modell*. Shaker Verlag.
- Erikson, E. H. (1955). Freud's "The Origins of Psycho-Analysis". *International Journal of Psycho-Analysis*, 36, 1-15.
- Fechner, G. Th. (1889). *Elemente der Psychophysik* (2nd ed.). Breitkopf und Härtel.
- Freud, S. (1891). Zur Auffassung der Aphasien. In C. Tögel & U. Zerfaß (Cur.), *Sigmund Freud Gesamtausgabe* (Vol. 3, pp. 13-106). Psychosozial-Verlag.
- Freud, S. (1900a). *The Interpretation of Dreams*, SE, 4.
- Freud, S. (1900b). *The Interpretation of Dreams*, SE, 5.
- Freud, S. (1914). *On Narcissism: An Introduction*, SE, 14.
- Freud, S. (1923). *The Ego and the Id*, SE, 19.
- Freud, S. (1927). *The Future of an Illusion*, SE, 21.
- Freud, S. (1930). *Civilization and Its Discontents*, SE, 21.
- Freud, S. (1940). *An Outline of Psycho-Analysis*, SE, 23.
- Freud, S. (1941). *Psycho-Analysis and Telepathy*, SE, 18.
- Freud, S. (1950). *Project for a Scientific Psychology*, SE, 1.
- Habermas, J. (1968). *Erkenntnis und Interesse*. Suhrkamp.
- Hartmann Cardelle, V. A. (2019). Metapsychological consequences of the conscious brainstem: A critique of the conscious id, *Neuropsychoanalysis*, 21(1), 3-22. <https://doi.org/10.1080/15294145.2019.1620628>
- Holt, R. R. (1965). A review of some of Freud's biological assumptions and their influence on his theories. In N. S. Greenfield, W. C. Lewis (Cur.), *Psychoanalysis and Current Biological Thought* (pp. 93-124). Madison and Milwaukee: University of Wisconsin Press.
- Holt, R. R. (1968). Beyond Vitalism and Mechanism: Freud's Concept of Psychic Energy. In B. B. Wolman (Cur.), *Historical Roots of Contemporary Science* (pp. 196-226). New York: Harper & Row.
- Jonas, E., Kording, K. P. (2017). Could a Neuroscientist Understand a Microprocessor? *PLoS Computational Biology*, 13(1), e1005268. <https://doi.org/10.1371/journal.pcbi.1005268>
- Jones, E. (1953). *The Life and Work of Sigmund Freud* (Vol. 1). Basic Books.
- Kanzer, M. (1973). Two prevalent misconceptions about Freud's "Project"(1895). *The Annual of Psychoanalysis*, 1, 88-103.
- Kris, E. (1954). *Introduction to The Origins of Psychoanalysis, Letters to Wilhelm Fliess, Drafts and Notes: 1887-1902*. Edited by: M. Bonaparte, A. Freud, E. Kris. (E. Mosbacher, J. Stratchey, Transl.). Imago Publishing Company.
- Löffler-Stastka, H., Dietrich, D., Sauter, T., Fittner, M., & Steinmair, D. (2021). Simulating the mind and applications – a theory-based chance for understanding psychic transformations in somatic symptom disorders. *World Journal of Meta-Analysis*, 9(6), 474-487, doi: 10.13105/wjma.v9.i6.474

- Mealy, G. (1955). A method for synthesizing sequential circuits. *Bell Labs Technical Journal*, 34(5), 1045–1079.
- Pongratz, M., Mironov, K. (2015). Accuracy of positioning spherical objects with a stereo camera system. *2015 IEEE International Conference on Industrial Technology* (pp. 1608-1612). IEEE.
- Pribram, K. H., Gill, M. M. (1976). *Freud's 'Project' Re-Assessed: Preface to Contemporary Cognitive Theory and Neuropsychology*. Basic Books.
- Schmidt-Hellerau, C. (1995). *Lebenstrieb & Todestrieb, Libido & Lethe*. Verlag Internationale Psychoanalyse.
- Strachey, J. (1966). Editor's Introduction to "Project for a Scientific Psychology". In J. Strachey, A. Freud, A. Strachey, A. Tyson, A. & Richards (Cur.), *The Standard Edition of the Complete Psychological Works of Sigmund Freud* (Vol. 1). London: The Hogarth Press and The Institute of Psycho-Analysis.
- Sulloway, F. (1979). *Freud, Biologist of the Mind: Beyond the Psychoanalytic Legend*. Basic Books.
- Wiener, N. (1948). *Cybernetics or Control and Communication in the Animal and the Machine*. The MIT Press, Cambridge MA.
- Zucker, G., Wendt, A., Habib, U., Schaaf, S., Sifara, L. C., & Blöchle, M. (2015). Building Energy Management and Data Analytics. *5th International Symposium on Smart Electric Distribution Systems and Technologies* (pp. 462-467). IEEE.