SEMON, SCHRÖDINGER, AND REPRESSED MEMORY

Abraham R. Liboff

The Problem With Instinct

The subject of hereditary imprinting is very interesting. Although we all agree that human behavior is shaped both by genes and by environment, the fractional contribution of each can be a matter of some contention. What we call instinct is in a special category. Humans readily accept this notion when it comes to animals but are often uncomfortable in applying the same idea to themselves. One is reminded of Freud's characterization of civilization as the renunciation of instinct.

It is difficult to deny that our behavior at birth is already imprinted in a variety of ways. One excellent example is found in the child's personality, which, more often than not, mirrors that of the parent. Studies on primates make a strong case for genetic imprinting of cautiousness in some newborn chimps versus aggressiveness in others. Although this particular pair of behavioral opposites happens to be somewhat readily classifiable, it seems reasonable to expect that if these imprints are possible then other less well-defined traits may also be inherited.

This begs the question: exactly how far can the heritability

of one's behavior be extrapolated? Does caution go hand-in-hand with thoughtful? Does thoughtful mean introspective? Does introspection imply spiritual? Are religious tendencies genetically determined?

It was Carl Jung, of course, who explored these ideas, postulating that many of our deepest attitudes and emotions are actually vestigial remnants of imprinting processes built up over many tens of thousands of years. With all that he wrote on the subject, Jung consistently avoided making any mechanistic connection to genetics. Either he was wise enough to recognize the potential pitfalls in such speculation or perhaps he merely preferred not bothering with annoying details, concentrating, as it were, on the big picture. In retrospect, it is interesting to note that there is a certain sameness between the work of Jung and that of Wilson and the Sociobiologists, if not in the road taken, then certainly in the beginning and end points.

Intergenerational Memory

In the following we speculate further on the matter of human imprinting. Unlike the long-term scenarios of both Jungians and Sociobiologists that reach back into the remote past, we concentrate on the transfer of behavior over one generation, over intergenerational times, i.e., from parent to child. More to the point, we suggest the possibility of a much larger hereditary transfer of behavioral characteristics than is currently believed. Any mechanism that might explain how behavioral attitudes can be transmitted to offspring in a non-environmental, non-learned manner would go far towards providing a basis for Jungian Archetypes. We are also profoundly aware of the dangers in this suggestion. Some of our deepest cultural taboos, questions of racism and ethnic discrimination, are tied to the notion that this group or that carries inherent abilities or lack thereof. But our approach, whatever its other faults,

has no ties to the simplistic nonsense of de Gobineau, Chamberlain, and Shockley.

It is clear at the outset that what is proposed carries more than a hint of scientific dissonance. Lacking a reasonable mechanism, any such speculation may perhaps also be classified as Lamarckian, as flowing against the paradigm established by Darwin, Wallace, Watson and Crick. We are totally defenseless in this regard, and we can only hope for some future reprieve in the form of an additional, as yet unspecified, hereditary mechanism above and beyond DNA replication.

Even apart from showing how Archetypes might arise, there are certain consequences of this idea that are themselves well worth pursuing. To the best of our knowledge, no one has made the connection between imprinting and models of consciousness. There is good reason for this. Ordinarily, we think of genetically derived changes in the brain as long-term effects, catalogued simply as one more example of natural selection. Imprinting phenomena are regarded in this manner as little more than any other evolutionary effect on neuronal content and distribution. These phenomena occurred a long time ago and to whatever extent they might have in the past affected the way the mind functions, it is argued that they are now a commonly shared part of the present package of consciousness, a system long fixed in equilibrium. By definition, all humans are self-aware.

However, this argument would necessarily fail to hold for short-term changes. Indeed for the strange hypothesis we are considering the intrinsic nature of consciousness would have to be redefined. Consciousness would not necessarily be something ascribed to each and every representative of *homo sapiens sapiens* who enjoys the same sort of collective mind formed many thousands of years ago. Instead, one would have to admit the possibility that human consciousness is not static, but is constantly changing in each generation under inputs derived from the individual's immediate forbears. Even though the wiring pattern of the brain is deeply rooted in our evolutionary past, mind and its relation to consciousness may

be more a function of contemporary inputs than is realized. Moreover, if the mind has two sources, information received over one's lifetime, and that received, as it were, from previous lifetimes, then we aver that the most essential element of consciousness, namely awareness, is primarily derived from that innate sense of continuity that accompanies a mind derived from one's parents and grandparents.

Thus, let us propose that animals, humans included, have a hitherto unrecognized capacity to transmit elements of consciousness because of some unknown type of reproductive process that does not necessarily involve DNA replication. By "elements of consciousness" we mean more than what is usually described by terms such as behavior, personality, and even character. We are suggesting much more. Included are all mind-related activities, things such as thoughts, visual experiences, and emotional responses. In humans, these transmitted elements of consciousness are further augmented by our distinguishing central nervous system (CNS) feature, namely, bursts of cognition. No proof is offered for any of this (although one might conceivably devise experiments to test this hypothesis). Instead, we have assembled a pattern of circumstance, hopefully provocative, but by no means foolproof. This hypothesis provides not only a reductionist basis for Wilsonian Sociobiology and the Jungian Archetype, but also for the many observed imprinting phenomena in humans and animals.

Psycho-Lamarckism

During his undergraduate years at the University of Vienna in the early 1900's, Erwin Schrödinger attended lectures by the physiologist Richard Semon, who later achieved fame for his studies of memory. Indeed the term *meme*, which has lately received attention among sociologists, was first introduced by Semon. Another concept he introduced was that ideas and character could be transferred directly from parent to unborn

child. Schrödinger* realized the advantages that might stem from this concept, continuing to believe in it even after it was pejoratively labeled as Psycho-Lamarckism, and most remarkably even after the molecular basis for genetics was discovered, some decades later.

Why would one want to revisit this idea? Simply stated, there is now a good deal of supportive evidence that at the time was not available to Semon and his followers, Schrödinger included. Some of this evidence is in the form of consciousness-related phenomena, often poorly defined and verging on the less-than-credible. Most important, if one views this whole set of circumstantial evidence as a whole, Semon's teachings, although still speculative, become less far-fetched.

For example, we now have available the fruits of Chomsky's work in psycholinguistics, that human evolution has provided a special language acquisition device that already incorporates, in children, content-dependent mechanisms to handle the grammatical complexities that are so taken for granted by everyone. If we come preloaded with brains poised to accommodate the subtleties of language, is it really so far removed from CNS function for thoughts to also be passed along?

The less-than-credible mind-related phenomena that may be relevant are especially fascinating, not so much for what is claimed, but for the quandary these claims pose for any objective study of human consciousness. That is to say, if we think we know the difference between truth and fancy, but reject fancy on the basis of what we think, then thinking alone can never raise fancy to fact. (This especially is the problem faced by those advocating quantum consciousness models). The objectivization of the human mind, unlike everything else in nature, presents a barrier that is made of

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* Some of Schrödinger's thoughts on consciousness are conveniently found as a companion piece to his famous essay "What is Life?". With typical Schrödingerian disregard for the commonplace, this second essay was entitled "Mind and Matter".

us. We cannot get to where we are headed without going through our head.

False Memory Syndrome

The continuing arguments concerning repressed traumatic memories that are later recovered is a good case in point. There are always three parties involved in these sad stories: the subject whose memory is being explored, the therapist acting as a catalyst for releasing the memory, and the parent or older relative allegedly responsible for the original event. It is not unreasonable to think that there are cases where early abuse actually did occur, where the frightful memory was repressed, and where hypnosis, many years later, did bring the original events to the surface. On the other hand, one must be impressed by the strength of the vigorous denials by many of the accused parents, often matching that of the examining therapist. In response, the latter assert: who else could be responsible for such trauma, if not the parent? The accused parents point to a life of gentle caring for their children, with no ancillary evidence whatsoever that they might have ever behaved in the manner pictured by these alleged memories.

Alternate explanations abound. There is hard evidence of mistaken claims of abuse, of children led to false statements by zealous interrogators. To make things even more murky, it has been argued that memories with no apparent cause are possible.

Consider one additional scenario, in which a parent, a grandparent, or a great-grandparent may have experienced the event in question, and somehow transmitted this memory down the generational line, where in each case it has lain untouched, until brought to light through properly managed hypnosis. The parent or grandparent may have been the abusee and hidden the memory from himself, in exactly the same manner as the child is supposed to have done. This is an area where experiment would be useful: parents accused of

the abuse claimed by their children should perhaps themselves be examined for traces of similar memories.

Our argument is hardly limited to the question of recovered memory. There are many other disturbing constructs of the human mind which we tend to disregard, preferring to deal with observations that appear less unreasonable. There is the incredible belief, shared by otherwise reasonable individuals, that they have lived before. In fact, there is the sneaking suspicion that this belief may be more widespread than commonly thought, since many are loath to admit such things. It is not difficult to see how this particular idea, commonly regarded as an otherwise unclassified aberration of the mind, could be explained if thoughts were passed from parent to child.

In this connection, we note the general belief in reincarnation shared by a good fraction of the world's population as a religious tenet. As with so many religious ideas, reincarnation is one more way of dealing with the unpleasantness of death. Like heaven, it is a convenient thing to look forward to. One wonders, nevertheless, how much this particular belief indicates the likelihood of acceptance by the followers for reasons more experiential than rational. Reincarnation as a religious formalism may be easier to sell to people who already believe in it.

Dreams, Memories, and Hallucinations

Dreaming is in a different class, certainly not regarded as incredible, since everyone admits to these nightly flights of fancy. But there is still much in the way of scientific mystery. The content of dreams, as distinct from its physiology, continues to be discussed in the most speculative ways. Everyone seems to agree that the activities of the waking day are reflected in the dreams of the sleeping night. But understanding has progressed little beyond this simple observation. The coloration

and dimensions attached to dreams, even when associated with our daily experiences, are strange and not easily explained. We find that the interpretation of dreams is, as in the past, still the work of shamans, hardly different from long-forgotten paleolithics, biblical prophets, or *wunderkinder* such as Freud. There is mystery in each and every dream, in its discordance with reality, a discordance that is supremely different from the cognitive dissonance and the irrationality so readily practiced by humans when awake.

Dreams are discontinuous in at least three ways, in time, in place, and in person. It is conceivable, (although unlikely) that these discontinuities will someday be found to be physiologically reasonable, consistent with the missing neurobiological picture that is supposed to eventually provide us with a more satisfying explanation of all brain function. One day, perhaps, we will be successful in devising neural network models that naturally incorporate these discontinuities into the sleeping state.

On the other hand, the content of dreams may instead represent an overlay of present on top of past, today's memories mixed not only with memories of one's childhood, but also with those of parent, grandparent, and ancestor. It is clear that dreams based on a juxtaposition of past and present would be difficult to describe, except in phantasmagoric ways. With this premise it is also very clear why dreams might have remained so fertile an area for shamans in every culture and time.

Worth commenting on in this context is the infamous Oedipus complex, perhaps the best known of Freud's constructs. It affects not only the content of dreams but is often expressed even more fully in the waking state as full-blown personality disorders. There are interesting consequences when the Oedipus complex is viewed in the light of our intergenerational transference hypothesis. Consider that the emotion and passion directed from one parent to the other is arguably at its greatest just prior to, during, and immediately after the act of conception. It is conceivable, under our hy-

pothesis, that these thoughts and feelings might well have a high probability of being transferred to the pre-natal outcome of this conception, thereby resulting in an increased likelihood of oedipal feelings in the child and later in the adult.

Further, this approach avoids the thorny issue of infant sexuality, which Freud held to be a necessary spur to the expression of the Oedipus complex. Infant sexuality is hardly necessary if the intense attraction between child and parent results from an implanted feeling instead of a sexual need. And, as we have already mentioned, thoughts implanted by an individual from a previous generation would be difficult to separate from intragenerational memories. One wonders whether Freud himself, with all of his wonderful analytic powers, would have been capable of distinguishing the implanted idea from actual childhood memories.

We also note that Random Eye Movement (REM) sleep patterns are detected in the pre-natal human. This is peculiar, since REM sleep is connected to the dream state, as observed in adults. It is tempting to suggest, that if the prenatal REM pattern is indeed associated with the act of dreaming, that these patterns may signal that the newly formed brain arrives pre-loaded with cognitive residues from the parent.

Speculating further, we are tempted to generalize that the underlying functional reason for dreams is to provide a window through which we can relate to the past. This theme is not very different from that expressed in dream cultures in primitive societies. Indeed, Aboriginal culture refers to the past as the "Dreamworld". Dreams are considered so important that many of these groups are adept at inducing daytime dreams, or hallucinatory states. Physiologically, one explanation for the way certain drugs work to induce such states is by stimulating opioid-like receptors in the human forebrain. These receptors are of more than a little interest, since their activation leads to a cascade of seemingly unrelated events: the release of pain-mediating endorphins, the initiation of the wound repair mechanism, and the transmission of signals to the immune system. The same part of the brain carrying this

remarkable protective system apparently can also result in hallucinatory phenomena.

If hallucinations are merely dreams escaped into our waking hours, as we are suggesting, then we can also wonder whether dreams themselves are designed to be part of this protective package. And, if, indeed, dreams are windows into the past, then we must invert our usual way of thinking. It might be better to regard the events of the day as acting to perturb and color the primary function of the dream state, rather than the other way around.

And what of schizophrenics and others who hallucinate without cause, individuals who are unable to turn their dreams on and off? The mechanisms underlying multiple personality disorder and schizophrenia are still elusive. Although there may be as yet undiscovered, more likely explanations for mental illness, we should not disregard the potential involvement of intergenerational memories.

In any event, we see that there are at least four puzzles of the mind—the paradox of repressed memory, the widespread belief of having lived before, the function and interpretation of dreams, and the origin of the oedipal complex—that all seem to have a similar potential basis for rational explanation using the hypothesis of intergenerational memory.

Rationalizing Love

There are other bits of stray evidence in support of our thesis, including profound emotional experiences that are widely shared, poorly understood, and yet taken for granted. Love is a good example. We consistently avoid discussing this phenomenon in terms of possible origins, instead endlessly musing about the trappings of love: how to recognize it, how to deal with it, and (inevitably) how to deal without it. We know that love is not simply a by-product of sexual gratification or a hedge against loneliness. It is all of this and more. There is a deep mystery to human love, whether expressed by Alfredo in

La Traviata, as, offstage, he hauntingly voices the cry "*Misterioso*!", or in the very title of the ballad, "*Ah Sweet Mystery of Life*". Perhaps the clearest statement of all is found in the remarkable words to the Rodgers and Hart song:

It seems we stood and talked like this before
We looked at each other in the same way then
But I can't remember where or when
The clothes you are wearing are the clothes you wore
The smile you are smiling you were smiling then
But I can't remember where or when
Some things that happen for the first time
Seem to be happening again
And so it seems that we have met before
And laughed before and loved before
But who knows where or when?

In less eloquent words, the phenomenon of falling in love may represent a present-day association with a face or voice or personality imprinted from the past. In some measure imprinting of face or form is acknowledged for humans, to wit, the protective reaction engendered by the shape of any baby's face. But that is a universal imprinting, probably predating humans, and highly conserved in other species. We seek to extend this notion to the short-term, suggesting that the profound attractiveness of one individual to another may be carried forward through to later generations, to reappear again as the deeply felt and seemingly irrational response that we refer to as love.

Reinterpreting the phenomenon of *deja vu* is even easier. This effect is another universally shared, deeply personal observation that is wanting for an explanation, despite the fact that experiencing it can be profoundly disturbing, and invariably results in heightened self-awareness. Clearly, if thoughts and sights can be carried into further generations, then one should expect the occasional locking into a buried memory of place or phrase, resulting in what is experienced in the now as a sort of mental resonance with the past. It is instructive that

one of the most common descriptions of *deja vu* is the feeling of "having lived through this before"

There are also experiences involving memory that are, strictly speaking, not classifiable as *deja vu*, mainly because they are longer lasting that that fleeting sense of reliving one moment of prior consciousness. I vividly remember the eerie sense of familiarity upon visiting the city of Budapest for the first time. Not only had I never been there before, but there is no record, at least for three generations or so, of anyone in my family, having been there either. It was a sensation that I have never felt before and never since that one and only time. Apparently, this experience, as with so many others of this genre, is hardly unique. Others have mentioned the same feelings in regard to other places, each describing a familiarity that remains entirely inexplicable. In my own case I have taken to half-believing that not too many generations back, ancestors probably passed through this city, or even lived there. The feeling was simply too intense to allow me to reject any explanation, no matter how far-fetched.

Collective Memories

In a more credible vein, it is well-known that we are caught up in atavisms that occasionally touch us deeply. Who among us has never been transfixed by a simple campfire? It is extremely difficult in such cases to deny the likely connection to human beginnings. The German biologist, Ernst Haeckl (mentor to Richard Semon), touched this raw emotion when he initiated, as an outgrowth of his philosophy, a movement for people to commune with nature by hiking regularly.* Each weekend, a large fraction of the German nation responded, taking to

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* A remarkable remnant of this movement is to still be found in Washington, DC, where the Wanderbirds hiking club walks every weekend rain or shine. Present-day members have no collective memory concerning the dim century-old origins of this club, originally the German WanderVögel, given over to hiking, but also to strident nationalism.

forests and fields, acting out a relation to nature that has also stirred most of us at one time or another. And, in a connected observation, whether the city dweller appreciates it or not, there is a profound sense of human continuity found in every family that farms the soil.

I have already mentioned how much easier it would be to explain these atavisms and similar Jungian ideas relating to racial memory using our hypothesis. But Jung's ideas did not end at merely explaining the lure of campfires. There are profound additional aspects to the long-term scenarios of Jung and Wilson that both relate to human culture. And, no less profound are the cultural possibilities that must surely follow our proposed short-term, intergenerational, additions to memory.

Imagine a nation or a group of people that have had powerful experiences so widespread that these have been implanted in many members of this group in succeeding generations. What are the larger consequences of this assumption? To what extent, in other words, is today's population affected by yesterday's war, famine, slavery, or genocide? We all recognize that unless it has happened to your people, then it is human nature to conveniently forget the horrible details in a very short time. How many of us really understand the desperate life of slaves before Emancipation, the horrors of trench warfare in 1917, the suffocating miles of firestorm that swept Dresden, or the helplessness of Jewish parents in the face of Nazi brutality against their children? Once we admit to intergenerational memories handed down from parent to child we realize that there will be individuals whose forbears suffered trauma or knew of it first-hand who today still carry the emotional scars resulting from these long-ago events. Depending on the scope or number of people affected by the original event, the residual effects today can clearly permeate society in profound ways. The effect on our culture would be the global equivalent of individual repressed memory syndrome, only instead of only affecting one person at a time, extending out over large segments of society.

Is this not illustrated in the extraordinary lingering memories of slavery that are so deeply rooted in African Americans? The impact on black citizens has been so profound that many of them voice the opinion that federal reparations are in order. What makes this claim all so remarkable is that whites simply do not comprehend the basis for any such argument, despite the fact that the public in general is very well educated as to the cruelty and degradation that was so intrinsic to slavery. Why is the response of black and white to the very same event so very different? Four or five generations have passed, yet black anger still remains; some is undoubtedly due to the economic gap between black and white in America. But this cannot explain why an abiding anger is found in all African Americans, rich as well as poor. True, such feelings can be transmitted by word of mouth. Nonetheless we believe that this all-important aspect of black culture might have been so overwhelmingly imprinted by the monstrosity of slavery prior to 1865 that most of the present-day African American community still retains images and emotions directly transferred down from parent to child to grandchild to great grandchild, becoming so much a part of consciousness that one literally has to be an American black to really comprehend the depth of emotions that are involved.

Cognitive Instinct as a Selective Advantage

Many instincts are shared by humans and animals: the need for sex, for shelter, and for food are universal. We describe these instincts in biological terms as highly conserved, developed early on in the evolutionary process; although necessary to survival, they are not distinctly human. However, we know that there are activities that are specifically human, or nearly so. These relate to our superior cognitive abilities. Other animals are behaviorally imprinted to favor survivability. A chick does not have to learn from its mother to fear a hawk, and a

stock dog born and raised in the city will still round up sheep the first time she meets them. If low-grade mental imprints are observed in animals then should we not expect some transfer of higher-level thinking in humans? I argue that genetic imprinting of memory is likely an important adjunct to human continuity, in the same way as other animals are behaviorally imprinted to favor survivability.

The great advantage enjoyed by humans over other species is cognition and its application to other humans and to the surrounding world. It would be surprising to find that the human central nervous system lacked the ability to transmit important data from one generation to the next. This is self-evident today, considering the strength of our technological advances in communication. However, well before television and radio or the written word, or for that matter, long before the oral transmission of memory, it would have been supremely useful to have had a genetic mechanism in place to transfer memory. Is it totally unreasonable to suggest that there are vestiges of such a primitive system still in place today?

How Would it Work?

Just as with many other questions, the most difficult thing about this hypothesis is to delineate the hereditary process that could bring about this intergenerational memory. It seems almost brash to tackle this question, considering that everyday *intra*generational memory is itself a matter of some mystery. Following Chomsky, one can suggest a templated brain, fabricated and ready for future use. However, it is one thing to present a bare computer with only memory capacity and operating system in place. It's quite another to have this computer delivered with software pictures and paragraphs and games already imprinted in its memory.

We speculate that memory-to-memory transfer might occur during gestation. One possibility involves Prusiner's pri-

ons. These brain proteins are able to "reproduce" by altering the conformational state of other proteins, which then act to alter additional proteins, etc. One does not ordinarily think of prions as constituting a parallel vehicle to DNA, with all the bells and whistles necessary for genome coding and expression. They have to date been mainly identified with horrible conditions like mad cow disease and its equivalent in humans. However, we can guess that if there are bad prions there are likely good ones as well, the latter playing out some yet-to-be revealed brain function. Perhaps prions are present in our brains as an additional means of encoding memory through the shaping of proteins.

Prions are seemingly transportable in the blood stream. The human embryo is attached to the mother during gestation, receiving not only nourishment, but also, *inter alia*, immune protection, the latter implying a potential interaction with the mother's forebrain, and thus with her cognitive material. Thus one speculation is that prions (the good ones) carry aspects of the mother's consciousness to the neonatal brain in development.

There is a second conceivable mechanism through which information might be transferred from parent to child. Each of us carries an unseen, but very definite electromagnetic field configuration, unique to the individual. One aspect of this field is found in the remote measurements of EEG and EKG from the brain and heart, respectively, using highly sensitive magnetic detection (SQUID) techniques. Infrared emissions from our bodies are detected by the military and police in their night-vision scopes. Humans also emit low-level microwave radiation, all but undetectable except by means of highly sensitive apparatus. The brain generates electric frequencies ranging from a few Hertz to well above 50 Hertz. Among other things, these oscillations are connected to processes of memory. It is conceivable that the intimate lengthy nearness of a mother to her unborn child results in the transfer of cognitive information in what, for want of a better phrase, might be termed an electromagnetic manner.

Are Mental Aberrations Functionally Significant?

Lacking any reasonable mechanistic model, we have instead presented an *a posteriori* argument, suggesting a single cause for a group of wide-ranging presently observed phenomena. Some of these relate to aspects of consciousness that, for the most part, are confusing and difficult to categorize. Often regarded as mental aberrations or signs of mental illness, they are difficult to fit into computational models of the brain (one has to have a firm picture in mind of the mind before understanding the effects of perturbations). If dreams and hallucinations are difficult to explain mechanistically, perhaps we can invoke the less demanding question of functionality—if, that is, we first admit to the possibility that there exist such functional aspects. Admittedly, it is rather difficult to ascribe functionality to phenomena that are poorly understood. However, mental aberrations, poorly understood as they may be, are nevertheless extremely complex phenomena. The chance of a complex thing happening accidentally is admittedly small. But the likelihood falls sharply when complex phenomena occur repeatedly, and one should be on the alert for the reasons why such things occur, even when the picture is far from clear.

When I was an undergraduate at Brooklyn College, my professors were quick to dismiss the EEG time-varying potentials* as non-functional epiphenomena. As I returned to this question over the years, I noticed that this explanation continued to hold sway, even as the analysis of EEG signals became increasingly important as a diagnostic tool. Now, as evidence has mounted for a wide variety of intracellular calcium oscillations and intercellular electrical oscillations in the visual and olfactory compartments of the brain, the EEG pendulum has swung in the other direction. We still have no proof that EEG signals serve any useful function, but after some decades of

* more commonly, brain waves.

thinking it over, many neurophysiologists now think that perhaps they were too quick to rush to judgment on this matter.

There is a certain similarity to the way science has dealt with dreams and other mental excursions. Instead of classifying these as epiphenomena, accidental by-products of the brain, perhaps we should attempt to place them in context, as part of some larger picture. One such possible explanation is that they are one of the ways in which consciousness is inherited, no less than all our other inheritable physical attributes. Putting this another way, if evolution has managed, via genetics, to pass along a measure of everything that has occurred before, whether it is the color of our eyes, the number of our fingers, or the size of our brains, then is it not reasonable to also seek to include that part of us that we regard as the most important? It is hard to avoid the strong gut-feeling that the mind must also be dragged along from generation to generation, no less than all our other baggage.

This is not to deny that each of us during the road from birth to death is subject to countless stimuli, images and thoughts from people, places, and constantly improving communication devices, and that these inputs must shape our behavior in incalculable ways. The memories of these events as well as our responsive attitudes are nowadays sometimes explained by synaptic plasticity, the idea that a continuing rearrangement of neural networks occurs in the brain to fit changing inputs.

However, synaptic plasticity may not be enough to account for the transcendent mind. At the root of whatever constant reinterpretation of data that goes on in any one brain, there is awareness of self, a quality that goes beyond the *spatial* reconfiguration that is the basis of synaptic plasticity. Perhaps we can suggest that the mind is more time-like than space-like. Even though the mind may be physically associated with just one human replicate at a time, we should allow for the possibility that it may also constitute an organic whole, an iterative product of the past, and that perhaps it is shared from parent to child in a long unbroken chain of cognition and awareness.