

THE GENOME AS THE BIOLOGICAL
UNCONSCIOUS – AND THE UNCONSCIOUS AS
THE PSYCHIC ‘GENOME’:
A PSYCHOANALYTICAL REREADING OF
MOLECULAR GENETICS

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ABSTRACT: 1900 was a remarkable year for science. Several ground-breaking events took place, in physics, biology and psychology. Planck introduced the quantum concept, the work of Mendel was rediscovered, and Sigmund Freud published *The Interpretation of Dreams*. These events heralded the emergence of completely new areas of inquiry, all of which greatly affected the intellectual landscape of the 20th century, namely quantum physics, genetics and psychoanalysis. What do these developments have in common? Can we discern a family likeness, a basic affinity between them, so that we can use the one to deepen our understanding of the other? One common denominator is that they open up realms of inquiry that are significantly different from the world of everyday experience, namely the realm of elementary particles, of genes and genomes, and of the unconscious. But to what extent can we meaningfully argue, for instance, that the genome is the biological unconscious, and the unconscious the psychic genome? To address these questions, I will build on the work of two key intellectual figures who have explored the affinities of these developments in depth, namely Erwin Schrödinger (a quantum physicist and avid reader of Schopenhauer who initiated molecular biology) and Jacques Lacan (who reframed the specificity of psychoanalysis with the help of 20th century science: the era of structural linguistics, but also of quantum physics, molecular biology, bioinformatics and DNA).

KEYWORDS: 1900; Genomics; Psychoanalysis; Erwin Schrödinger

INTRODUCTION: THE YEAR 1900

1900 was a remarkable year – an *annus mirabilis* – for science. Several ground-breaking events took place: in physics and biology, but also in psychology. Max Planck introduced the quantum concept, the work of Gregor Mendel was rediscovered, and Sigmund Freud published *The Interpretation of Dreams*.¹ These three events triggered the emergence of completely new areas of inquiry, all of which greatly affected the intellectual landscape of the 20th century, namely quantum physics, genetics and psychoanalysis. The quantum concept paved the way for the emergence of elementary particle physics, the discovery of anti-matter and the Large Hadron Collider at CERN (where the ‘hunt’ for the inexorable Higgs-boson has apparently achieved its goal). The rediscovery of Mendel inaugurated the birth of genetics and the gene concept, thereby setting the scene for the rise of molecular biology in the second half of the 20th century, culminating in the sequencing of the human genome (1990-2003). And psychoanalysis, although grounded in late nineteenth-century neurophysiology, had a significant impact, not only on psychotherapy, but also on the humanities (from philosophy up to literature studies) and on culture and self-understanding at large.²

The question addressed in this paper is: what do these three developments have in common? They all have been truly revelatory in the sense of opening up new realms of research, significantly different from the familiar world of every-day human experience, namely the *quantum world* (as opposed to the macro-world of classical physics), the *genome world* and the molecular structure of genotypes (as opposed to the organismal and phenotypic world of traditional biology) and the *unconscious* (as opposed to conscious mental life and human agency). But otherwise, at first glance at least, these strands of intellectual development seem to represent worlds apart from one another:

Φ	B	Ψ
Max Planck	Rediscovery of Mendel	Sigmund Freud
Quantum concept	Mendel’s laws of inheritance	Interpretation of symptoms / dreams
Quantum physics	Genetics	Psychoanalysis
The quantum world	The genotype / the genome	The unconscious
Atoms	Genes	Unconscious drives

¹ Actually, the book was published on November 4, 1899, but it was decided to put the year 1900 on the front page.

² In *Die Frage der Laienanalyse* (The question of lay analysis) Freud already argues that therapy is one application of psychoanalysis among others and that its future may rather be in the humanities (1926/1948, p. 283).

Elementary particles physics	Molecular biology, genomics	Depth psychology, psychoanalytic humanities
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And yet I will argue that, on closer inspection, they do have a number of key features in common. A remarkable ‘family likeness’ can be discerned between them, so that one can be used to further our understanding of the others, and vice versa.

Moreover, this family likeness has become more apparent as the 20th century unfolded. Notably, two key intellectual figures played a decisive role in discerning the connections between these (initially quite separate) strands of research, which I will refer to as ϕ , β and ψ . First of all, I will build on the work of Erwin Schrödinger (1887-1961), a key protagonists of quantum physics who, after being awarded the Nobel Prize in 1933 for his discoveries in the field of wave mechanics in 1926 (resulting in the famous *Schrödinger equation*), gave a series of lectures in 1943 entitled *What is life?*, heralding the molecular turn in biology. This resulted in the discovery of DNA by Watson and Crick ten years later (1953), thus establishing a (molecular) bridge between ϕ and β . In the same year (1952-1953), the French psychoanalyst Jacques Lacan (1901-1981) inaugurated a lecture series (the famous *Séminaires*) in which he reframed the Freudian conception of the unconscious with the help of contemporary research fields, notably linguistics, but also cybernetics, informatics and molecular biology – thus bridging ψ and β :

ϕ	B	ψ
Planck (1900)	Mendel (1900)	Freud (1900)
Schrödinger (1943) \longrightarrow	Watson and Crick (1953) \longleftarrow	Lacan (1953 -)

Is there a (more than superficial, in-depth) affinity between these developments? And can a comparative analysis, using psychoanalysis as its conceptual frame of reference, deepen our understanding of their significance?

The design of the paper is as follows. First of all, I will describe the three events, and the developments unleashed by them, in more detail. Next, I will outline the role of Erwin Schrödinger in the molecularisation of biology (bridging ϕ and β). Notably, I will focus on his speculations concerning the *genom* (spelled without an *e* at the end). Subsequently, I will analyse Lacan’s reframing of the Freudian unconscious, paying special attention to references to molecular biology as an emerging bridge from ψ to β . Finally, I will address the extent to which we may see the genome as the ‘biological unconscious’, and the unconscious is the ‘psychic genome’. Like Sanches Faveret (2002) I will argue that (contrary to what is often claimed) contemporary science, rather than undermining psychoanalysis, helps us to reassert its specificity, while only

psychoanalysis really allows us to discern the deeper significance of the scientific revolution (still raging) that was unleashed a century ago.

A THREE-FOLD SCIENTIFIC REVOLUTION

In 1900, the German physicist Max Planck (1858 – 1947) discovered that light and other forms of energy are discharged, emitted and absorbed in discrete packets which he called ‘quanta’. On December 14, 1900, he reported his findings to the German Physical Society, an event which signalled the beginning of ‘quantum’ physics. On the quantum level, phenomena cannot be explained by the same laws and principles that allow us to make sense of the macro-world of human experience (Planck 1901). Quantum changes occur in a leap-like, unpredictable fashion. In this strange and unimaginable realm, a formerly unknown world seemed waiting to be uncovered. The quantum concept provided the stepping-stone for research into the elementary particles of energy and matter, culminating in the quest for the Higgs-boson (the ‘grail’ of contemporary physics).³

In the Spring of that same year, a publication by the Austrian monk Gregor Mendel (1822-1864) was suddenly rediscovered by three (or even four)⁴ biologists who, more or less independently from one another, “chanced upon the same article at almost exactly the same time” (Henig, p. 178). Mendel’s work had been sporadically cited over the years in botanical books and journals, but now its ground-breaking significance was suddenly recognised. His famous pea experiments led to the discovery of the ‘elementary particles’ of life, which he referred to as ‘elements’, but which came to be known as genes. Mendel (1866/1913) surmised that beyond the visible phenomena of life, there is a hidden realm where discrete ‘elements’ (which are either present or absent) determine the visible features of organisms. Hendrik de Vries (one of his re-discoverers) subsequently showed that at this micro-level, changes tend to occur in a sudden, discontinuous, leap-like fashion, a phenomenon for which he coined the term ‘mutation’. As Schrödinger later noticed in *What is life?* (p. 36), these jump-like, discontinuous changes (in research field β) are remarkably reminiscent of the ‘quantum jumps’ studied in research field ϕ . Mutations are leap-like changes in the molecular structure of a gene. Therefore, mutation theory is the “quantum theory of biology” in a more than figurative way (p. 36). Both “great theories” (quantum physics and genetics) not only coincide in time (p. 51), but also convey the same basic idea. We may see the new biology, building on Mendel’s work, as *depth* biology, focussing

³ <http://news.brown.edu/pressreleases/2012/07/higgs> [consulted: July 2013]

⁴ By De Vries, Correns and Tschermak and, slightly later, Bateson, who would become the most devoted ‘apostle’ of the new gospel (Henig 2000).

attention on a formerly inaccessible, hidden realm within the nucleus of a living cell. In the same way, we may refer to quantum physics as *depth* physics, exploring the behaviour of particles on atomic levels. Thus, the year 1900 symbolised the onset of what in retrospect came to be known as the “century of the gene” (Fox-Keller 2000), culminating in the human genome sequence, the ‘grail’ of biology (Lee 1991).

The phrase ‘depth biology’ points to the third revolutionary strand taking off in 1900, namely psychoanalysis or ‘depth psychology’, inaugurated by Freud’s magnum opus *Die Traumdeutung* (1900/1942).⁵ Throughout the 19th century, various conceptions of the unconscious had been put forward (by authors such as Eduard von Hartmann), but Freud introduced a completely new methodology (‘sui generis’) for studying this unknown realm in a systematic manner (namely through a symptomatic reading of discourses of patients, novelists and many others). His approach bears some striking similarities both with the new physics (i.e. quantum physics) and with the new biology (i.e. genetics). This is already suggested by one of Freud’s earliest psychoanalytical texts, namely the *Entwurf* (‘Project’, Freud 1895/1950), describing the psyche as a system in which energy ‘quanta’ move about. But it also becomes evident in his final text, the *Abriss* (‘Outline of psychoanalysis’ 1938/1941) in which he argues that the unconscious (*Es* or *id*) is the oldest psychic province or realm, containing everything that is *inherited* [my italics] and present at birth.⁶

Throughout his writings, Freud insisted that the unconscious really is a different realm, with a peculiar logic of its own, unlike the functioning of the conscious mind: an invisible stratum to which the basic categories of space, time and causality no longer apply and which can only be studied indirectly, through symptoms such as anxieties, slips of the pen (the discursive version of ‘mutations’) and other instances of behavioural deviance - much like elementary particles can only be studied indirectly, through traces in cloud chambers, while genes are studied through biological ‘symptoms’ resulting from mutations (either occurring spontaneously or caused by environmental factors such as radioactivity).

Besides the fact that all three strands were initiated by German-speaking (German and Austrian) authors – a reminder that German was once the academic *lingua franca* of the pre-War epoch - some other family resemblances can be pointed out as well. One important common feature is the discontinuity, the gap (or split), between ‘surface’ and ‘depth’. Psychoanalysis discerns a discontinuity between the phenomenological world of everyday consciousness on the one hand, and the realm of

⁵ The “textbook of psychoanalysis”, according to Lacan (2013, p. 426).

⁶ “Die älteste dieser psychischen Provinzen oder Instanzen nennen wir das *Es*; sein Inhalt ist alles, was ererbt, bei Geburt mitgebracht, konstitutionell festgelegt ist” (1938/1941, 68/69). I will return to this important quotation later.

unconscious thoughts and wishes (surfacing in symptoms) on the other. In physics, it is the gap between the deterministic world of classical physics, unfolding on the scale of human sensory experience, and this other, hidden, capricious world, where leap-like changes occur which we are principally unable to notice directly and which defy the ordinary rules of logic (for instance: electrons taking up two possible positions at the same time). Special techniques must be developed to study this weird region, such as double-slit experiments. Likewise, genetic experiments must be conducted to study the behaviour of genes with the help of statistics. All these hidden, capricious entities of 20th century science (particles, genes, repressed desires, and so forth) are visible only through their *traces* (in clouds chambers, phenotypic features, neurotic symptoms, and the like). I will now elaborate these family resemblances between ϕ , β and ψ in more detail, starting with the bridge erected by Erwin Schrödinger between ϕ and β .

SCHRÖDINGER'S IMPACT

Schrödinger was one of the most prominent representatives of the new 'depth' physics. He was awarded the Nobel Prize in 1933 for his seminal discoveries in 1926, one of the highlights of 20th century physics, resulting in the famous Schrödinger equation ($H\Psi = E\Psi$), regarded by many as equalling Einstein's $e = mc^2$ in significance.⁷ Yet, from his student days at the University of Vienna onwards, he developed a profound interest in biology as well. With his close friend Franz Frimmel (a biology student) he spent countless hours discussing the origins of life, taking long walks about the city, engrossed in conversation.⁸ Notably, they read and discussed in great detail the book *Die Mneme als erhaltendes Prinzip* ["The mneme as a preserving principle"] by Richard Semon (1904/1908) which endeavoured to explain how information is engraved (recorded) and transmitted by living organisms. Schrödinger's life-long interest in biology culminated in his lecture series *What is life?*, presented during his Dublin exile in 1943 and published as a best-selling book in 1944. This series inaugurated the emergence of molecular biology as a research field and heralded the massive post-war exodus of physicists into the emerging life sciences.

⁷ Schrödinger's discovery is one of the most telling modern examples of a scientific *eureka*-experience, shrouded in mystery. The pivotal insight suddenly came to him while spending his Christmas leave in Arosa, an alpine *Kurort* at 1700 altitude in Switzerland, in the company of a woman (not his legal wife) whose identity has never been disclosed. At a certain point, 'it' must have happened, but Schrödinger never went into much detail as to exactly how his brilliant discovery was made. All of a sudden it was there, fuelling a series of papers that immortalised his name and enabled him to acquire distinguished professorships, one of them in Dublin.

⁸ These discussions between a biologist and a physicist are reminiscent of the deliberations between Watson (a biologist) and Crick (a physicist) who likewise used to walk about the Cambridge campus discussing DNA.

Ten year after, in 1953, James Watson and Francis Crick discovered the structure of DNA. Together with Maurice Wilkins they were awarded the Nobel Prize in 1962.⁹ All three laureates published extensive memoirs, and in all of them, the crucial role of Schrödinger's message is explicitly acknowledged.¹⁰ Right in the beginning of his autobiographical best-seller *The Double Helix*, James Watson (1968/1996) mentions Schrödinger as a key source of inspiration, for himself, but also for Francis Crick.¹¹ The latter confirms this in his own autobiography (1988, p. 18), while a similar passage can be found in Wilkins's autobiographical account (2003/2005). After describing the extent to which physicists had been involved in wartime military activities such as cracking the code and developing the atomic bomb, it was Schrödinger who made Wilkins set his mind on gene research.¹² After reading the book, Wilkins decided to become a "biophysicist". Several other 'converts' can be added to this list.¹³

Still, Schrödinger's role in the coming of age of the modern life sciences is not beyond dispute. Science historian Lily Kay (2000) explicitly down-plays it, aiming to demolish "the Whig mythologies spun around Schrödinger's *What is life?*". According to

⁹ Rosalind Franklin, the other key player in the story, had tragically died at the time the Prizes were awarded (in 1958). Yet, in Brenda Maddox's biography of Franklin (2002) the importance of Schrödinger is likewise stressed: by thinking of living organisms in terms of molecular and atomic structure, Maddox tells us, he helped post-war physicists recover from their "professional malaise" by allowing them to address the problem of life in their own language (p. 123).

¹⁰ As Moore (1989) phrases it: "Schrödinger brought physics to the attention of biologists" and vice versa. Watson read the book in 1946 as an undergraduate at Chicago, undecided what to do. From the moment he read it, he became "polarized towards finding out the secret of the gene ... There is no other instance in the history of science in which a short semi-popular book catalysed the future development of a great field of research. The influence of the book continues to be felt" (p. 403/4).

¹¹ "A major factor in [Crick's] leaving physics and developing an interest in biology had been his reading in 1946 of *What is life?* by the noted theoretical physicist Erwin Schrödinger. This book very elegantly propounded the belief that genes were the key components of living cells and that, to understand what life is, we must know how genes act" (p. 13).

¹² "When [the War came to an end] we scientists began to think about what we would like to do ... I was certain that I did not want to continue nuclear research ... Then [someone] lent me a book with the rather ambitious title *What is life?* It was written by Erwin Schrödinger, the celebrated quantum physicist. As a student I had liked Schrödinger's contributions to quantum physics [and] I was attracted by Schrödinger's thinking in *What is life?* because he linked the extremely important biological idea of a gene with the rather strange world of electrons moving in crystals ... The main impact of Schrödinger's book was that it set me in motion" (2003/2005, p. 84).

¹³ Quite recently, for instance, genomics celebrity Craig Venter joined the train of life scientists who pointed to Schrödinger as their personal intellectual hero. In July 2012, he delivered a speech in Dublin entitled *What is life?* in which Schrödinger's question is revisited from the point of view of contemporary life science research. <http://edge.org/conversation/what-is-life> (consulted: June 2013). And in his recent book *Life at the Speed of Light* he writes: "I have read *What is life?* on at least five different occasions, and each time, depending on the stage of my career, its message has taken on different meanings along with new salience and significance" (2013, p. 3).

Kay, the reverence for Schrödinger is part of a canonisation process meant to legitimize the post-war migration of physical scientists into molecular biology. From Kay's perspective, Schrödinger's book was a mere mixture of typically "Germanic" (p. 62) and "fin-the siècle" (idem) preoccupations, "interwoven with ideas from Mendel and radiation genetics, quandaries of thermodynamics, conundrums of quantum mechanics and a Spenglerian gloom of cultural decline and social decay" (ibidem). From my point of view, however, it is precisely this unique and fertile mixture of (indeed, German-speaking) quantum physics, genetics and other fin-the siècle preoccupations which allowed Schrödinger's book to play this bridging role.

SCHRÖDINGER'S KEY IDEA: THE 'GENOM' AS AN INTERMEDIARY BETWEEN THE QUANTUM- AND THE MACRO-WORLD

What is life? begins with an apparently simple question: why are atoms so small and organisms so large? Whereas the size of atoms ranges between 1 and 2 Ångström (Å) (10^{-10} meter), the size of bacteria is already measured in micro-meters, which means that they are 10.000 times as large as atoms. Due to this enormous difference in scale, living beings (including humans) cannot see or feel or hear single atoms. Should organisms exist so sensitive that a single atom could make a perceptible impression, they would dwell in a rather turbulent and chaotic world. And this is precisely why living organisms are so large. The quantum world is too capricious, too unpredictable to survive in. Survival presupposes a certain degree of orderliness. Yet, the order we perceive in our daily lives results from the laws of statistics. Events which are essentially random and probabilistic yield predictable results due to the effect of large numbers. At a much smaller level, Brownian movement and the 'random walk' of molecules would utterly confuse us. Therefore, Schrödinger argues, organisms are many-atomic structures, safeguarded from chaotic, single-atomic events by sheer size. Whereas small-scale entities change dis-continuously (in a leap-like, disruptive fashion), large-scale systems change slowly and continuously.

Yet, this is only half the story, as organisms happen to dwell in both worlds at the same time. Within each and every living being there exists a string of atoms (which Schrödinger refers to as an 'aperiodic crystal') called 'the genom' (without the *e*) that is exposed to atomic and molecular events, in the form of (random) mutations. Due to the molecular size of this aperiodic crystal, leap-like molecular events do play a role in the vicissitudes of living organisms, for mutations are caused by quantum jumps in the molecular structures of genes (p. 36) and mutation theory is therefore the quantum theory of biology. Thanks to the grossness of our bodies and sense organs, we feel at home in a fairly predictable world and may learn from previous experiences, but a dislocation of only one (or just a few) atoms may nonetheless suffice to bring about

well-defined, visible change on the macro-level of microbial or organismal life (p. 82). Thus, the *genom* (the sequence of genes located on the chromosomes) is the nexus / interface between the quantum- and the macro-world. The difference between phenotype and genotype is not only that the former refers to a more ‘external’, visible, surface-like aspect of our organism, and the latter to a more ‘deeper’ and ‘internal’ aspect. Rather, we should say that while the phenotypic body is part of the macro-world of everyday life (studied by classical physics and classical biology), the genotype or *genom* can only be understood in terms of the molecular approach of modern physics.

Another physical concept that deepens our understanding of the phenomena of life is ‘entropy’: the tendency of everything to degrade into chaos - and of living entities to return to an inorganic state, an issue addressed by Freud (1920/1940) as well, we will come to that. How can life avoid rapid decay? Apparently, the *genom* introduces a kind of “negative entropy” which postpones or compensates for the increase of entropy that would normally be expected on the basis of the laws of physics.

Finally, the *genom* is a biopolymer - an aperiodic crystal - that is: a regular sequence of variable elements allowing for an almost unlimited number of possible arrangements. In combination with its incredible length, it may function as a Morse code, as carrier of the code of life (p. 65). In order to understand this enigmatic ‘thing’, hovering between biology and physics (p. 3), biologists and physicists must from now on learn to work together. Thus spoke Erwin Schrödinger.

Ten years before Schrödinger presented his lecture, however, a young quantum physicist from Berlin, namely Max Delbrück, had already received the message. Already in the 1930s he migrated from quantum physics to biology, and from the German-speaking to the English-speaking world (Fischer 1985). And as quantum physicists had managed to unveil the enigmas of the atomic world by focussing on the smallest of atoms (i.e. hydrogen), Delbrück argued that biologists should likewise turn their attention to what could be regarded as the minimal form of life - the ‘hydrogen atom of biology’ - namely the ‘bacterium-eating’ virus (bacteriophage). He settled upon the phage as his model organism (while working at Caltech, Pasadena) because he wanted to study a living entity that came as close as possible to what could be regarded as “the gene in itself” (*Das Gen an sich*, Fischer 1985, p. 98): a tiny packet of genes covered by a protein shell. The virus was a living *genome*, a replicating, quickly evolving intermediary between the quantum- and the macro-world. Thus, after having tried their hand on the structure of the atom, physicists now began their quest for the structure of the gene, taking with them their high-tech technologies and devices (such as crystallography) as well as the computational skills needed to analyse the data thus

produced. Max Delbrück would become a model, a father figure for James Watson (Fischer 2003).

Thus, a bridge was built between quantum physics and genetics, between ϕ and β . Yet, besides (quantum) physics and (molecular) biology, there was a third dimension to Schrödinger's intellectual endeavour, an additional source of inspiration and fascination, namely the work of Arthur Schopenhauer. Schrödinger "wasn't just a physicist", biographer John Gribbin tells us, he was "a disciple of Schopenhauer" (2012, p. 4). As Moore (1989) phrases it, he had "read everything written by Schopenhauer" (p. 111) and continued to read him throughout his life. This allowed him to connect ϕ and β with ψ .

THE DISCOVERY OF THE UNCONSCIOUS: CONNECTING B WITH Ψ

Arthur Schopenhauer (1788-1860) was a German philosopher heavily influenced by the work of Immanuel Kant (1724-1804). The latter had argued that beneath the phenomenal, human world (i.e. the world as *we* allow it to emerge: the world of perceptible entities and visible / tangible phenomena), there is the 'noumenal' thing-in-itself, i.e. ultimate reality, not directly accessible to observation. In his book *The World as Will and Representation*, Schopenhauer identifies Kant's phenomenal world with 'representation' and the noumenal realm with what he refers to as the 'will': a dynamic, creative force, the basic drive and thrust of nature, also active and discernible within ourselves as human beings. For indeed, the human body is on the one hand a visible, tangible phenomenon ('representation'), but at the same time a willing entity, a materialisation of the Will (1819/1960, p. 157 ff.). This means that two sources of insight are available to us: insights based on observation (human existence as it emerges in science and the visual arts) and insights based on immediate, inner experience (our drives and desires).

A subsequent decisive step was taken exactly 50 years later (in 1869) by Eduard von Hartmann (1842-1906) who relied heavily on Schopenhauer's writings but systematically replaced the latter's concept of the Will by that of the 'unconscious': an internal force that works relentlessly and unwaveringly, also in humans, and is neither able to learn nor to doubt (1869/1913a, p. 1). Through his *Philosophy of the Unconscious*, a highly influential book, the unconscious became an important ingredient of the intellectual ambiance of the fin-du-siècle, notably in the German-speaking world. Indeed, the Schopenhauer-Von Hartmann view (often referred to as the 'Romantic' or 'vitalistic' understanding of the unconscious) served as an important connecting element between the biological and the psychic realm, between β and ψ .

In his book, Von Hartmann (1869/1913a, p. xii) explicitly distinguishes the bodily unconscious ("das Unbewusste in der Leiblichkeit") from the mental unconscious ("das

Unbewusste im menschlichen Geiste”). The bodily unconscious is something we share with animals and plants. It is the organising principle of resistance against physical (inorganic) destruction (Schrödinger’s entropy).¹⁴ In plants, the unconscious works as an organic formative principle (“Organische Bildungstätigkeit”, 1869/1913b, p. 34) to realise an unconscious, pre-existing idea (“Gattungsidee”). Notably the cell is regarded as a laboratory in which organic substances are unconsciously produced (p. 35) to achieve this goal. And whereas in plants the unconscious manifests itself in *all* organic mechanisms, in animals it most notably surfaces in the instincts (1869/1913b, p. 36). These same instincts also manifest themselves in the human psyche, although Von Hartmann notices a certain dislike of using the term ‘instinct’ in this context because of its “beastly flavour”, apparently unworthy of humans.¹⁵

Von Hartmann subsequently argues that the most noteworthy manifestation of the human unconscious is erotic desire. In humans, much more so than in other animals, love can become a demonic force, affecting our doings to the point of absurdity. Why do humans at times fall victim to an erotic “fata morgana”, allowing themselves to become enslaved by sexual craving? This is because a kind of clairvoyance is at work in our psychic unconscious. Our hidden goal in life is not only to reproduce (as Schopenhauer had already argued), but also to *improve* humankind. And we fall horrendously in love with individuals who either seem to materialise our unconscious idea of humanity in the most impeccable manner (and therefore deserve to be replicated), or whose bodily and mental features seem to compensate our own inherited weaknesses and flaws, our faulty dispositions, so that our potential mutual offspring may be better off than ourselves (1869/1913b, p. 91 ff.). It was against this backdrop that the Freudian concept of the unconscious was conceived.

THE FREUDIAN UNCONSCIOUS

Freud began his career as a neuro-anatomist in the intermediary zone between β and ψ . Frank Sulloway (1979/1992) actually calls him “the biologist of the mind”, while Ernest Jones (1913) bestowed on him the title “Darwin of the mind”. As a young academic, Freud did extensive microscopic anatomical work on the gonadic structure

¹⁴ “Der Kampf ... mit dem Zersetzungs-, Rückbildungs- und Formzerstörungstreiben der materiellen Elemente” (1869/1913b, p. 35). Cf. Freud, notably *Jenseits des Lustprinzips*: “[Der Organismus] muß vor allem bestrebt sein, die besonderen Formen der Energieumsetzung, die in ihm spielen, vor dem gleichmachenden, also zerstörenden Einfluß der übergroßen, draußen arbeitenden Energien zu bewahren” (1920/1940, p. 138).

¹⁵ “Wir wollen in diesem Kapitel zunächst die menschlichen Instinkte betrachten, [obwohl der hohle Dünkel der Menschenwürde] sich sträubt, dieses Wort zuzulassen, weil ihm etwas Tierisches anzuhaften scheint” (1869/1913a, p. 85).

of the eel and the spinal cord of the Sea lamprey before becoming a psychotherapist, using therapeutic experiences to develop a speculative model of the psyche. Althusser (1967) and others have argued that an epistemological rupture dissociates the neuro-anatomical work of the younger Freud (which is excluded from his *Gesammelte Werke*) from the psychoanalytic oeuvre of the mature Freud, which really got off ground in 1900 with the *Interpretation of dreams*.

Here, Freud presented his theory of the unconscious ('das Unbewusste') as a realm completely separate from (and fundamentally different from) consciousness ('das Bewusstsein'), notably in Chapter VII. In the 1920s, however, he introduced a new, 'structural' model of the psyche, involving the ego ('das Ich'), the super-ego ('das Über-Ich') and the id ('das Es'), where the id more or less (but not completely, Freud 1926/1948, p. 225) assumes the role which the unconscious had played in the previous model. The id is the unorganized, deeper part of the personality structure, notably containing the basic instinctual (sexual and aggressive) drives.

A concise definition of the id is given in one of Freud's final (unfinished) works: *An outline of Psychoanalysis* ('Abriss der Psychoanalyse', already mentioned), where he explains that the psychic apparatus consists of three provinces or agencies: the ego, the super-ego and the id. The latter is the oldest of the three and contains *everything that is inherited*, everything that is present at birth and laid down in the constitution, above all: the instincts ('Triebe'), which originate from the [somatic](#) organisation and which find their first psychical expression here.¹⁶ This definition, emphasising basic instincts originating from the body, seems fairly open to a biological (even genetic) interpretation, featuring the id as a kind of inner animal,¹⁷ to be domesticated by upbringing, society and culture, in collaboration with the ego (and its defence mechanisms) and the super-ego (as the internalisation of societal restrictions and demands). The phrase 'everything that is inherited' seems to suggest that the id might be regarded as the sum of our (unconscious) genetic predispositions.

We should not jump to conclusions too quickly, however. The short-cut between the genome (as a kind of 'genetic unconscious') and the unconscious (as a kind of 'psychic genome') is not that easily made. Notably because one of Freud's most prominent followers Jacques Lacan, in his 'writings' (*Écrits*) as well as in his Seminars, relentlessly criticised and vehemently rejected a 'biologistic' reading of Freud,

¹⁶ "Die älteste dieser psychischen Provinzen oder Instanzen nennen wir das *Es*; sein Inhalt ist alles, was ererbt, bei Geburt mitgebracht, konstitutionell festgelegt ist, vor allem also die aus der Körperorganisation stammende Triebe, die hier einen ersten ... psychischen Ausdruck finden... Dieser älteste Teil des psychischen Apparates bleibt durchs ganze Leben der Wichtigste..." (1939/1941, p. 67/68).

¹⁷ The unconscious has often been regarded as our "inheritance from the animal world" (Sulloway 1979/1992, p. 4).

replacing it with a completely different (albeit still Freudian) understanding of the unconscious, the ego and the id. According to mainstream (biologistic) interpretations, Lacan argues, the id is indeed seen as the animal within, an intermediate between man-as-an-animal and man-as-a-civilised person. This seems to be confirmed by Freud's use of the term drive (*Trieb*), even more so when used in its (standard) English translation: *instinct*. The id then becomes the realm of our (sexual and aggressive) genetic heritage. These beastly instincts function as somatic-psychic forces that somehow have to be subdued to enable us to adapt to the demands of our socio-cultural environment (modern civilised existence and social life). Building on a meticulous re-reading of Freud's oeuvre, however, Lacan persistently argues that such an interpretation misrepresents the genuine and unprecedented significance of Freud's discovery of the unconscious. As if Eurydice (temporarily brought to life by Orpheus-Freud), is allowed to disappear, to slip away again.¹⁸ To keep the authentic Freudian concept alive, to save it from these misinterpretations, it must be drastically reframed.

The conceptual problem is caused by a chronic ambivalence that runs through the work of Freud himself. Although he was trained (and began his academic career) as a neuro-anatomist of the positivistic school (as we have seen), his discovery of the unconscious entailed an epistemological rupture: a fundamental departure from his earlier work. Still, his intellectual upbringing resulted in a kind of wavering, with Freud on some occasions stressing the uniqueness of psychoanalysis (as an endeavour *sui generis*) while on other occasions cherishing the hope (or even the expectation) that one day his basic concepts would be reinterpreted in biological terms and re-embedded in biology: a chronic wavering between positivistic and non-positivistic understandings of psychic life (Ellenberg 1970). According to Lacan, this can be solved by reframing Freudian psychoanalysis with the help of 20th century science (to which psychoanalysis itself belongs). Psychoanalysis is not a nineteenth-century, but a twentieth-century phenomenon.

In order to more clearly discern what is at stake here, we must contextualise the Freudian theory of the unconscious and place it within a broader conceptual and temporal horizon. To begin with, I will briefly summarise the various ('Romantic') theories of the unconscious that emerged in the course of the 19th century, both before and during Freud's lifetime. Subsequently, I will focus on Lacan's reframing of the unconscious, using the language of 20th century science. I will notably (but not solely) refer to Lacan's Seminars, launched in 1953: the year of the discovery of the structure of DNA.

¹⁸ "Eurydice deux fois perdue" (1973, p. 33)

ORPHEUS AND EURYDICE: THERAPISTS AND THEIR MEDIUM

In terms of intellectual climate or *Zeitgeist*, the first half of the 19th century differed rather drastically from the second half, notably in German-speaking areas of Central Europe. The first decades were dominated intellectually by the *Naturphilosophie* of Schelling and Hegel, and aesthetically by the Romantic view on life and art. Moreover, science and art were not seen as two separate realms, but as closely intertwined, so that many scientists wrote poetry or drama, while many poets and playwrights were interested in (or even actively involved in) scientific work. This changed during the second half of the 19th century, when Romanticism gave way to realism and naturalism in literature and art, whereas positivism replaced philosophy of nature in the academic world. All this was of course very much in tune with the increasing prestige and sway of science and technology over daily life and the advent of large industrialised cities and nation-states.

This development is clearly reflected in the vicissitudes of the concept of the unconscious, as captured by Henri Ellenberger's in his monumental 932-page monograph (1970). Whereas the unconscious had been a respectable subject for intellectuals during the first part of the century (notably: inquiries into 'animal magnetism'), the positivistic attitude of the second half entailed a different course, namely microscopic neurological brain research using animal brains as models. Animal magnetism and hypnotism were exiled from academic campuses. Towards the end of the century, however, the unconscious, and everything associated with it (dream-interpretation, hypnosis, speculative neurology, psychotherapy, parapsychology) made a remarkable come-back. All of a sudden, the unconscious was in vogue again, notably due to the pioneering work of psychiatrists (Charcot, Janet, Breuer, Bleuer, etc.) concerning afflictions such as hysteria and schizophrenia. It was in this intellectual ambiance, during the late 1890s, that Sigmund Freud - a positivistic neurophysiologist who went to Paris to hear Charcot and decided to become a psychotherapist - developed a theory of the unconscious of his own.

The core concepts of the 19th century view of the unconscious can be summarised as follows. An important source of information were famous patients / mediums (mostly female) such as Katharina Emmerich (1774-1824) and Fredericke Hauffe (1801-1829), whose performances during séances were studied and recorded by authors such as Clemens Brentano and Justinus Kerner respectively. Hauffe, when in a cataleptic state, would speak in a strange, unknown language which, she claimed, was the original language ('Ursprache') of mankind (Ellenberger 1970, p. 80), written in a system of ciphers representing numbers. The idea that a primeval human language (to be reconstructed with the help of mediums and myths) had once existed, was an important issue for Romantic scholarship (Ellenberger 1970, p. 184). Kerner published

a book on these experiences in 1829, a compilation of observations and experiments, entitled *The seeress of Prevorst*. For Kerner, Hauffe's case provided a kind of window into the functioning of the unconscious and should therefore be meticulously studied. Towards the end of his life, becoming blind, Kerner began to experiment with inkblots, and published a book about this as well, entitled *Klecksographien* (1857), a precursor of the famous Rorschach-test: likewise a procedure for studying unconscious processes.

A similar trend was the rise of Spiritism, notably in the United States, where it became something of an epidemic. This hype-like movement also involved (usually female) mediums who claimed to converse with spirits, but also transmitted messages from people like Plato, Galileo¹⁹ or Goethe, often employing an elementary knocking code. As Ellenberger rightly observed, there may have been a connection with the rise of telegraphy (p. 83). There is a family resemblance, I would argue, between these two phenomena that coincide in time and therefore resonate, or mirror one another. Like telepathy, telegraphy was a form of communication 'at a distance', with someone who was physically absent, using a Morse Code, which was actually quite similar to the knocking code. Another technique used by mediums (and by researchers studying them) was 'automatic writing', also employed by psychiatrists studying the unconscious life of their patients, and writers, such as Ludwig Börne - write down everything that comes to mind! - as a way to open up unconscious materials and to lift various inhibitions pervading conscious mental life, hampering artistic spontaneity and creativity.

This whole complex of methods and ideas, temporarily eclipsed by positivism and neurophysiology, suddenly resurged during the 1880s and 1890s. Hypnosis was rehabilitated (by Charcot, Bernheim, and others) and again acquired scientific status. Psychiatrist like Pierre Janet (a contemporary of Freud) published voluminous case histories of (female) patients, using techniques such as hypnosis and automatic writing or automatic talking,²⁰ while Breuer's patient Anna O (real name: Bertha Pappenheim), with her vivid hallucinations and strange, a-grammatical language (she was later handed over for treatment to Freud), was reminiscent (in terms of linguistic performance, but also because it was she, rather than her therapist, who determined the course of the treatment) of famous mediums such as Emmerich and Hauffe. The same goes for Hélène Smith (real name: Catherine-Elise Müller), also known as the Muse of automatic writing, who claimed to convey messages from Mars in a Martian

¹⁹ The French astronomer Camille Flammarion (1862/1863), an enthusiastic believer in Spiritism, published a *Genesis* supposedly dictated by the spirit of Galileo.

²⁰ See for instance his thesis entitled *L'automatisme psychologique* (1889/1907).

language by using this technique. Her case was made famous by the book *From India to the planet Mars* by Théodore Flournoy in 1900. Automatic writing not only resonated with the free association technique developed by Freud, but also with the word association test employed by Jung and the ‘stream of consciousness’ device described by William James (1885, 1890) and practiced by authors such as André Breton and James Joyce.²¹

Another important element was dream-interpretation, to which a flood of publications had been devoted before Freud published his version. Many conveyed the idea that dreams use a universal language of symbols, reminiscences from a remote past (p. 205). Some of these authors, such as Carl Gustav Carus (1789-1869), argued that dreams allow us to descent into the unconscious to study it. He also distinguishes layers within the unconscious: whereas the ‘formative’ unconscious directs bodily growth and organ functioning, another part surfaces through images while we sleep, a distinction which basically concurs with Von Hartmann’s distinction (discussed above) between a physiological unconscious (directing bodily existence of plants, animals and humans) and a psychic unconscious, active in (human) mental life.

Against this backdrop Freud developed his conception. In a posthumously published manuscript known as the *Project* (‘Entwurf’), written in 1895, the brain is depicted as a system in which energy particles (‘quanta’) move from the centre to the periphery and back (Freud 1895/1950). The system is bent on discharging its energy surplus in order to reduce the tension, but as the options offered by the outside world (i.e. human culture) are limited, the system often has to abstain from this, finding itself confronted with a serious ‘economic’ problem, as the electrical flow starts damming up due to the lack of fit between nervous system and social environment. Freud started writing his *Traumdeutung* in 1897, predominantly using his own dreams as source material. According to Ellenberger, one typical Freudian element (as compared to previous views on the unconscious) was his emphasis on inhibition and on (mechanisms of) defence. The primary task of consciousness (the ego) was to ward off excessive excitation, from external sources (with the help of the sense organs, working as filters, allowing only small samples of information to enter through tiny apertures) but also from internal sources (the stream of unconscious wishes and ideas), while anxiety is the signal-experience that the ego’s protective barriers are being overrun. Freud apparently tried to combine the positivist views of the psyche (functioning as a kind of electric apparatus) with the neo-Romantic view (a psyche consisting of

²¹ A related example is Friedrich Nietzsche’s *Also sprach Zarathustra*, with the author acting as a medium for Zarathustra as his alter ego: *Da, plötzlich, wurde Eins zu Zwei / Und Zarathustra ging an mir vorbei...* Actually, Carl Gustav Jung discovered that the book contains a passage copied from a journal edited by Kerner called *Blätter von Prevorst* (Ellenberger 1970, p. 170).

conscious and unconscious stratum). This built-in ambiguity gave rise to conflicting interpretations among followers and readers. Lacan proposes to clarify these issues using insights not available to Freud at that time, notably coming from 20th century linguistics, a field of research initiated by Ferdinand de Saussure (1857-1913), a contemporary of Freud.

JACQUES LACAN: THE UNCONSCIOUS REGAINED

Before studying Lacan's reframing of the unconscious in more detail, let me give a brief outline of his views on human existence as such. Point of departure is the conviction that, rather than being 'superior' to other creatures, humans are basically deficient beings (*Mängelwesen* in the sense of Arnold Gehlen). Our psychic malaise not merely applies to neurotics and schizophrenics, but to the human condition as such. There is no optimal environment that allows us to satisfy our desires. Notably, there is an inherent weakness in the ego in the form of a basic split (*Spaltung* in German), not only *between* the ego and the id, but one that cuts right through the ego itself (Freud 1938/1941b). Due to this primordial vulnerability (in connection with our exceptional prematurity and foetal helplessness at birth) there is a disruptive gap between what we seek in this world and what we find. As a result of this, we have become infected with culture, in the form of visual images (which may function as phantasms to assuage our haunting desires), but also with 'symbolical' elements, such as words, dates, formula and numbers. Thus, we have fallen prey to language. And although culture (notably language) is often regarded as a kind of compensation for our biological deficiencies, culture-as-compensation became excessive in its own right: we have overcompensated our original lack, and are now overwhelmed by cultural (often technologically produced) messages, gadgets and cues, giving rise to a plethora of neurotic or psychotic symptoms. One reason for objecting to a 'biologisation' of psychoanalysis is that, from Lacan's perspective, the human situation is without precedent in nature. We dwell in a self-made, instable, insatiable, symbolical (linguistic) world, quite incomparable to the environments of other animals. Let me now turn to his concept of the unconscious.

First of all, Lacan argues that, contrary to what Freud at times seems to suggest, the unconscious is not a loose and fluid collection of drives, but in fact highly organised (1975a, p. 79). His basic contention is that the unconscious is structured *like a language* (1981, *passim*). It is not the seat of primordial instincts, but rather consists of chains of signifiers as 'elements' that can be combined and recombined in accordance with certain rules, as reflected in our verbal and written utterances and their various symptoms (1966, p. 501 ff.). The unconscious is a kind of discourse-producing machine: *ça parle*, 'it' or 'id' speaks, and we should think of it / id as a kind of linguistic 'tissue'. In most cases, the unconscious speaks indirectly to us, through dreams, mistakes (slips of

the pen) and other symptoms, but in the discourse of psychotic patients the unconscious may surface *as such*, in an uncanny and disruptive manner, as a strange and enigmatic language, the discourse of the Other, a primordial type of speech. This is exemplified by one of the most famous psychotic patients of the Freudian era: Senate President Paul Schreber who, in his *Memoirs of my nervous illness*, describes how God uses a fundamental language (*Grundsprache*) to communicate with a select number of exceptionally gifted individuals, such as himself (1903/2003, p. 10). This language is composed (as Lacan phrases it) of “elements” belonging to a basic “code” (1998, p. 154), employed to receive and transmit repetitive messages written in a codified manner (p. 481): a language that functions as the discourse of a powerful, anonymous Other who acts as the seat of the “code”.²² This may sound fairly similar to how mediums of the 19th century expressed themselves, but Lacan insists that the Freudian unconscious has nothing in common with that fluid, 19th century, “Romantic” understanding of Von Hartmann and his predecessors (1973, p. 32). Rather, for Lacan, the Freudian unconscious firmly belongs to the 20th century, taking us beyond the Romanticism-positivism dichotomy. Its structure can only be clarified with the help of 20th century disciplines such as linguistics and (indeed) molecular biology. The question now is: what is the relationship between this unconscious ‘code’ and the biological ‘code’, discussed in the previous section: the genome? Is the unconscious a kind of psychic genome and, if so, in what sense? Lacan’s first Seminar more or less coincided with the discovery of the structure of DNA, the first highlight / milestone of molecular biology (the field brought into existence by Schrödinger and Delbrück, as we have seen). Is there a relationship between the structure of the unconscious and the structure of DNA, between structuralism in psychoanalysis and structuralism in biology? As it happens, in various Seminars (albeit usually more or less in passing), Lacan indeed seems to point to a basic analogy between the genetic code and the unconscious-as-a-code. I will now follow some of these references in more detail.

To begin with, Lacan was well aware of the discovery of Watson and Crick and pointed to analogies that may be discerned between the Freudian unconscious and the double helix. Apparently, possible analogies between structuralism in biology and in linguistics were among the topics Lacan discussed with Chomsky during their meeting at MIT in 1975, to which Lacan refers in one of his last Seminars (2005, p. 31), in a passage where Watson and Crick are explicitly mentioned²³ and where he explains how the molecular gene sends messages to the cell and from there to other levels, notably the hormonal level, from where new sets of messages are discharged throughout the

²² “L’autre ... comme trésor du signifiant, comme siège du code” (1998, p. 148).

²³ Albeit not in the usual order: Lacan refers to the double helix “de Crick et de Watson” (2005, p. 32).

body, and so on. Yet, Lacan insists, such messages cannot be properly called a “language” (p. 32). This line of reasoning is followed by Lacan in other Seminars as well: both the genome and the unconscious can be described from the point of view of structural linguistics. Both essentially consist of a ‘code’, a ‘chain of signifiers’, a series of ‘combinations’ of signifiers that may be either present or absent, *Fort* or *Da*. As such, both types of code are (up to a point) comparable and may mutually elucidate one another. In a Seminar entitled *The Formations of the Unconscious*, for instance, Lacan depicts the unconscious as a “typographical” realm (1998, 147), consisting of lines and dots (the most basic signifiers), bent on replication, where all sorts of typos may occur,²⁴ a phrase that seems reminiscent of Schrödinger’s Morse code and the occurrence of mutations. And yet, eventually Lacan insist that, notwithstanding the genome’s linguistic, code-like features (due to its being a sequence of discrete elements), only the unconscious (as a uniquely human phenomenon) can be genuinely regarded as a language. Lacan certainly would have rejected catchy phrases still in vogue such as the genome as the ‘book of life’.

In one of his most famous seminars, entitled *The four fundamental concepts of psychoanalysis*, Lacan refers to the biological phenomenon of mitosis, which consists of a considerable “loss” of elements”, namely chromosomes: an “expulsion” which is followed by a recombination (1973, p. 169). According to Lacan, this phenomenon reveals a certain affinity between the intricacies of the unconscious-as-a-language and the play of signifiers (with its combinations and re-combinations) that is studied by genetics. Indeed, the unconscious consists of strings (chains, series) of signifiers, to which other elements can be connected (1998, 478), by way of a “chemical reaction” (1998, p. 196). Although it is clear that DNA and the unconscious are not identical, their analogies may yet help us to understand the unconscious in terms of structure, consisting of discrete elements (elementary constituents) that can be either present or absent (1978, 1981).

In another Seminar, Lacan explicitly points to the notion of ‘information’, whose astonishing success permeated contemporary science “with the speed of lightning” (1975b, p. 21/22). This notably applies, he argues, to the molecular “information” of the gene, with its nucleoproteins winding as strands of DNA, wrapped around each other, from where messages are recorded and distributed: a linguistic phenomenon basically, postponing the degradation into inorganic matter (a remark quite reminiscent of Schrödinger of course). But again, Lacan subsequently tries to make it clear that the operations of genes and nucleotides are not completely similar to those of signifiers in human language, if only because in the latter case language functions on

²⁴ “L’espace de l’inconscient, est en effet un espace typographique” (1998, p. 147).

two levels: namely as the discourse of the speaking subject (with all its intricate grammatical complexities and inconsistencies) and as the discourse of the ‘Other’ (the unconscious code which surfaces in symptoms). In the same way, although it is perfectly legitimate to study sexuality from a biological perspective, notably on the chromosomal level, with its combinations of XX and XY, human sexual desire as such is something of a completely different order (2007, p. 30/31). And this is important because otherwise psychic phenomena would ultimately be reducible to biological ones (which is of course the basic message of biologism). Lacan argues that the functioning of both DNA and the unconscious can be elucidated by basic concepts borrowed from structural linguistics, but without implying that the one is therefore fully reducible to (or even identical with) the other.

Elsewhere he likewise explains how recent developments in biology explore the manner in which the “genotype” directs the production of hormones, which in their turn determine the various physical processes of sexuality (2011, p. 43). Moreover, Lacan argues that the reproduction of life is ultimately determined by something which in itself is neither living nor non-living, namely a molecular programme, the “codon”, situated on the chromosomes (2011, p. 43).²⁵ Due to the tendency towards repetitiveness embedded in this code, the living organism is able to fend off entropy for a while, i.e. the tendency of complex molecules to return to an inorganic state (Cf. Schrödinger). These phenomena of constant replication and reproduction can already be studied in bacteria, Lacan points out (2011, p. 53). In this manner, biologists have discovered how messages are formed through combinations and recombination on the level of DNA to inform the production of proteins with the help of enzymes.²⁶ In other words, besides linguistics, molecular genetics may likewise function as a lens that allows us to discern the complexities of the unconscious as a ‘code’, although eventually he keeps insisting that language as employed by speaking human subjects is something of a completely different order (p. 54).

In summary, I would argue that what Lacan basically comes forward with is a 20th century updating / reframing of the distinction which Von Hartmann already made, namely between the *somatic unconscious* (i.e. the genome as a code, with its series of ‘signifiers’, its re-combinations, its messages, etc.) and the *psychic unconscious*, which likewise functions as a series of signifiers and as a code, but on a different (psychic)

²⁵ “la reproduction de la vie émerge de quelque chose qui n’est ni vie ni mort ... à savoir ce que nous appellerons le programme ou encore le codon, comme on dit à propos de tel ou tel point repéré des chromosomes” (2011, p. 43).

²⁶ “...une combinatoire, dont les modulations sont celles qui passent de l’acide désoxyribonucléique à ce qui s’en transmettra au niveau des protéines, avec la bonne volonté des quelques intermédiaires qualifiés notamment d’enzymatiques ou de catalyseurs” (2011, p. 53/54).

level, as a language. And whereas the genome can be regarded as the somatic / bodily 'unconscious' of all living entities (humans, animals, plants, microbes), the psychic unconscious is a uniquely human phenomenon, because of the unique and pervasive ways in which human existence is imbued by language. Whereas the needs, growth patterns and functions of the body are to a certain extent governed by the biological code (the genome), human desire (with its plethora of symptoms and socio-cultural intricacies) is to a large extent dominated by the unconscious as a psychic code. It is in this manner that neurotic symptoms for example may be seen as the psychic / behavioural equivalents of mutations (i.e. forms of deviance caused by genetic mutations on the biological / phenotypic level).

CONCLUSION

We have seen that, for Lacan, the unconscious is not a biological phenomenon. And yet, there are various striking similarities between the unconscious as a language (a code, a series of combinations of signifiers) and the structure and functioning of DNA, so that the one can be used to clarify (to some extent) the processes and intricacies of the other. Whereas the genome functions as our physiological unconscious (directing, but also – in the case of disruptive mutations – hampering bodily existence), the psychological unconscious may be seen as directing (or hampering) mental life, albeit not in a deterministic manner, but in a more complex and interactive way - much like the phenotype is the outcome of intricate interactions between the genome / genotype and the environment, as the environment affects the genome as well (as revealed by epigenetics). In the same way, traumatic experiences may leave their epigenetic traces in the unconscious. Mutations, the 'quantum-leaps' occurring in the Morse code of biology, as Schrödinger phrased it, are to some extent like the symptoms studied by depth psychology. But whereas the biological genome is something we have in common with all other life forms, the unconscious is typically human: a kind of secondary, psychic genome, a product (and at the same time producer) of culture (resulting from the co-evolution / co-production of culture and the unconscious). Due to the deficient nature of our split ego, human beings have become 'subjects': they have fallen prey to language and culture long ago and this has created the linguistic 'tissue' which Freud refers to as the id. Whereas in other animals there is a certain fit (or pre-established harmony, as Lacan phrases it) between genome, organism and habitat, in the case of human beings there is a fundamental *discordance* between what we seek and what we find, and this has allowed the symbolic to invade our mental world. In this manner, a second genome has entered / infected our system. Similar to the way in which physiology is affected (and to a certain extent determined) by DNA,

our mental life is consistently plagued by this ‘code’ that has taken hold of us, sending off repetitive messages of desire.

In order to clarify its role, and to distance it from 19th century Romanticist and / or positivist conceptions of the unconscious, Lacan borrows from structural linguistics (notably from De Saussure influential *Cours de linguistique générale*, published posthumously in 1916). But other key intellectual endeavours of the 20th century – notably quantum physics, bioinformatics and molecular genomics (ϕ and β) – share these common affinities as well and may therefore be used to further our understanding of the psychoanalytic revolution. All these research strands study molecules, genomes and the unconscious in terms of basic discrete elements / constituents that can be either present or absent (*Fort* or *Da*) in a discontinuous, discrete way, and may therefore be represented by letters from the alphabet or other symbols²⁷ (i.e. by signifiers). Their family resemblances may be employed for mutual elucidation.²⁸

CODA: SCIENCE ETHICS ACCORDING TO LACAN

Besides epistemological relevance, there is societal relevance to such an exercise as well. It will allow us to think through, from a Ψ -perspective, the societal impact of modern scientific endeavours in areas ϕ and β . Lacan himself has pointed this out quite explicitly. Contemporary science, he argues, is obedient to one imperative only: continue to produce knowledge, continue to know! (1991, p. 120). We are not literally *told* to do so, but it is a message inherent in contemporary science *as such*, in which we are all embarked (p. 121), coming from the scientific unconscious / id as it were. We are no longer in the habit of hesitating whether we should move further, as previous generations of researchers were. We have unravelled the secrets of molecular structures and nuclear fission, Lacan argues, but who would consider putting brakes on this game of signifiers and combinations called nuclear and molecular science, resulting in an ‘inconceivable’ power over matter and life.²⁹ It is no longer an option not to obey the basic commandment of science: Go on, produce! (p. 121). Urging

²⁷ For example the Mendelian alphabet: Aa, Bb, Cc, etc., or elementary particles from quantum physics such as *e* (electron), μ (muon), *H* (Higgs) etc.

²⁸ Other important events occurring in (or around) 1900 may be added to this list, no doubt, such as Hilbert’s 23 unresolved mathematical problems, the publication of Edmund Husserl’s *Logische Untersuchungen* (i.e. the birth of phenomenology as a philosophical movement), the discovery by Martinus Beijerinck of the virus and the discovery of blood types by Karl Landsteiner (the identification of blood types in terms of letters from the alphabet: A, B, AB and O, the latter meaning: absence).

²⁹ “Déjà les choses, mon Dieu, sont là. Elles ont montré où on va, de structure moléculaire en fission atomique. Qui peut même penser un instant que puisse s’arrêter ce qui ... en révélant l’impossible, en fait jaillir une nouvelle puissance ?” (1991, p. 120).

scientists to restrain themselves, by putting restrictions on research, is out of the question.³⁰ Nothing will curb the momentum of our overwhelming will to know, manifesting itself in key discoveries in areas φ and β . And yet, we must realise that science will not make us happy. New truths may be beneficial or disastrous, probably both, but the basic misfit / tension between our genome / unconscious and our socio-cultural environment cannot be undone.

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³⁰ From a Lacanian perspective, events such as Asilomar or the GMO-debate are mere asides: they will only have a transient effect.

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