

Phactum
Special Edition
of The Newsletter of the
Philadelphia Association for Critical Thinking

editor: Ray Haupt email: phactpublicity@aol.com
Webmaster: Wes Powers www.phact.org

THE PHYSICS OF FREE WILL

by A. Granville Fonda

PhACT, the Philadelphia Association for Critical Thinking,
is dedicated to the idea that the pathway to a better world is science and clear
logical thinking, as opposed to the mysticism and faulty science that is so popular
in the world today.

The PhACT Council

Eric Krieg, President
Bob Glickman, Secretary
Susan Glickman, Treasurer
Wes Powers, Webmaster
Ray Haupt, Phactum Editor
Mike Caro

Dr. David Cattell, Ph.D.
Dr. David Cragin, Ph.D.
Dr. David Langdon, M.D.
Tom Napier
Becky Strickland

About Phactum Special Editions

Each Phactum Special Edition will be a member-contributed article having a single theme likely to interest other skeptics. By virtue of distribution in electronic format only, they will provide a place for articles longer than we can accommodate in our normal publication. Submissions must be in an electronic format that is easily readable.

Articles must be written to be comprehensible to bright laymen and by the editor and others that he may call upon for advice. Subject matter can be controversial. Matters wildly in opposition to the zeitgeist of mainstream skepticism are welcome. As skeptics we tend to dwell on topics of science, superstition, quackery, etc. – but let's not forget history, biography, poetry, philosophy, and many other topics that make life so interesting.

We encourage readers with expertise in a field to participate, and we also encourage laymen to investigate a topic and write it up. It is a great way to educate oneself and educate others as well.

“We are at the very beginning of time for the human race. It is not unreasonable that we grapple with problems. But there are tens of thousands of years in the future. Our responsibility is to do what we can, learn what we can, improve the solutions, and pass them on.” ~ Richard P. Feynman

Opposing and concurring viewpoints can be expressed in Letters to the Editor, which may be printed in Phactum, or by way of letters to the author.

About This Phactum Special Edition

This author tackles a problem which, despite its long history, for some lacks any immediate importance. It nevertheless fits into the active search in the scientific community for *unification*, for a “theory of everything.” That hunt cannot succeed while it leaves unsolved the mind-body problem, the “hard problem” of how each of us physically and yet willfully governs our own muscles. Convinced as the physicalists are that the solution to this mystery must be purely physical, as yet it remains just that – a mystery.

The great majority of the world population, in contrast, simply dismisses the physicalist view. They say, “they just don't know” that not everything is physical – mysterious as that may be. This view rather diminishes respect for the scientific approach, whatever its tangible benefits. However, the physicalist stubbornly asks, by what means could the nonphysical affect the physical? Is that not impossible? We thus see two fundamental mysteries, each seeming as insoluble as the other.

It behooves the physicalist to at last solve the “hard problem;” and professional engineer Al Fonda, drawing on his expertise in mechanical and servomechanical systems and in forensic disputation, claims to have done so.

The free-will-versus-determinism controversy blends also at the other end of the spectrum into the question of *responsibility* and consequent ethics. If one could not have done otherwise, as physicalism can seem to imply, then how could one be held responsible for anything? The author speaks to this as well, preserving free will – as well as determinism – and leaving us free to consolidate the solution with ethical and compassionate considerations in our own lives.

A PHACT *Preprint* of a pending publication

Issued December 6, 2010

**This document is available in digital form in at the Phactum Special Editions page at:
<http://phact.org/special.php>**

**DISCUSSION is invited at the PhACT Discussion Board at:
<http://phactforum.org/>**

Abstract of Preprint: THE PHYSICS OF FREE WILL

© 2010 A. Granville Fonda

In a nutshell – **Each of us is a sensitive, intelligent, considerate, and adaptive automaton.**

Our ethereal minds - the majority of us have long been convinced - mystically interact with our physical bodies; and that explains self and free will. Others, increasingly, say No, there can be no interaction between the nonphysical and the physical. But then they hesitate, asking, if it's all physical, what is the explanation for self and free will?

In a review of answers to this question, the author recites all the major historical and contemporary aspirants. A working solution emerges, however, only with the application of modern control system concepts. Here's how...

Tenably the self consists, as Hume held, of nothing but "bundled" memories of perceptions. To infer "meaning" from recalled experience we must construct scenarios appropriate to the experiences. Therefore, our memories include numerous "just-so stories" - useful fabrications, new and old.

One such construction is the very concept of "the self" as an entity – and that ties together the bundle. Another construction is that what the body is observed to currently be doing is what “the self” has chosen to do – and this constitutes the feeling of free will. Other constructions are anticipatory; if metaphorically the mind is a theater, based on the past and the present we maintain a repertoire of rehearsals for the future. Muscular action ensues, as James held, when one rehearsal for action gains dominance and is enacted – sometimes with a focus of attention, sometimes with no such attention.

The novelty is this: to consider this bundle of perceptions and this available repertoire to be not static, but dynamic – varying in time. Mental functions can be reconfigured literally in the blink of an eye. The repertoire is being persistently and instantly revised by immediate sensory experience. By **re-entrant cognitive repertoire theory** the self is not stuck in time – rather, it is rebuilding and reconstructing itself even as it acts.

Ongoing self-revision is a process in which a dynamic Self is comprised not alone of what previously did happen - or was planned to perhaps happen - but also of fresh memories of what just now did happen. This new information instigates new plans as to what might yet happen. No sooner do we work the plan, than we re-work the plan. The result is that, in every instant, in the place of the old self stands the new self.

All this is consistent with general neurobiological observations. Certain synapses do form memory traces by means of long-lasting activity-dependent changes in synaptic strength – and other neurons do energize the muscles as rehearsed. Avoiding all philosophical esoterica, the whole explanation is indeed rather mundanely physical, relying neither on anything supernatural nor, other than perhaps peripherally, any quantum phenomena.

Our "self" thus consists of our immediate as well as our distant memories of our own constructions and rehearsals, descriptive of what we have been, what we are, and what we might yet become. According to its merits one rehearsal or another becomes dominant, and with or without focal attention that potent rehearsal governs a muscular enactment. This all flows as a physical cascade of causation, given our memories as they are at each instant. But in every instant, due to ongoing sensing those memories change.

As seen from the outside, physiologically speaking, this is a predestined, physical, determinate sequence. We are automata. Yet as seen from the inside, psychologically speaking - as seen by the self doing the encountering - it is simply "me, doing my own thing" – within the constraints imposed by those memories.

Free will, then, is indeed free, as the activity of the brain as seen from within. Yet simultaneously it is, as Spinoza said, indeed determined; every event having a reason, being in every respect causally determined according to consistent physical law. Neither view denies the other. Neither need there be any ethereal connection between our minds and our bodies.

We can do as we will even though, as Schopenhauer said, we can will only as we must. And we are not merely condemned to be free, as Sartre said; we are, whether we like it or not - and we do like it - determined to be free.

The Physics of Free Will

© 2010 A. Granville Fonda

Preamble. MAGIC, FATE, OR PHYSICS? – Resolving the Problem of Freewill

Can it be true that, while in large part we are physical machines, also there is a ghost in that machine, indeed perhaps a divine spirit? If not, then are we mere automata, fated to act as we do? Or, is there a third possibility? Can there be a middle ground between rampant fantasy and paralyzing fate? Neither magic nor fate, but simply, unexceptionally, physics? Yes, according to this forensic engineer.¹ Indeed, through physics at the human scale we can see ourselves as *both free and fated* – for although there is no ghost “in” the machine, the ghost “is” the machine!

This goes well beyond a nice academic discussion. Worldwide, many of us - indeed, the majority of us - have long accepted its best-known answer, *supernaturalism*, which holds that we humans are inexplicable exceptions to the physical and natural world. While we cannot explain why we are exceptions, obviously we must be. Inferring then some sort of a higher power - from which we are also somehow free - historically we have constructed a variety of defiantly unverifiable belief systems. And we have advocated each of these to the necessary exclusion of the other – sometimes to the point of deadly intolerance.

There is a fundamental problem with supernaturalism, in that it claims validity without verifiability. While some seeming miracles are misunderstood natural events, faith nevertheless soars where reason cannot follow. By shrugging off the chains of reason, or more accurately those of credibly interpreted bodily sensation, any contention whatsoever may be (and probably at some time has been) claimed to be the pure and utter truth. Inherently there is nothing to distinguish a holy and divine revelation from a mad and perverted delusion. Their claims to validity without verifiability are equal.

No such claim is made in views such as *physicalism*, which holds that all things and events are physical. The entire universe is in this view an interactive totality in which every event follows regularly from and only from its physical antecedents. All is thereby determined, then, even within our bodies and our brains – this subsidiary view being *determinism*. Even when we act intentionally and without coercion those antecedent causes govern us. It follows that we are physical machines, functioning as automata. However, should we deny determinism - and many do - it would seem that we too consider ourselves to be inexplicable exceptions to the regularities of the physical and natural world.

If only we could explain ourselves as not being exceptions at all, yet possessed of will which is free, our felt mutuality could be with others like us - all our fellow humans - and also with all of Nature. This unifying answer, should it become widely accepted, would be of great benefit to us all.

With “unexceptionality” as the goal, then, consider as a thesis The Physics of Free Will.

Chapter 1.1 THE PERENNIAL PROBLEM OF FREEWILL

**Physics cannot possibly deny human free will — *but still it seems to.*
Free will cannot possibly deny human physics — *but still it seems to.*
Unlikely as it might seem that anything can be said on this
subject which has not been said before, new insights -- confirmed
by recent observations in neuroscience -- may at last resolve it.**

Long before the earliest records of our species, a question which continues to concern us must have been asked. How is it, how am I to think about it, that in the process of being aware in general, of other things, I am specifically aware of myself, and of being aware? What is the difference between myself and what I experience; between Self and Other? What does it mean to be aware of both what **is** myself, and what **is not** myself — of both the free mental realm I internally experience and the apparently consistent and constrained physical realm I externally experience?

How can I feel both that there is a reason for everything, *and* that there is none for what I choose to do — that I always could have chosen to do otherwise? Asks a popular college text in philosophy, “Are all of my actions absolutely causally determined by what has gone before, or am I free in some sense to choose among a variety of alternative actions available to me? If I am determined to act as I do, then can I also consider myself responsible for what I do? If I am free, what is the nature of my I, that I should have this strange capacity to act freely?”² Arguably there is no deeper question.

So posed that question limits us to the case of “actions absolutely causally determined by what has gone before.” Only when that predicate has been thoroughly treated will we consider the matter of indeterminate physics.

Comprehension follows from doubt, and from time to time all propositions should be doubted again. This is the ongoing process of “skepticism” — a word derived from the Greek *skeptomai*, to look about, to consider. Using the title of this essay as a focus, let’s consider not the *belief* but the *skepticism* involved in two propositions currently prominent in the West, diametrically opposed but perhaps underappreciated as being equally cogent.

1.2 THE TWO OPPOSED SKEPTICS

As viewed by a First Skeptic (either of the twins of Figure 1), mentality is something other than a physical effect.

- Skepticism of this type dismisses the contention that the mental can be explained as a physical phenomenon.
- While physical causation cascades from one effect to the next according to consistent recurrences which we codify as natural law, also, mysterious as it may be, there are inter-actions between the physical and the nonphysical which are exempt from natural law.
- We know personally of this exemption by means of our direct experience of uncaused (free) will as within us it occurs, and the consequent actions we take for which we feel and are responsible.
- Free will has no physics, for while free will is real it is not a physical phenomenon. So,
- “*The physics of free will*” is *oxymoronic*.

As viewed by a Second Skeptic, mentality is entirely a physical, indeed a mechanistic, effect.

- Skepticism of this type dismisses the contention that the mental or anything else constitutes a nonphysical phenomenon. A thought is not itself a thing, other than as a neurological phenomenon.³
- Within ourselves as elsewhere, physical causation deterministically cascades from each physical effect to the next strictly according to recurrences which we codify as natural law.
- Mysterious as it may be, we seem to have personal experience of uncaused (free) will and of consequent actions we take for which we feel we are responsible.
- One such explanation, *epiphenomenalism*, argues that “free will” is no more than a peripheral phenomenon, a feeling of no consequence; it has no actual effect on the cascade of causation. If so,
- “*The physics of free will*” is *oxymoronic*.

In the latter instance these diametrically opposed skeptics share a refusal to even consider the possibility that “free will” is a genuine and efficacious but also entirely physical phenomenon. But in any case the skeptics differ regarding how much difference there really is among things.

The First Skeptic sees a profound difference in kind between human spontaneity and inanimate mechanism – the mystical cannot possibly issue from the mechanical. Yet the mechanical body is driven by the nonphysical mind – which terminates this discussion.

Yes, they differ, says the Second Skeptic, but not in kind; if they do interact they must be of a kind; they cannot uniquely differ. If they did they would be unable to interact – neither would have any knowledge of the other.

Each of these views has long been known, each has its merits, and each has its problems. To the end of resolving this conflict we will take to task not the First but the Second Skeptic. We will question the claim of accounting for free will - as a feeling, and as an actuality - without any violation of the laws of physics.

We thus question the explanation of free will within the concept of determinism, which is, as nicely phrased by Wikipedia, “the philosophical view that every event, including human cognition, behavior, decision, and action, is causally determined by the environment. It is, in essence, the view that one’s life is predetermined before one is even born. Determinism proposes there is a predetermined unbroken chain of prior occurrences back to the origin of the universe.”⁴

In this view, what we imagine to be a decision-tree available to us, affording us a choice at each fork, always the opportunity to “do otherwise,” does not exist; the choice we make is always the consequence of its antecedents, even within us. Other than as a fantasy, the decision tree never existed; only a zigzag leading to a fated conclusion.

We will question this view; however, repugnant as it surely is, do we have a way to deny it? Looking back, all we see is the zigzag that was; how could we possibly know, looking forward, that we really could make the choice we will not make, really could take the road we will not take?

1.3 NEWTON VERSUS NEWTON

Consider the case of the father of practical physics, Sir Isaac Newton (1643-1727). Newton was at times a First Skeptic and at other times a Second Skeptic. As a First Skeptic, Newton famously said in his Principia (1687) that “This most beautiful system of the sun, planets, and comets, could only proceed from the counsel and dominion of an intelligent and powerful Being.”⁵ He also said in his Optiks (1704) that “As we are conscious of our power to move our bodies, so we cannot deny the same power to God.”⁶ While the former is a simple argument from incredulity, the latter more elegantly follows the logic of his third Rule of Reasoning,⁷ which is that qualities which are found locally will be found globally – hence (here), *as in Self, so in Other*. Since so obviously our non-physical minds control our physical bodies, even in the heavens there must be interaction between the physical and the non-physical.

Indeed, in Newton’s time it did seem that on earth only divine intervention could possibly account for the wonders of Nature, ourselves included. Now, however, thanks to Darwin, Evolutionists are able to claim that it’s all natural, all the workings of a cascade of physical causation. But, hidden up the sleeve - or in the subconscious - of the contemporary Creationist is (I suspect) the ultimate trump card, the one which Newton played, namely the personally known nonphysicality of free will.

Conversely, however, as an exemplary Second Skeptic Newton said also in his Principia, “Tis the business of this Philosophy to argue from the effects to their causes till we come at ye first cause & not to argue from any cause to the effect till the cause as to its being & quality is sufficiently discovered....Even arguments for a Deity if not taken from Phaenomena are slippery & serve only for ostentation.”⁸

Argue today’s Creationists, “Teach the Controversy.” Yes, but within “the controversy” is the question of the validity of, in effect, *psychokinesis* - whether something purportedly nonphysical (though not necessarily God) can affect something physical - and whether the control our minds seem to exert over our bodies is - as Newton argued - a case in point.

As part of the dualistic viewpoint, what cannot be physically sensed nevertheless can be transcendently



Figure 1. TWO OPPOSED SKEPTECS

experienced. That part of the ancient doctrine of *exceptionalism* claims that our personal experience of self (and our freedom of will) transcends the strict chain of causation we observe elsewhere. We are so sure that the feeling of having freely willed and acted is authentic that we infer that there must be two differing but interacting domains – the tangible and the intangible; the physical and the nonphysical.

Physicalism⁹ rejects this inference on the basis that sensing is an instance of interaction, so what is tangible is physical, while what is intangible is *ipso facto* ineffectual. Neither can there be any interface which both is and is not physical, for nothing can be what it is not. This applies in converse fashion Newton's third Rule of Reasoning, but takes the physical nature of Other to be Universal, forming a continuum lacking any peculiar borderline at which the Laws of Nature cease to pertain. Hence, *as in Other, so in Self*. What cannot be sensed, goes this argument, can make no sense – what isn't matter, doesn't matter.

Newton's Third Law, stating in effect that forces always occur in matched opposed pairs, so that a single isolated force cannot exist,¹⁰ argues to the same end. Even Einsteinian physicists might agree that this Third Law still holds. Neither do even theists argue that God can do that which is in His world impossible.

Epiphenomenalism is the further view, says The Stanford Encyclopedia of Philosophy, that “mental events are caused by physical events in the brain, but have no effects upon any physical events. Behavior is caused by muscles that contract upon receiving neural impulses, and neural impulses are generated by input from other neurons or from sense organs. On the epiphenomenalist view, mental events play no causal role in this process.”¹¹ The obvious threat here is automatism; but both now and during evolution, if we do not affect our own actions, what are our “selves” doing here?

The dualist insists that having everything be physical is no way to have free will, and we actually do have free will - despite, granted, a metaphysical mystery as to how that can happen. With equal intransigence the monist insists that to imagine that the nonphysical can somehow affect the physical is no way to actually have free will - despite, granted, a physical or a psychological mystery as to whether we do have it, or if we do not, why we think we do.

Evidently what one skeptic credits and vaunts the other discredits and dismisses. Each skeptic is on their own behalf as sanguine as the other, and each as much as the other sees as insurmountable the barrier which confronts the other. As yet they have battled each other to a stalemate. Any of us might at this point accept one as readily as the other, as many already have done. Or we might bide our time, deciding to be undecided while awaiting a solution.

1.4 WHAT TO DO WITH THIS STALEMATE?

I suggest that the waiting is over. If the Second Skeptic claims that all is in principle observable, and that Reason should not fail to resolve the issue, then as already noted our tactic must be to cross-examine the Second Skeptic. If, however, free will really does deny physicalism, then “We have a problem, Houston.”

We offer here a way to comprehend both the feeling of free will and its physical action *without* conflict with determinism; a way, indeed, to comprehend free will as being itself deterministic. Logically, and with experimental support, there is a deterministic cascade of causality in which we, as self-aware beings, participate – a cascade which is in part responsive to our preferences while those preferences themselves are responsive only to their physical antecedents. Extremely briefly – we will show that *we do as we will, but we will as we must*.

As much as our solution to the problem is a departure from those previously ventured, it also has points in common with many of them. Both the commonalities and the failings will be evident in the following review. Hopefully this will read like a detective story in which suspension mounts with each suggested scenario – yet none of them solves the mystery.

Chapter 2. A SYNOPSIS OF THE LITERATURE

We summarize here in brief the major relevant literature – nothing philosophically “esoteric”¹² being here considered relevant. In Appendix 1 each of these topics is expanded and all sources are recited.

2.1 Before the Pre-Socratics the concept of causes was mixed up with much that was extravagant and superstitious. Because the powers of nature were uncertain and capricious it was necessary to offer them sacrifices and pray to them. The early philosophers sought instead the nature of things in themselves.

2.2 Democritus (ca. 460 BCE/ ca. 370 BCE) predicated a world consisting of tiny atoms moving randomly in an infinite void, which through their accidental collisions and combinations, accounted for all the features of our world, including us.

2.3 Plato (428-347 BCE) held that there is a realm of abstract forms, essences, or universals apart from the physical world, which are real even though we cannot physically see them. A thought thus is itself a thing.

2.4 Aristotle (384-322 BCE) argued to the contrary that “forms are powerless to explain changes of things ...Forms are not causes of movement and alteration in the physical objects of sensation.” Plato and Aristotle are respectively the dualist and the monist, the First Skeptic and the Second.

“Feelings and actions,” said Aristotle, “receive praise or blame when they are voluntary but pardon, sometimes even pity when they are involuntary.” Augustine, Aquinas, Hume, and many others agreed that from volition issues responsibility. Still, how is it that volitions, any more than forms, can be “causes of movement and alteration” in the physical body in which they reside?

2.5 Chrysippus (c.280-207 BCE) said “although it is true that by fate all things are forced and linked by a necessary and dominant reason, nevertheless the character of our minds is subject to fate in a manner corresponding to their nature and quality. ...each man’s own will and the character of his mind govern the impulses of his thoughts and minds and his very actions. It is still he - and not external factors alone - who is responsible for the behaviour.”

2.6 William of Ocham (1280-1349) not only said that “It is useless to do with more what can be done with less,” but also championed the view that essences are nothing more than concepts in the mind.

2.7 Naturalism (ca 1500-). After a long eclipse during the Dark and Middle Ages, the belief that everything is the result of natural laws - Naturalism - was revived, presuming at first that God, after creating the world with its motion and natural laws, did not intervene. Soon leading thinkers began making a transition to a naturalistic worldview that, while retaining the mechanistic view of nature, would discard God and the soul.

These developments revived the puzzle of determinism versus free will. A strict *determinist* would say that, if they have “no need of that hypothesis” in the heavens, we also need none to account for originality of thought. A strict *libertarian* would say that the feeling of free will trumps any argument from causality. And a *compatibilist* would claim to see a resolution of the problem – even if others might consider that to be nothing more than obdurate libertarianism.

2.8 Renee Descartes (1596-1650), by rejecting any idea that can be doubted, arrives at only *cogito ergo sum* (“I think, therefore I am”). He suggested that the body works like a machine and that it follows the laws of physics. The mind (or soul), on the other hand, does not follow the laws of physics. While the mind controls the body, the body can also influence the otherwise rational mind.

Descartes is thus a First Skeptic, claiming that there are two drastically differing domains, one which does and another which does not follow the laws of physics. He proposed that nonphysical events could cause small changes in the shape of the pineal gland. Others promptly objected that according to the physical account of



William of Ockham

motion there will be no such change unless there is a physical force that causes it.

2.9 Thomas Hobbes (1588-1679), writing when freedom of the will was called Liberty and determinism was called Necessity, said that “Liberty and Necessity are Consistent: As in the water, that hath not only Liberty, but a Necessity of descending by the Channel: so likewise in the Actions which men voluntarily doe; which (because they proceed from their will) proceed from Liberty; and yet because every act of mans will, and every desire, and inclination proceedeth from some cause, which causes in a continuall chaine (whose first link in the hand of God the first of all causes) proceed from Necessity. So that to him that could see the connexion of those causes, the Necessity of all mens voluntary actions, would appeare manifest.” Certainly a vivid metaphor; but is it more than that?

2.10 Baruch Spinoza (1632-1677) held, in opposition to Descartes’ mind-body dualism, that everything must necessarily happen the way that it does. Therefore, humans have no free will. They believe, however, that their will is free.

He contended that everything that exists in Nature (i.e., everything in the Universe) is one Reality (substance) and there is only one set of rules governing the whole of the reality which surrounds us and of which we are part. Spinoza viewed God and Nature as two names for the same reality. Possibly he viewed Liberty and Necessity similarly – but, perhaps not.

“Things which have nothing in common cannot be one the cause of the other. If they have nothing in common, it follows that one cannot be apprehended by means of the other. Things which have nothing in common cannot be understood the one by means of the other.

“The human body as well as the body of an animal must be a machine. Mind and body are one and the same thing, conceived first under the attribute of thought, secondly under the attribute of extension. Men think themselves free, inasmuch as they are conscious of their volitions and desires, and never even dream of the causes which have disposed them to wish and desire. Thus what is called the consciousness of freedom is nothing but the unconciousness of causation.”



2.11 John Locke (1632-1704) maintained that we are born without innate ideas and that knowledge is determined only by experience derived from sense perception. He made a distinction between passively acquired simple ideas, such as ‘red,’ ‘sweet,’ ‘round,’ etc., and actively-built complex ideas, such as numbers, causes and effects, abstract ideas, ideas of substances, identity, and diversity.

“The most important ideas of relation are doubtless the ideas of cause and effect. One cannot fail to notice that qualities and substances begin to exist and later pass away. By comparing the producer and the product the mind forms the ideas of cause and effect.”

2.12 David Hume (1711-1776) held that “our idea of necessity and causation arises entirely from the uniformity observable in the operations of nature, where similar objects are constantly conjoined together, and the mind is determined by custom to infer the one from the appearance of the other. These two circumstances form the whole of that necessity, which we ascribe to matter.

“After we have perform’d any action; tho’ we confess we were influenc’d by particular views and motives; ’tis difficult for us to persuade ourselves we were govern’d by necessity, and that ’twas utterly impossible for us to have acted otherwise; the idea of necessity seeming to imply something of force, and violence, and constraint, of which we are not sensible. We feel that our actions are subject to our will on most occasions, and imagine we feel that the will itself is subject to nothing; because when by a denial of it we are provok’d to try, we feel that it moves easily every way. But these efforts are all in vain; and whatever capricious and irregular actions we may perform ...we can never free ourselves from the bonds of necessity.

Hume claimed that incompatibilism is merely “a verbal dispute, since everyone, he says, accepts both determinism and free will.” This does nothing, however, to rule out an error of attribution in regard to either determinism or free will - they may not be what they appear to be - nor does it establish a possible causal path to one’s actions from our will.

“Self or person is not any one impression, but that to which our several impressions and ideas are suppos’d to have a reference. For my part, when I enter most intimately into what I call myself, I always stumble on some particular perception or other, of heat or cold, light or shade, love or hatred, pain or pleasure. I never can catch myself at any time without a perception, and never can observe any thing but the perception.

“[We are each] nothing but a bundle or collection of different perceptions, which succeed each other with an inconceivable rapidity, and are in a perpetual flux and movement. The mind is a kind of theatre, where several perceptions successively make their appearance; pass, re-pass, glide away, and mingle in an infinite variety of postures and situations. As a memory alone acquaints us with the continuance and extent of this succession of perceptions, ’tis to be considered, upon that account chiefly, as the source of personal identity. Had we no memory, we never shou’d have any notion of causation, nor consequently of that chain of causes and effects, which constitute our self or person.”

Hume also drew an analogy between the self and "a ship, of which a considerable part has been chang’d by frequent reparations, [which] is still considered as the same." Hume advocated a moral theory based on human actions and human responsibility rather than metaphysics and religion. Hume argued that it makes sense to hold a person responsible for an action only if the action was caused by his character, rather than by random events or external compulsion.

2.13 Baron d’Holbach (1723-1789) made an unrelenting case for naturalism and determinism. “The will ...is a modification of the brain, by which it is disposed to action or prepared to give play to the organs. This will is necessarily determined by the qualities, good or bad, agreeable or painful, of the object or the motive that acts upon his senses; or of which the idea remains with him, and is resuscitated by his memory. In consequence, he acts necessarily; his action is the result of the impulse he receives either from the motive, from the object, or from the idea, which has modified his brain, or disposed his will.

“The actions of man are never free; they are always the necessary consequence of his temperament, of the received ideas, of the notions, either true or false, which he has formed to himself of happiness: of his opinions, strengthened by example, forfeited by education, consolidated by daily experience....

“Man will be an enigma to himself, as long as he shall believe himself double; that he is moved by an inconceivable spiritual power, of the laws and nature of which he is ignorant. Pure spirits, according to the only idea man can form of them, having no organs, no parts, cannot see any thing; can neither hear our prayers, attend to our solicitations, nor have compassion for our miseries”



2.14 Immanuel Kant (1724-1804) argued for a dualistic conception of us as being simultaneously present in two worlds. This way, we can maintain that while we are causally determined in the “phenomenal” world and subject to the laws of nature, we are also at the same time free in the “noumenal” world and subject to the laws of reason. The recognition of this dual presence in both worlds solves the tension between free will and causal determinism.

2.15 Arthur Schopenhauer (1788-1860) emphasized the role of man’s basic motivation, which Schopenhauer called will. His analysis of will led him to the conclusion that emotional, physical, and sexual desires can never be fulfilled. Consequently, he favored a lifestyle of negating human desires, similar to the teachings of ancient Greek Stoic philosophers, Buddhism, and Vedanta.

Schopenhauer claimed that as phenomenal objects appearing to a viewer, humans have absolutely no free will. They are completely determined by the way that their bodies react to stimuli and causes, and their characters react to motives. As things that exist apart from being appearances to observers, however, humans are free will.

When a person inspects his or her self-consciousness, they find the feeling “I can do whatever I will as long as I am not hindered.” But, Schopenhauer claimed that this is merely physical freedom. He asserted “You can do what you will, but in any given moment of your life you can will only one definite thing and absolutely nothing other than that one thing.”

Motivation is causality that passes through a knowing mind. For animals, the motive must be immediately present. Humans, however, can also respond to motives that are abstract concepts and mere thoughts. Therefore, humans are capable of deliberation in which a stronger abstract motive outweighs other motives and necessarily determines the will to act.

Every human has a unique way of reacting to motives. Character does not change. Behavior, however, can change when a character learns how to attain its goal through a different way of acting. The means change, but not the ends. This is the result of improved cognition or education.

“Everything that happens, happens necessarily. Through that which we do, we find out what we are. To wish that some event had not taken place is a silly self-torture, for this means to wish something absolutely impossible.

“My exposition does not eliminate freedom. It merely moves it out of the area of simple actions ...up to a region which lies higher, but is not so easily accessible to our knowledge. In other words, freedom is transcendental.”

2.16 Charles Darwin (1809-1882) developed a theory of how humans could have evolved through natural selection of random variations. Darwin still believed in the assumption that God, in creating the universe, had built in laws of evolutionary development; but his successors rejected his deism in favor of a completely atheistic worldview.

For some, as the current Catholic stance shows, despite an acceptance of Darwinian evolution of the body, the alleged nonphysicality of free will continues to anchor the argument for human exceptionalism.

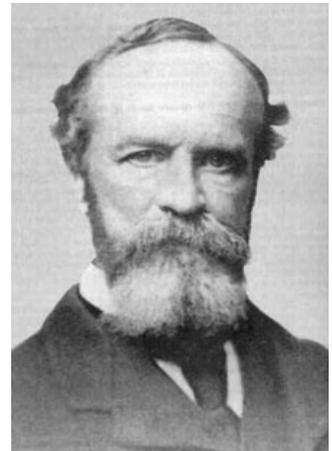
2.17 Thomas Henry Huxley (1825-1895) held that, just as “the steam-whistle which accompanies the work of a locomotive engine is without influence upon its machinery, it seems to me that in men, as in brutes, there is no proof that any state of consciousness is the cause of change in the motion of the matter of the organism. The feeling we call volition is not the cause of a voluntary act, but the symbol of that state of the brain which is the immediate cause of that act. We are conscious automata.”

2.18 William James (1842-1910) said that attention is “the taking possession by the mind, in clear and vivid form, of one of what seem several simultaneously possible objects or trains of thought. It is possible to conceive of it as an effect and not a cause. An idea must be there before we can attend to it. Attention only fixes and retains what the ordinary laws of association bring ‘before the footlights’ of consciousness.”

“Wherever movement follows *unhesitatingly* and *immediately* the notion of it in the mind, we have ideo-motor action. We are then aware of nothing between the conception and the execution. We think the act, and it is done; and that is all that introspection tells us of the matter.

“Any new conceptions, emotions, and active tendencies which evolve are originally produced in the shape of random images, fancies, accidental out-births of spontaneous variation in the functional activity of the excessively instable human brain, which the outer environment simply confirms or refutes, adopts or rejects, preserves or destroys.”

James “suffered from repeated bouts of near-suicidal depression, which often focused on the issue of free will. By 1904 James was looking to psychic phenomena and the soul of traditional metaphysics as a possible solution to the crisis of meaning and spiritual comfort that not only affected William James personally, but also many of his contemporaries and successors. Consciousness and its huge related vocabulary were expelled from ‘respectable’ philosophy and science. The result was a kind of psychic wound in the Western intellectual tradition.”



2.19 Sigmund Freud (1856-1939) and his colleague Josef Breuer “took Leibniz’s earlier suggestion of unconscious perception, and, following James, added in unconscious semantics and motivation as well, thus setting the scene for the emergence of psychodynamic theory during the first half of the 20th century.

“The picture they painted of an inner welter of emotionally charged content, clamouring to be heard but only if suitably camouflaged, still colours our everyday conceptualisation of free will. Indeed, one common modern view of free will is that it is at least in part just a ‘post-hoc rationaliser,’ a system which has no editorial control over what our deeper motivations have us do, but which can then explain the resulting behaviours away. It is a mechanism which thinks it is in charge, but is not.”

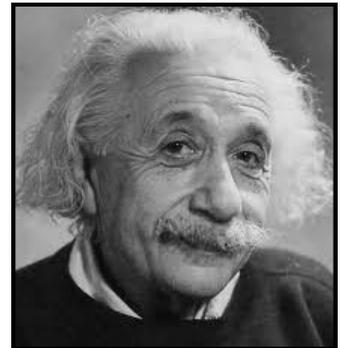
2.20 Jules Henri Poincaré (1854-1912) held that creativity and invention consist of two mental stages, first random combinations of possible solutions to a problem, and then a critical evaluation. “All the combinations are formed as a result of the automatic action of the subliminal ego, but those only which are interesting find their way into the field of consciousness. A few only are harmonious, and consequently at once useful and beautiful,

and they will be capable of affecting the geometrician's special sensibility, and will thus give them the opportunity of becoming conscious. In the subliminal ego, on the contrary, there reigns what I would call liberty, if one could give this name to the mere absence of discipline and to disorder born of chance."

Poincaré's two stages - random combinations followed by selection - became the basis for Daniel Dennett's two-stage model of free will.

2.21 Arthur Holly Compton (1892-1962) championed the idea of human freedom based on quantum uncertainty. First there is a range of random possible events, then one adds a determining factor in the act of choice."When one exercises freedom, by his act of choice he is himself adding a factor not supplied by the physical conditions and is thus himself determining what will occur."

2.22 Albert Einstein (1879-1955) said "I do not believe in freedom of will. Schopenhauer's words, 'Man can indeed do what he wants, but he cannot want what he wants', accompany me in all life situations and console me in my dealings with people, even those that are really painful to me. This recognition of the unfreedom of the will protects me from taking myself and my fellow men too seriously as acting and judging individuals and losing good humour."



2.23 Erich Fromm (1900-1980) saw personal freedom as able to rise from and above the biology, thus defying the forces of determinism. "Both helplessness and doubt paralyse life, and the cure is self-realisation, that is to say, the active expression of the individual's emotional and intellectual potentialities."

2.24 Kenneth Craik (1914-1945) laid the foundation for the concept of mental models, that the mind forms models of reality and uses them to predict similar future events. He said, "If the organism carries a 'small-scale model' of external reality and of its own possible actions within its head, it is able to try out various alternatives, conclude which is the best of them, react to future situations before they arise, utilise the knowledge of past events in dealing with the future, and in every way to react in a much fuller, safer and more competent manner to the emergencies which face it."

2.25 Norbert Wiener (1894-1964) is regarded as the originator of cybernetics, a formalization of the notion of feedback, with many implications for engineering, systems control, computer science, biology, philosophy, and the organization of society.

The term cybernetics stems from the Greek *kybernetes*, steersman, governor, pilot, or rudder. It is "the study of systems and processes that interact with themselves and produce themselves from themselves." "Action by the system in an environment causes some change in the environment and that change is manifest to the system via information, or feedback, that causes the system to adapt to new conditions: the system changes its behavior."

2.26 Gilbert Ryle (1900-1976) is known for his critique of Cartesian dualism, for which he coined the phrase "the ghost in the machine." He asserted that the workings of the mind are not distinct from the actions of the body. They are one and the same. He also claimed that the nature of a person's motives are defined by that person's dispositions to act in certain situations.

2.27 Karl Popper (1902-1994) revisited the idea of quantum indeterminacy as a source of human freedom. Like James (see Appendix 1) he compares free will to Darwinian evolution and natural selection; but then (like Compton) for ordinary uncertainty (copying errors) he substitutes quantum uncertainty. "A range of possibilities is brought about by a probabilistic and quantum mechanically characterized set of proposals of possibilities brought forward by the brain. On these there then operates a kind of selective procedure which eliminates those proposals and those possibilities which are not acceptable to the mind."

2.28 Daniel C. Dennett (1942-) articulated the case for a two-stage model of decision making in contrast to libertarian views.

"When we are faced with an important decision, a consideration-generator whose output is to some degree undetermined produces a series of considerations, some of which may of course be immediately rejected as

irrelevant by the agent (consciously or unconsciously). Those considerations that are selected by the agent as having a more than negligible bearing on the decision ultimately serve as predictors and explicators of the agent's final decision."

More recently he emphasizes a modular view of the mental – a view in which the mind consists of semiautonomous modules (networks of neurons organized to carry out specific functions). This allows for numerous competing modules, a stream of conflicting and continuously revised contents, no one narrative thread of which can be singled out as the true version of conscious experience.

2.29 Benjamin Libet (1916-2007) was involved in research into neural activity and sensation thresholds. His most famous experiment (1983) demonstrates (see Figure 2) that the unconscious electrical processes in the brain precede conscious decisions to perform volitional, spontaneous acts, implying that unconscious neuronal processes precede and potentially cause volitional acts which are retrospectively felt to be consciously motivated by the subject.

If the brain has already taken steps to initiate an action before we are aware of any desire to perform it, the causal role of consciousness in volition is all but eliminated. Libet's experiments have received support from other research related to the neuroscience of free will.

One observer notes, "Our conscious thoughts seem to come into our minds from nowhere: you can't catch yourself deciding to think something, however quickly you turn round. There is really nothing mysterious about this. The processes which give rise to conscious thoughts cannot themselves be conscious, or they in turn would need to be underpinned by other conscious processes, and so on. The act of making a decision must always precede, if only marginally, conscious awareness of having made a decision." Seen in this light, Libet's experimental findings could hardly have been otherwise!

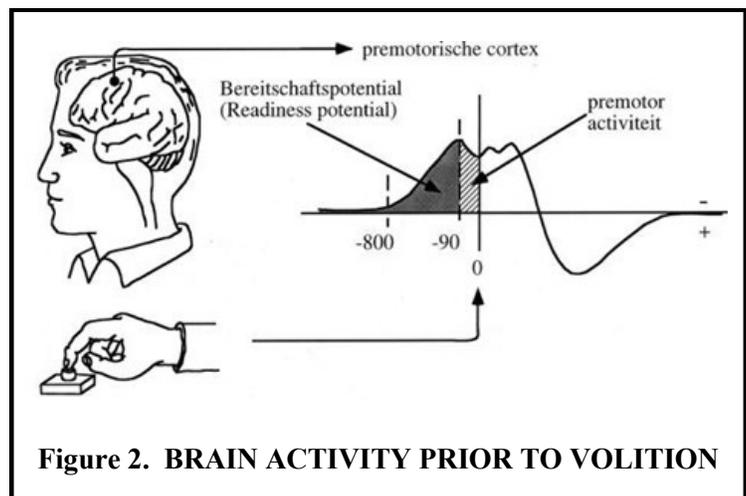


Figure 2. BRAIN ACTIVITY PRIOR TO VOLITION

2.30 Marvin L. Minsky (1927-) explains, in *The Society of Mind* (1985), how what we call intelligence could be a product of the interaction of non-intelligent parts. His theory is the concept of minds as collections of enormous numbers of semi-autonomous, intricately connected "agents" that are themselves mindless. "We grow in overlapping waves, in which the older agencies influence how our later ones will behave.

"Let's call this a simulacrum: a reproduction of only the higher-level effects of a stimulus. A simulacrum at the very highest level could lead a person to recollect virtually no details about a remembered object of event, yet be able to apprehend and contemplate its most significant structures and while experiencing a sense of its presence. ...Not only can it work more swiftly while using less machinery, but we can combine the parts of several simuli to imagine things we have never seen before – and even to imagine things that couldn't possibly exist.

"Existence seems continuous to us not because we continually experience what is happening in the present, but because we hold to our memories of how things were in the recent past. Without those short-term memories, all would seem entirely new at every instant, and we would have no sense at all of continuity or, for that matter, of existence.

"For ages people have wondered about the relationship between the mind and body. Some philosophers have ended up with images that portray two different kinds of worlds, one of matter and one of mind, somehow connected by mysterious threads of spiritual causality, or somehow involved with the 'uncertainty principle' in physics. I see no merit in such ideas because as far as I'm concerned, the so-called problem of body and mind does not hold any mystery: *Minds are simply what brains do.*

"Concerns about minds are really concerns with relationships between states, so naturally minds seem detached from physical existence. It doesn't matter what agents are; it only matters what they do and what they are connected to.

"To be sure, we sometimes have the sense of being dragged along by internal processes which, though

they come from within our minds, nevertheless seem to work against our wishes. But on the whole we still feel that we can choose what we shall do. Whence comes this sense of being in control? According to the modern scientific view, there is simply no room at all for 'freedom of the human will.' Everything that happens in our universe is either completely determined by what's already happened in the past or else depends, in part, on random chance.

"Does this mean that we must put aside the ancient myth of voluntary choice? No. Too much of our psychology is based on it for us to ever give it up, even though we know it's false."

2.31 Bernard J. Baars (1946-) suggests that there is a "global workspace" system underlying conscious experience. "The global workspace is the publicity organ of the nervous system; its contents, which correspond roughly to conscious experience, are distributed widely throughout the system.

"A vast collection of specialized automatic processors, some of them nested and organized within other processors, can compete or cooperate to gain access to the global workspace underlying consciousness, enabling them to send global messages to any other interested systems. Any conscious experience emerges from cooperation and competition between many different input processors.

"Voluntary control of action can be treated as a special kind of problem-solving, with both conscious and unconscious components. Properties like selectivity, limited capacity, self-consciousness, the ability to report conscious contents, knowledge of the world, reflective consciousness; consciousness as the domain of rationality; consciousness as the 'glue' for combining different perceptual features, as the domain of error-correction and trouble-shooting, as a tool for learning; and the relationship between consciousness and novelty, voluntary control, and self – all these points are consistent with, and appear to follow from the present framework.

"There is evidence suggesting that 'unattended' streams of information are processed and represented even though they are not conscious. Further, habituated perceptual events – those to which we have become accustomed – apparently continue to be represented in the nervous system." Evolution, he points out, "seems to have given us one conscious system to supervise many subconscious ones."

2.32 Daniel M. Wegner (1948-), in *The Illusion of Conscious Will* (2002), tackles the long-debated notion of free will through the scope of experimental psychology. "One might assume that the experience of consciously willing an action and the causation of that action are the same thing. As it turns out, however, they are entirely distinct.

"We tend to see ourselves as the authors of an act primarily when we have experienced relevant thoughts about the act at an appropriate interval in advance and so can infer that our own mental processes have set the act in motion. [However,] correlation is not a proof of causation.

"Conscious will is an illusion in the sense that the experience of consciously willing an action is not a direct indication that the conscious thought has caused the action. Calling this an illusion may be a bit strong, but the term illusion does convey the possibility that we place an erroneously large emphasis on how will appears to us and assume that this appearance is a deep insight.

"The will is not some cause or force or motor in a person, but rather is the personal conscious feeling of such causing, forcing, or motoring." Reciting Libet's results, "the brain started first, followed by the experience of conscious will, finally followed by action. Conscious wanting, like action, is a mental event caused by other events."

Wegner notes that Antonio Damasio "has described the general function of emotions as 'somatic markers,' deep and unavoidable reminders of the body's interests in what we do and what we experience." "Conscious will is the somatic marker of personal authorship, an emotion that authenticates the action's owner as the self.

"The experience of will is an indicator to which we refer as we steer. In the same sense that laughter reminds us that our bodies are having fun, or that trembling alerts us that our bodies are afraid, the experience of will reminds us that we're doing something. The occurrence of conscious will brands the act deeply, associating the act with self through feeling, and so renders the act one's own in a personal and memorable way. Will is a kind of authorship emotion."

2.33 Robert Doyle (ca 1940 -) says of Free Will: "it's a normal biological property, not a gift or a mystery."

"The physical world is fundamentally undetermined, it began in chaos and remains chaotic and random at the atomic scale. Even for large objects, the laws of physics are statistical laws ... Quantum collisions of

high-energy radiation with the macromolecules carrying genetic information create mutations that are a source of variation in the gene pool.

“When Isaac Newton discovered apparently perfectly accurate dynamical laws of motion for the planets, he seemed to confirm a deterministic universe. But as Newton knew, we never had observational evidence to support the presumed perfection. The physical laws became a dogma of determinism.

“Before quantum uncertainty, many philosophers, mathematicians, and statistical scientists argued that chance was just a name for our ignorance of underlying deterministic processes. They denied the existence of real chance in the universe. “s soon as quantum mechanics was established in the 1920's, first scientists and then philosophers began claiming that quantum indeterminism could explain free will. “after a few years thought, the scientists generally qualified their enthusiasm or reported admissions of failure.

“Quantum uncertainty remains the best explanation for breaks in the causal chain of strict determinism. But attempts to use the strange non-intuitive aspects of quantum mechanics as models for the decision process have been hopeless failures. We must identify the critical aspect of quantum mechanical uncertainty that makes an "intelligible" contribution to human freedom while preserving moral responsibility.

“Our model simply identifies the source of randomness as the inevitable noise, both thermal noise and quantum noise, that affects both proper storage of information and accurate retrieval of that information at later times. These read/write errors are an appropriately random source of unpredictable new ideas and alternative action possibilities. We are unpredictably creative.”

2.34 Luke Muehlhauser (1985-) says “The world once had nothing but dead matter, and yet it managed - completely by accident and without the intervention of an intelligent actor - to wake up one day and become self-aware. I think that is more amazing than any story about a magical being injecting life into dead matter. Ours is a story about dead matter that awakened itself. ...

“I am the pattern of matter in my brain. It doesn't matter that the atoms in my brain are exchanging quarks. It doesn't even matter whether my brain is made of proteins or silicon. What matters is the pattern of matter. That's what constitutes my thoughts, personality, emotions, beliefs and desires. That's what constitutes me. Of course, I am changing all the time. As a matter of semantics, my identity passes through a causal-historical chain. My brain is different than it was the previous moment, but my identity passed through one to the other because my brain of a moment ago caused my brain of now.

“We do not make uncaused choices. Our choices are determined. But we do have the ability to do what we want.”

2.35 Anthony R. Cashmore (ca 1940-) recently said “It is often suggested that individuals are free to choose and modify their environment and that, in this respect, they control their destiny. This argument misses the simple but crucial point that any action, as 'free' as it may appear, simply reflects the genetics of the organism and the environmental history, right up to some fraction of a microsecond before any action.

“It is my belief that, as more attention is given to the mechanisms that govern human behavior, it will increasingly be seen that the concept of free will is an illusion, and the fallacy of a basic premise of the judicial system will become more apparent.”

Chapter 3. NEUROSCIENCE

3.1 Neuroscience (in brief here; expanded, with sources, in Appendix 2) can be defined as “a scientific discipline that studies the structure, function, development, genetics, biochemistry, physiology, pharmacology, pathology of the nervous system, and psychology. The methodologies employed by neuroscientists have been enormously expanded, from biochemical and genetic analysis of dynamics of individual nerve cells and their molecular constituents to imaging representations of perceptual and motor tasks in the brain. The study of the brain is becoming the cornerstone in understanding how we perceive and interact with the external world and, in particular, how human experience and human biology influence each other.”

The Dana Alliance for Brain Initiatives says that “We humans are learning machines, and the brain is the engine that drives the machine. Crammed into the three pounds of convoluted tissue inside our skulls is a dynamic mass of a hundred billion or more nerve cells, each one capable of making thousands of connections with others. These are the nuts and bolts of the learning machine.

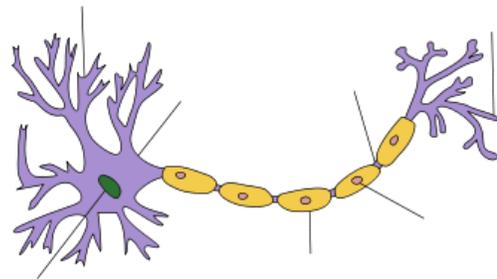
“Every aspect of brain function is represented in the brain as patterns of electrical and chemical signals traveling between nerve cells. Each thought, action, or sensory perception stimulates distinct sets of nerve cells and brain chemicals. One can imagine each cell as a musician in an elaborate symphony orchestra, playing its individual notes in harmony with other sections of the orchestra to generate pieces of the musical score. The concerto that emerges from all the sections working together is nothing less than human behavior itself.

“When we experience something repeatedly, such as practicing a musical score, we are reactivating the same circuit of synapses over and over again. After several repetitions, the synapse physically changes, enhancing the efficiency of the circuit and encoding the experience or behavior into a long-term memory.

“The adult brain is fine-tuned by experience in both its performance and its abilities, essentially organizing itself in accord with its experience to prepare for the future. This capacity of the brain to structurally adjust itself to reflect our life experience - which scientists called plasticity - is what enables us to learn and to change the brain by learning.”

Recent research further suggests that quantum information processing may be expediting macro-level, hence deterministic, brain processes. “An electron in one biomolecule might hop to a second biomolecule, even though classical laws of physics hold that the electrons are too tightly bound to leave. The special properties of the quantum realm allow events to unfold at speeds and efficiencies that would be unachievable with classical physics alone. Yet new experiments keep finding quantum processes at play in biological systems.”

3.2 Nervous system. From Wikipedia, “The nervous system is an organ system containing a network of specialized cells called neurons that coordinate the actions of an animal and transmit signals between different parts of its body. Neurons send signals to other cells as electrochemical waves travelling along thin fibres called axons, which cause chemicals called neurotransmitters to be released at junctions called synapses. Motor neurons, situated either in the central nervous system or in peripheral ganglia, connect the nervous system to muscles or other effector organs. Central neurons, which in vertebrates greatly outnumber the other types, make all of their input and output connections with other neurons. The interactions of all these types of neurons form neural circuits that generate an organism’s perception of the world and determine its behavior.



“One very important subset of synapses are capable of forming memory traces by means of long-lasting activity-dependent changes in synaptic strength. Experimental studies of electrophysiology beginning in the early 20th century showed that the nervous system contains many mechanisms for generating patterns of activity intrinsically, without requiring an external stimulus. A modern conception views the function of the nervous system partly in terms of stimulus-response chains, and partly in terms of intrinsically generated activity patterns—both types of activity interact with each other to generate the full repertoire of behavior.”

“The neurons that take in sensory information send it to a neural network that he (Stanislas Dehaene) and his colleagues call the router. Like the router in a computer network, the brain's version can be reconfigured to

send signals to different locations. The human brain efficiently solves certain operations such as object recognition and categorization through a massively parallel network of dedicated processors. However, human cognition also relies on the ability to perform an arbitrarily large set of tasks by flexibly recombining different processors into a novel chain. The network exhibits parallel processing at peripheral sensory levels, a memory buffer capable of keeping the result of sensory processing on hold, and a slow serial performance at the router stage”

3.3 Attention, from Wikipedia, “is the cognitive process of selectively concentrating on one aspect of the environment while ignoring other things. Attention has also been referred to as the allocation of processing resources. There is a general consensus in psychology that there is an executive system based in the frontal cortex that controls our thoughts and actions to produce coherent behavior.”

One model “identifies four core processes of attention, with working memory at the center:

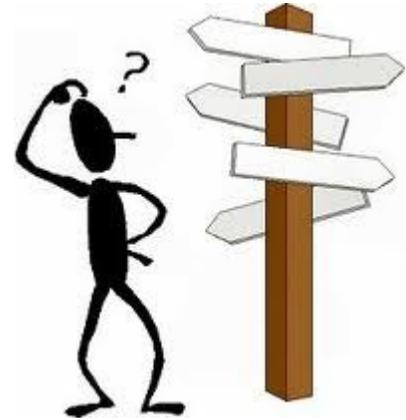
- Working memory temporarily stores information for detailed analysis.
- Competitive selection is the process that determines which information gains access to working memory.
- Through top-down sensitivity control the momentary content of working memory can influence the selection of new information, and thus mediate voluntary control of attention in a recurrent loop.
- Bottom-up saliency filters automatically enhance the response to infrequent stimuli, or stimuli of instinctive or learned biological relevance.”

In neuroscientific jargon the “top” is largely the prefrontal cortex, and the “bottom” is bodily sensation.

Chapter 4. DISCUSSION

4.1 So Much Discussion, So Little Resolution. Not to mention others known in the literature but not recited here, we have heard above from everyone from Democritus to Cashmore, from 400 BCE to 2010 CE. Among these, some confirm the problem but hold that there is no solution. Others have said that there is no problem, or that the solution is obvious; but it is easy to doubt from what they say the basis for their optimism. We end up being tantalized with many a likely piece of the solution, but not yet knowing how to assemble the pieces.

So says Shaun Nichols, Professor of Philosophy and Cognitive Science, University of Arizona, who leaves no stone unturned in his recorded 24-lecture video series on Free Will and Determinism - ending with the remark that “the course will not offer a definitive answer to the problems of free will.”¹³ Even Marvin Minsky, at the conclusion of his up-to-then insightful book on Society of Mind, says, “No matter that the physical world provides no room for freedom of will: that concept is essential to our models of the mental realm. We're virtually forced to maintain that belief, even though we know it's false.” Thus, he leaves the matter utterly unresolved.



In this quest, any dualism, from paganism on through Plato's essentialism, Cartesian dualism, Kant's "noumenal" world, and Schopenhauer's despairing transcendentalism, is worse than useless, as it hides away within an enigma the mystery of how the nonphysical can affect the physical. Of course, many useful fragments remain if they can be extracted from the dualism.

Aristotle, in arguing that essences are powerless to explain changes of things, threw down the gauntlet of demanding a mechanism to justify any such claim, before the claim could be so much as considered. This has remained a proper challenge for all who followed, and must be met also by our Second Skeptic.

Chrysippus saw deeply into determinism, and correctly so, we will argue. Like Aristotle, William of Ockham saw that essences are nothing more than concepts in the mind. Descartes certainly shook the apple tree, but beyond “the cogito” few of his apples now pass the taste test. Hobbes' claim that “to him that could see the connexion of those causes, the Necessity of all mens voluntary actions, would appeare manifest” suggested no mechanism to justify that claim. As did Spinoza's claim that “Mind and body are one and the same thing, conceived first under the attribute of thought, secondly under the attribute of extension.” This can be read as another instance of Spinoza's general approach of dual-aspectism, proposing that what seem to be two different things may actually be merely differing aspects of the same thing, which remains potent.

As does Locke's distinction between passively acquired simple ideas and actively built complex ideas. Such as, that by comparing the producer and the product the mind forms the ideas of cause and effect – echoed by Hume. Who among much else also said that the mind is “a kind of theatre, where several perceptions successively make their appearance; pass, re-pass, glide away, and mingle in an infinite variety of postures and situations.” Another good metaphor in need of a mechanism.

Likewise d'Holbach's unrelenting case for naturalism and determinism, in which, for lack of a mind-body explanation, “man remains an enigma to himself.” As he did for Schopenhauer, who nicely analyzed but then gave up on physicalism, and for Huxley, who embraced physicalism. James, like Schopenhauer, made many perceptive observations, but could offer no mind-body explanation, and suffered for its absence.

Craik noted the desirability of having “a 'small-scale model' of external reality.” Weiner introduced the more general concept of cybernetics, where action by the system in an environment causes some change in the environment and that change is fed back to causes the system to adapt to new conditions: the system changes its behavior. Now we are getting to an actual mechanism – but we have gotten away from our initial problem.

Claims of compatibilism - claims that there is no conflict between purported determinism and perceived free will - can be traced from Chrysippus through at least Hobbes, Spinoza, and Hume to Dennett and surely others. Claims like Hume's, that incompatibilism is merely “a verbal dispute,” neither rule out causal misattributions nor offer alternative causal means. Not without reason James called compatibilism a “quagmire of evasion;” and experiments by Libet and others are contra-indicative of such a causal link. Thus compatibilism may well be, as we have said, nothing more than obdurate libertarianism. Convinced as we may be that we act

freely, what we lack is rational justification for that conviction.

Popper suggested quantum indeterminacy as a source of human freedom, as did Doyle, but as we shall see it need not be deemed (as they proposed) the *sole* means to that end. Indeed, many do not see how random phenomena could be involved at all without harming our control of our actions. Dennett and others postulate a prolific generator of considerations, some of which will then be promoted on their merits, but only Doyle's suggestion finds a role for quantum effects. However, not only are quantum effects for Doyle the sole source of free will, but he does not even discuss Libet.

Confirming James's self-observations, Libet's experiments suggest that the brain has already taken steps to initiate an action before we are aware of any desire to perform it, so that free will plays no part in their initiation. As we shall see, far from compounding the apparent paradox this actually solves it. Minsky adds many insights, as do Baars and Wegner, but none of them dismiss Minsky's characterization of free will as a false but necessary belief. Or, as Wegner maintains, it is an illusion, merely "the somatic marker of personal authorship, an emotion that authenticates the action's owner as the self."

In this chapter we will further recite from these sources as we recapitulate and frame the controversy. In the next chapter we will offer an argument which, if accepted, resolves it.

4.2 Liberty and Necessity. To recapitulate, once our survival needs have been met we may pause to reflect upon how it is that we meet those needs at all. We are *free*, at *liberty*, we say, to mentally plan to act and then to physically act on our own behalf. But how is it that we do so, when all about us we find things able only to respond to applied efforts in a simplistic and predictable manner? What, given the predictability of things physical, can account for our own unpredictability?

Or, are we mistaken to draw so strong a distinction? Are the actions of things physical perhaps less determined by whatever acts upon them than they seem, while we are actually more "determined" than we say we are?

From infancy we all know that, when we so will, by our own muscular efforts we can move things which had not been moving, or stop them if they had. To dismiss such causality would seem insane; never knowing what to expect next, we would never know what to do next. Later we learn (in our culture) that this local observation was codified and generalized centuries ago by Sir Isaac Newton. Of necessity, bodies act only mutually upon each other, and they accelerate in strict proportion to such action.

So simple a rule; and chained from each place to the next, how could it ever cease to apply? It would seem that such "Laws of Nature" inherently must apply always and everywhere, without the least exception. The entire universe of what-is must be of-a-kind.

The Physical, the Material, and the Natural are common, all-inclusive names for whatever is the "stuff" of the Other. But, are we somehow internally an instance of some other-than-Other stuff, or are we throughout a particular instance of that stuff?

If the latter, it is ironic that from internal experience we have inferred our own Freedom of Will – and then from external experience we have willfully inferred, internally, quite the opposite. By use of Liberty we have set forth a Necessity which seems to contradict that very Liberty; we have by Freedom inferred a Determinism which seems to deny our own Freedom.

It is on this fundamental point that our two Sceptics are diametrically opposed. The ancient, "dualistic" resolution of this paradox is that *we are exceptional entities, supernatural in part as well as natural in part*. Physical/nonphysical interaction does occur, albeit by means unknown. The will is inherently free of physical law because it is not physical; it is an error to claim the will is not free. This is the "metaphysical" claim to Free Will – the purported escape from causality in the case of the Self.

Others, however, reject this very premise. Making no claim that absence of proof of the supernatural is proof of its absence, they need only argue that to claim uniqueness is to deny mutuality. As Spinoza said, "Things which have nothing in common cannot be one the cause of the other. If they have nothing in common, it follows that one cannot be apprehended by means of the other." Even should the natural and the other-than-natural somehow both exist, they could not interact – they would share no qualities and exchange no effects. Which leaves us with a "physicalist" and determinist claim, the application of causality as much to the Self as to Other – which seems to deny Free Will as an escape from causality.

4.3 Burden of Proof. Placing the burden of proof on the Second Sceptic, the task of the physicalist is nothing less than to escape this inference; to accommodate both Liberty and Necessity, both Free Will and Determinism, by

means of - per Hume - "the best explanatory and empirical principles available to the investigation of human mental phenomena, using theory based on human actions and human responsibility rather than metaphysics and religion."

Of course we will be using the "hypothetico-deductive" model or method, according to which "scientific inquiry proceeds by formulating a hypothesis in a form that could conceivably be falsified by a test on observable data. A test that could and does run contrary to predictions of the hypothesis is taken as a falsification of the hypothesis. A test that could but does not run contrary to the hypothesis corroborates the theory. It is then proposed to compare the explanatory value of competing hypotheses by testing how stringently they are corroborated by their predictions."¹⁴

Any such hypothesis is an inference from limited observation; an inductive construct, a candidate theory – initially a speculation, for all we know at first an utter fiction. As Locke said (Appendix 1), from passively acquired simple ideas (sensory perceptions) we actively built complex ideas "such as perception, thinking, doubting, believing, reasoning, knowing, willing, and all the different actings of our own minds." From the actual sensation the hypothesis manufactures a likely explanation for the experience. Only repeated observation corroborates any hypothesis; with continued corroboration confidence rises, but never possibly to 100%.



In principle the only certainty is uncertainty. Of course, in many cases we can draw so close to certainty that we tire of the pursuit. So-called "proof" is no more than the abandonment of residual doubt. The alternative is "reification," "hypostatization," or "concretization of the abstract" – invitations to the flat denial of opposing views.

Proceeding therefore on the "Amonistic" basis the mind must be, to account for modern observations, the brain as seen from within. Dual-aspectism is in itself quite tenable, as many seemingly different things are decided to be actually differing views of the same thing. The Morning and the Evening Stars, as the classical example.¹⁵

4.4 Are We Then Automata? We are subjectively unaware of how causality occurs in our brains; at best we can only construct a consistent set of explanations for what we experience. But how can Liberty and Necessity, which seem so contradictory, be encompassed within one consistent set of explanations?

The implication of strict, or hard, Determinism is that they cannot be. Every event, including human cognition, behavior, decision, and action, is causally determined by the environment. One's life is predetermined by an unbroken chain of prior occurrences back to the origin of the universe. We unknowingly march to an unheard drummer. Epiphenomenalism is the subsidiary view that mental events are mere side effects of physical events in the brain, having no effects upon any physical events. In either case the obvious implication is that we are mere automatons.

Spinoza said that "Men think themselves free, inasmuch as they are conscious of their volitions and desires, and never even dream, in their ignorance, of the causes which have disposed them to wish and desire. Thus what is called the consciousness of freedom is nothing but the unconsciousness of causation."

Similarly Hume said that "We feel that our actions are subject to our will on most occasions, and imagine we feel that the will itself is subject to nothing; because when by a denial of it we are provok'd to try, we feel that it moves easily every way. ...But these efforts are all in vain; and whatever capricious and irregular actions we may perform ...we can never free ourselves from the bonds of necessity." It is (he thus says) an instance of necessity when we are by some antecedent "provok'd to try." The Baron d'Holbach eloquently argued likewise.

The more common view on this point is that the *feeling* of liberty must validly denote *actual* Liberty. In this view, called Libertarianism, "willing" must objectively be what we subjectively experience it to be. Logic and Natural Law be damned, we simply cannot be mistaken. When the further claim is made that this view does not conflict with Determinism, the view is called Compatibilism. In either case an escape from the laws of Nature is merely assumed without explanation, as yet. It does so no more logically than dualist Exceptionalism. We will develop later a Compatibilist view which does not rest on Exceptionalism.

As to responsibility, while we might jokingly claim that the brick which fell on someone's head did so of its own accord, we don't mean it. We do mean it, however, when we blame the mind which commanded the arm which threw the brick. We assign blame despite recognizing in the mind a sequence of causes for the motive, prior Nurture and Nature ad infinitum. Thus, we commonly attach responsibility when a chain of causality has passed through a human mind. We feel this even in our own case – so that we brood over decisions which we now regret, wishing we had at that time made use of our freedom to do otherwise.

This Compatibilist predicate governs our legal system, whereby we hope to deter brick-throwers and the like. The deliberators are left to determine responsibility when given evidence of a chain of causality which has passed through the defendant's sphere of influence. We thus normally say (with Aristotle) that if an act is willed - performed knowing and intentionally, without coercion - then it can be deemed "free." Spinoza similarly said that "a thing is free which exists and acts solely by the necessity of its own nature."

Perhaps simply *being* a system, experiencing it from the inside, provides both a feeling of ownership regarding, and legitimate responsibility for, what the system does. Or it may be sufficient to simply declare as a matter of attitude that when a chain of causality has passed through a human mind, responsibility attaches. But let's study that predicate at some length.

In the common view the chain from will or volition onward is clear. Once we exert our will, exercising our own volition, our muscles do then act, and consequences do evidently follow, for which we do then feel responsible. This is why we reason that despite in turn itself being caused, volition leads to responsibility. While later we will question that view, let us first consider the emergence of volition from the knowledgeable Self.

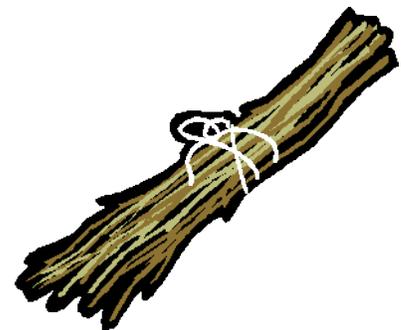
4.5 What is the Self? What do we experience as The Self? Hume said that

"I never can catch myself at any time without a perception, and never can observe any thing but the perceptions ...[We are each] nothing but a bundle or collection of different perceptions, which succeed each other with an inconceivable rapidity, and are in a perpetual flux and movement. ...The mind is a kind of theatre, where several perceptions successively make their appearance; pass, re-pass, glide away, and mingle in an infinite variety of postures and situations. ...They are the successive perceptions only, that constitute the mind. ...As a memory alone acquaints us with the continuance and extent of this succession of perceptions, 'tis to be considered, upon that account chiefly, as the source of personal identity."

Similarly a camera's portfolio never includes the camera itself – only at most a reflection of it. Although from the camera's portfolio we can quite confidently infer the camera's existence, that is an intellectual construct, a reification, not a raw experience. We are no more able to *sense ourselves*, as Hume argues, than a camera is able to view itself.

Memory *per se* is necessarily speculative. Even if accurately recalled, sensory data in itself has no meaning. At best (again) we can only construct a consistent set of explanations for what we experience. Given sensation we construct "meaning," fabricating contextual just-so stories, "mental constructs," to account for it. This is the inherently inaccurate process of "induction" – by approximating, by disregarding variations between similar things, we consider only their similarities; the fumes of experience coalesce into the elixir of significance. It is our option to *feel* certain, but *actually* we live in a phantasmic universe of our own making, always subject to improvement.

Hume almost suggests that among our mental constructs is the very concept of Self. Indeed, Self may be simply one more construct, one more induction, noting similarities and disregarding variations so as to claim selfhood. Our memories do exhibit continuity, for the most part; and from that we may infer that there is a "me," an "I," a "Self." If so, the Self is one mental construct among many residing in our bundled memories. And it is then this construct which ties the bundle together.¹⁶ Nothing here requires that we accept dualism, a separable "Soul;" it is still tenably a fully physical phenomenon.



After all, what does constitute Self but a collection of perceptions, all a bit uncertain, some (hopefully) accurate and some (clearly) imaginary, some immediate and some distant? Must we, to have valid authorship, have an actual sense of self - must, indeed *can*, the brain observe itself in action? Speculatively it might, applying to itself its own mirror neurons, those which fire empathetically when other individuals eat or emote, so as (as a spandrel) to receive and recognize signals of its own activity. But, that suggests a faculty Hume did not introspectively detect. Others have offered other views, but to start minimally let us adopt only Hume's simple predicate. The successive perceptions only, and memories thereof, constitute the mind. Plus, what we may also imagine.

4.6 Imagination. Even in recalling experiences we are being imaginative; we can paint various differing details into the blanks. To function, then, we always “rationalize” to some degree, occasionally to the point of obvious prevarication. Since we always construct meaning, we are always creative to a degree. The degree, of course, varies widely. As we grope for the ill-remembered past, we supply details not of what was but what might have been. Speculation about the imperfectly recalled past imperceptibly becomes speculation about the imperfectly predicted future – some confident, some diffident. New ideas - new memory loops - are generated as further speculative rehearsals of what might yet come to pass.

Craik says on this point that

"If the organism carries a 'small-scale model' of external reality and of its own possible actions within its head, it is able to try out various alternatives, conclude which is the best of them, react to future situations before they arise, utilise the knowledge of past events in dealing with the future, and in every way to react in a much fuller, safer and more competent manner to the emergencies which face it."



Much later the present writer expressed the same concept with the aid of a flow diagram, provided in the present Appendix 3. Here the scale-model rehearsals are accomplished using conditional feed-forward requiring favorable evaluation of the likely consequences of the rehearsed action. When approved the result is issued to an enactment loop, hopefully to change the environment as intended.

Mental rehearsal clearly helps the individual make good decisions and avoid bad ones. Such success provides an evolutionary justification for rehearsing and for wanting to rehearse – the species succeeds through the successful individual.

4.7 Repertory Company. Hume’s theater metaphor suggests a repertory company with a large and varying cast, in which each current cast member is in active rehearsal for a particular part it is eager to play. Each is in competition with the other for dominance, that is, for our unconscious or (better yet) conscious attention and willful action.

This oft-used metaphor - the Dana Alliance similarly suggested the symphony orchestra - is further supported by the contemporary idea of “modularity of mind,” which is (from Wikipedia) “the notion that a mind may, at least in part, be composed of separate innate structures which have established, evolutionarily developed functional purposes.”¹⁷ Minsky’s Society of Mind theory, another example, is “the conception of minds as collections of enormous numbers of semi-autonomous, intricately connected agents that are themselves mindless.”

Minsky’s version of the repertory company is comprised of agents each called “a simulacrum: a reproduction of only the higher-level effects of a stimulus.” A bit more anthropomorphically, I prefer to call such a competing cast member a “factotum,” meaning “a general servant or a person having many diverse activities or responsibilities.” The word derives from the Latin command *fac totum* (“do/make everything”). We can say that it is these do/make everything factotums which “successively make their appearance” and thereby, says Hume, “constitute the mind.”



Each of us can personally confirm that several percepts and rehearsals do successively make their appearance as we encounter immediate events, review past events or thoughts, and consider possible future events and actions. Even without our being aware of it one of these plan-ahead “factotums” can steal the show - can go through its act without authorization, as James indicates -

"I sit at table after dinner and find myself from time to time taking nuts or raisins out of the dish and eating them. My dinner properly is over, and in the heat of the conversation I am hardly aware of what I do; but the perception of the fruit, and the fleeting notion that I may eat it, seem fatally to bring the act about. ...[Or, having laid abed,] we suddenly find that we have got up."

"Consciousness is in its very nature impulsive. We do not have a sensation or a thought, and then have to

add something dynamic to it to get a movement. Every pulse of feeling which we have is the correlate of some neural activity that is already on its way to instigate a movement. Wherever movement follows unhesitatingly and immediately the notion of it in the mind, we have *ideo-motor* action. We are then aware of nothing between the conception and the execution.

Thus, without their having appeared in the conscious, in what James dubs “*ideo-motor*” action the muscles are energized directly by what I dub “*factotums*.” In such cases we act not “just on a whim” but on not even a whim – with not a thought at all as to the act. Unless we consciously intervene, indeed we are slaves to our antecedents. In *ideo-motor* action we are *determined*, we are *fated*, to act as we do.

This corresponds to Libet’s observation that -

“unconscious processes in the brain are the true initiator of volitional acts, and free will therefore plays no part in their initiation. If the brain has already taken steps to initiate an action before we are aware of any desire to perform it, the causal role of consciousness in volition is all but eliminated.”

At any given time, in *ideo-motor* action one or another of the *factotums*, one or another of the rehearsal loops available in memory, may be selected for enactment. This is a mechanistically competitive process; there is no selector, director, authorizer, or promoter – it is strictly survival of the fittest.

We are then unconscious automata. A strong cast member, a vigorous *factotum*, steals the show. As this rehearsal prevails the resulting intention is enacted to the point of satisfaction, all while we are unaware of the rehearsal, the intention, the action, or the satisfaction.

4.8 Conscious Automata. James proceeds to the case of conscious action when he (famously) says that -

“An idea must be there before we can attend to it. Attention only fixes and retains what the ordinary laws of association bring ‘before the footlights’ of consciousness. ...Our psychic life has rhythm: it is a series of transitions and resting-places, of ‘flights and perchings.’ We rest when we remember the name we have been searching for; and we are off again when we hear a noise that might be the baby waking from her nap.”

Metaphorically, the theater company stands in array “before the footlights of consciousness,” with each *factotum* vying for attention. Which, when gained, says James, is -

“the taking possession by the mind, in clear and vivid form, of one of what seem several simultaneously possible objects or trains of thought. Focalization, concentration, of consciousness are of its essence. It implies withdrawal from some things in order to deal effectively with others.

Attention, expressed in more modern terminology, is “the cognitive process of selectively concentrating on one aspect of the environment while ignoring other things. Attention has also been referred to as the allocation of processing resources.”

Frith similarly says that “One of the central aspects of motor control involves a forward model, a non-conscious pre-motor system operating prior to the actual execution of movement and its sensory feedback. This forward mechanism generates a conscious sense of agency for action.”

Dehaene explains that “The neurons that take in sensory information send it to a neural network that ...like the router in a computer network ...can be reconfigured to send signals to different locations. ...We couldn’t possibly carry a separate network of neurons for every response to every possible situation. But we can learn rules, and we can use those rules to rearrange an all-purpose router. ...

“The human brain efficiently solves certain operations ...through a massively parallel network of dedicated processors. However, human cognition also relies on ...flexibly recombining different processors into a novel chain. ...The network exhibits parallel processing at peripheral sensory levels, a memory buffer capable of keeping the result of sensory processing on hold, and a slow serial performance at the router stage.”

The Dana Alliance says that “we humans are learning machines, and the brain is the engine that drives the machine. Crammed into the three pounds of convoluted tissue inside our skulls is a dynamic mass of a hundred billion or more nerve cells, each one capable of making thousands of connections with others. These are the nuts

and bolts of the learning machine.

"From the day we are born - and even before - the brain is primed for learning, ready to capture the experiences of our lives and encode them into its web of nerve connections."

Attention introduces an element which was not a part of ideo-motor action. As we all know we can be alert to the percepts, immediate and recalled. And those we recall (even if freshly formed) we can rerun, revise, and re-evaluate. The distinction from ideo-motor action is that in this case we are *conscious* automata. But this is not yet enough.

As we continue we remember Peter Hanks' admonition that "The processes which give rise to conscious thoughts cannot themselves be conscious, or they in turn would need to be underpinned by other conscious processes, and so on. The act of making a decision must always precede, if only marginally, conscious awareness of having made a decision."

Chapter 5. RE-ENTRANT COGNITIVE REPERTOIRE

5.1 Hidden in Plain Sight. So far we have elucidated the role of memory in consciousness, with persistent memory loops, all necessarily fabricated to some degree, offering event sequences assembled not only from snips of recollection from the distant, recent, and immediate past, but also from speculative projections into the future – that is, rehearsals of what might yet be encountered or undertaken. Even as our senses report current events and their durations, there is also a prospective repertoire as well as a retrospective panoply, always available and competing among them for control with or without conscious attention. In the latter case - when some component of the repertoire gains control *without* conscious attention - we are aware of nothing but the execution.

A veritable beehive of activity; yet even this fails to adequately describe human mental capability. We have not yet accounted for conscious attention and the feeling of free will, much less for directly effective free will. The latter would necessarily consist of a neurologically causal chain from the feeling to the action; from conscious volition to motor-neuron activation and consequent muscular actions such as gaze redirection or limb movement. *How is it, we must ask, that thinking incites action?*

Libet's biomedical evidence denies that it does so, at least not always. What have we missed? If we are not to resort to the supernatural, to classically extraphysical means of excitation of our motor neurons - internal telekinesis - we need to identify some physically causative path.

Actually, at this point we already have all we need; all the essential components have already been mentioned. The answer is right there in front of us, hidden in plain sight. Namely – to recognize the existing situation as a *re-entrant dynamic process* – by no means static. We continually direct our conscious attention *to ourselves* as well as our environs while we are in action; and we accordingly revise not only our existing plans for action, but *our customary means of making such plans*.

The “Adaptive Unconscious” is described in Wikipedia as “a set of mental processes influencing judgment and decision making, in a way that is inaccessible to introspective awareness. ...The adaptive unconscious is distinguished from conscious processing in a number of ways, including being faster, effortless, more focused on the present, and less flexible.

“In other theories of the mind, the unconscious is limited to 'low-level' activity, such as carrying out goals which have been decided consciously. In contrast, the adaptive unconscious is thought to be involved in 'high-level' cognition such as goal-setting as well. ...The term adaptive unconscious reflects the idea that much of what the unconscious does is beneficial to the organism; that its various processes have been streamlined by evolution to quickly evaluate and respond to patterns in an organism's environment. Although research suggests that much of our preferences, attitudes and ideas come from the adaptive unconscious, subjects themselves do not realise this: they are 'unaware of their own unawareness.’”¹⁸



5.2 Cognitive Feedback. The novelty lies not in the existence of the process - which is obvious - but in its significance - which is not at all obvious. In its principle it is a familiar friend, closed-loop control - the cybernetic process in its original sense (see Norbert Weiner) - but as yet “we,” including without evident exception all of the cognitive theorists we have cited, have been ignoring its full effect.

Our output, which is our own behavior, by self-surveillance is re-entered as a feedback signal denoting the effect so far of the plans currently being enacted, providing an ongoing progress report which continually informs and frequently re-forms the cognitive repertoire.

We may think of the consequences as a succession of events in which -

- **We follow the pre-existing plan.** By way of programmed "enactment" we continue in the execution of whatever action it was we just initiated.
- **We observe the consequences.** By way of our senses we observe that action as well as both resulting

and independent changes in our environment.

- **We revise the initial plan accordingly.** By way of the effects of those observations on our more facile factotums, but anchored by our more steady factotums, we affirm or revise our action plans.

Or – we plan the work; then we work the plan; and then as we see how it goes we *re-work* the plan.

But all of this exists in a continuum which actually has no successive steps; it is all happening at once, everything at virtually the same time, signal transport and processing speed permitting. We must consider that any steps we may hypothetically imagine will approach the infinitesimal even as they become more numerous. What we can only describe as if it were a slide show, we experience as if it were a movie.

Our neurological functional array is not only busy - we knew that - but it is *constantly changing*. Our available repertoire, our assemblage of factotums, is rebuilt on the fly, in every moment of experience. Even as it is used the array is rebuilt. It is rebuilt, moreover, according to its own self-contained plan. All of which is consistent with cybernetics defined as “the study of systems and processes that interact with themselves and produce themselves from themselves.”

Hume did suggest an analogy between the self and "a ship, of which a considerable part has been changed by frequent reparations, which is still considered as the same." Identity of the whole survives renovation of the parts. But his ship was changed neither rapidly nor drastically. If his shipwrights were to redesign his ship even as they rebuilt it, and were to rebuild it not in months but in milliseconds, the result might be the present conjecture. Likewise, while Minsky considered various time scales in his theory of the mind, they did not include the virtually instantaneous.

5.3 Chrysippus. Chrysippus saw (250 BCE) more deeply than Hume - a rare accomplishment - saying that "although it is true that by fate all things are forced and linked by a necessary and dominant reason, nevertheless the character of our minds is subject to fate in a manner corresponding to their nature and quality." Our mind not only mechanistically responds to causation, he was saying, but also the manner in which it responds - the *character* of our mind - is mechanistically responsive to causation. So while “fate,” or causality, rules the mind, at the same time the mind rules itself as it deterministically adapts to the flow of causation through it.

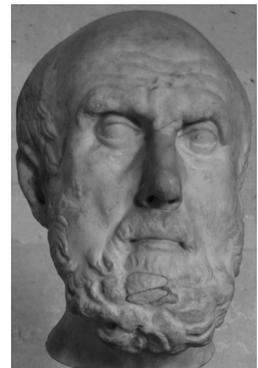
Millennia later, Muehlhauser (2009) similarly remarked "Ours is a story about dead matter that awakened itself. ...I am the pattern of matter in my brain. ...That's what constitutes my thoughts, personality, emotions, beliefs and desires. That's what constitutes me. Of course, I am changing all the time. ...My brain is different than it was the previous moment, but my identity passed through one to the other because my brain of a moment ago caused my brain of now."

In flow diagram terms (see Appendix 3), not only does the brain have its transfer functions, but the brain is adaptive, that is, it learns. Its transfer functions, its rates of change of output with input, such that input produces output – $o = i[\Delta o/\Delta i]$ – of which it has many - here dubbed factotums - are strengthened by success or weakened by failure, “in a manner corresponding to their nature and quality.”

As Chrysippus saw, but in modern terms, the mind is an adaptive servomechanism. It is deterministic, but part of what is predetermined is how it adapts itself in response to its own successes and failures, and to changes in circumstances. It is analogous to a vast pinball machine, or a complex of cascading dominoes, which learns from itself about itself and rebuilds itself accordingly.

The mind is also like a decision tree, in which the branches not used (“I could have done otherwise”) disappear after the fact - we cannot by regret change what we have done - but nevertheless in remembrance guide our future decisions (“I will hereafter do otherwise”). And we, like a good gardener, prune and graft our future-decision tree even as we work our way along it. All of this deterministically, each event responsive to its antecedents.

As seen from the outside, physiologically speaking, this is a predestined, physical, determinate sequence. We are automata. Yet as seen from the inside, psychologically speaking - as seen by the self doing the encountering - it is simply "me, doing my own thing" – within the constraints imposed by those memories. As Chrysippus said, “It is still he - and not external factors alone - who is responsible for the behaviour.”



Chrysippus

5.4 Instant Update. Not only does the mind thus inform and reform its repertoire, but it does so rapidly. The process occurs so quickly as to seem quite instantaneous, except when the new plan is to systematically review the candidate rehearsals. Plan the work ...work the plan ...and then re-work the plan. The ongoing re-entrant revision of “the self” is both persistent and automatic - indeed, it is done as in a mechanistic automaton - because “the self” has no separate role in the matter. There is no other “I” to do otherwise! There is only the cast assembled, comprised of the factotums, the theatrical cast which is causally - deterministically - affected by the flow of observations.

Among which observations are various bodily feelings. And among those is the feeling of authorship, the “feeling” of free will. As Wegner remarked, “we place an erroneously large emphasis on how will appears to us and assume that this appearance is a deep insight;” and as Libet reported, “the brain has already taken steps to initiate an action before we are aware of any desire to perform it.” That feeling in itself does nothing but report to the neurological array, to the factotums. And yet doing so is thus not really an “illusion;” rather, it is a useful *allusion*. An allusion which helps to reprogram the repertoire.

Whereby, instant by instant, *now-now-now-NOW-NOW-NOW*, more rapidly than we can possibly perceive, our bundle of perceptions is informed, guided, and if need be reconstituted. “The feeling of free will” is a persistently updated memory of the body’s sensing of its actions, a memory which is utilized in our continuing rehearsal for further action. We “follow the plan,” with the plan always in flux, limited by our ability to construct the consequences of possible actions and guided by our own character, our personality as constituted in the more stable factotums.

As described all of this is *fully* deterministic. There need *never* be an uncaused cause. It is all a physical causal cascade. Every factotum is formulated entirely out of neurological memory loops, our remembered past; some recent, some distant, some having never been more than imaginary, prospective, yet-to-be-taken branches of the decision tree.

Ours is indeed “a story about dead matter that awakened itself.” In humans (at least), Liberty and Necessity have become intertwined, equivalent, indistinguishable, mixed. We are momentarily determined, but only momentarily, whereupon we are according to our own characteristics redetermined, and this again and again - and in consequence we are free. It is by constant redefinition of its own constraints that will is free.



5.5 From Necessity, Liberty. Thus, by virtue of this ongoing feedback —

- **From Necessity, emerges Liberty. We *do* have free will, and we have it *deterministically*.**
- **WE DO AS WE WILL and yet WE WILL AS WE MUST.**
- **There is no ghost IN the machine. The ghost IS the machine.**

The result is what Hume correctly saw as “a bundle or collection of different perceptions, which succeed each other with an inconceivable rapidity.” These factotums succeed each other at the focus of attention even as they interact with each other, with the brain-body as it acts, and with the environment as it responds or changes. But, importantly, not all the factotums vary during a single episode; on stage along with the more ephemeral factotums are others which are comparatively stable, such as long-practiced routines, well-established knowledge, and favored proclivities. Within the blooming, bustling activity there is a stabilizing theme, a *modus operandus* which is uniquely our own. Our character; our personality.

While *the feeling of willing* is (per Libet, Wegner, and even James) “an effect and not a cause,” that effect is *not* futile, but is a vital, working, and informative component of a loop feeding itself, that is, a re-entrant stream of causation.

Not only are memories of what we did some time ago or thought we might do available in our stream of consciousness, but also immediate memories – what *immediately* just happened, including both sensations of bodily action and feelings of having instigated that action.

Due to this ongoing feedback there is in memory not endless repetition of the same scenarios but dynamic variation of them: while we recognize and tend to adopt pre-existing volition, also there is continual reconsideration and updating of the array of scenarios of

possible further action. As we then serially give sway to contemporary winners, to the most promising of the refreshed crop of factotums, our brain-body deterministically acts on that reconfigured set of antecedents.

And so “the play goes on” – with no playwright but our own relatively stable character, our own personality. That is what constitutes free will.

This seems to be well beyond anything others have yet suggested. It is, at long last, a concise description of the deterministic physics of free will. It may be dubbed **Re-entrant Cognitive Repertoire Theory**. With a pronounceable acronym, RCRT – we *recruit* matter to generate cognition.

This is as promised a Compatibilist view which does not rest on Exceptionalism – exemption from physicality. It is also a Libertarian view, for it insists that we “do it ourselves” regardless of arguments to the contrary. It is at the same time a Determinist, and thus of course a Physicalist, view, for it presumes only causes which have prior causes; nothing must be a first cause, or indeterministic.

5.6 The Totally Physical Explanation of Free Will. However titled or worded, conceptually this seems to be the proper and totally physical explanation of what we all refer to as “free will.” Everything mentioned here functions deterministically; all is predestined to follow from its antecedents. At the macro level, that is, free of any contribution by noise at the quantum mechanics level, fated it is. Still, ours it also is, for we continually ratify instantaneous ownership and effectiveness of this flow of causation through the mind. This is what justifies the “common view” – that the *feeling* of liberty denotes *actual* Liberty.

So it does, in the end, even though our feeling of “willing” is never, not ever, what we take it to be, namely the *immediate* cause of what the body does or is about to do. That misapprehension has for millennia dictated one dualistic fantasy or another, in religion and philosophy alike. The *feeling* of willing rather provides a true and useful ongoing action report to the coruscating array of action options, whereby with no perceptible delay the brain-body proceeds to do, continues to do, or chooses not to do, what it has just now reported as already having been willed.

Thus the feeling of willing does *indirectly* cause the action. By a process of elimination and promotion downstream in the cascade of causation, we indeed “will” what the brain-body will do next. We do then *correctly* have the feeling of willing, a feeling which *does* result in an immediate update of what is then best for us to do – and as a consequence, we do it. Unless, having reconsidered its likely consequences, we now “change our mind” – we respond to a different, now stronger factotum. Free will, else free won’t – we can affirm, and we can veto. Or, we may pause to deliberate. In any case, the loop back from old effect to new cause gives merely the *appearance* of a cause which is uncaused. “A convincing appearance, but a false one.

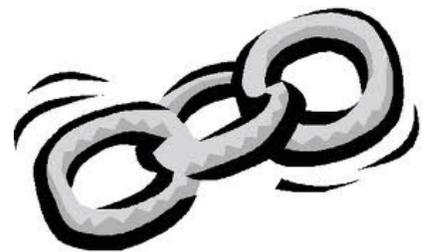
It would seem from the above description that “consciousness” is neither more nor less than the slowing-down of the otherwise “unconscious” processes; reconsideration; running the available rehearsals again while now more energetically cross-examining them for validity. But it may be that on further reflection a more explicit role for consciousness would be found.

As Muehlhauser remarked, “What matters is the pattern of matter. That’s what constitutes my thoughts, personality, emotions, beliefs and desires. That’s what constitutes me.”

Suitably rephrased, as the causal chain passes through the mind it produces outputs from inputs according to its construction. But from time to time its construction changes; it then differs from what it was the previous moment. In “a moment,” as fast as the neurological processes can occur, at “the speed of thought,” the adaptive mind may be reconfigured.

Thus *volition issues from the Self of the moment*, with its immediate output responsive to its immediate inputs according to the character of our minds – which character has transfer functions in turn responsive to other inputs in a manner shaped by our fetal/lifetime experiences. All of which is according to the Laws of Nature; and that explains the Physics, the ordinary worldly physics, of Free Will. Nothing here is in the least supernatural. This process and action, while compounded entirely from Necessity, constitutes the entirety of Liberty.

In this predicate we meet the challenge we had set before the Second Skeptic. The conundrum, the seeming paradox as between Determinism and Free Will, has vanished. Other than as a mental block, it does not and never did exist. By thinking properly outside of the box, the box we imagined has been eliminated. Each and



every step of the process described is *deterministic*, a matter of cascading cause and effect, involving no mystical element whatsoever – indeed, not even anything mysterious, given an understanding of conventional feedback control theory. Re-entrant cognitive repertoire theory is simply an application of ordinary closed-loop control concepts to a combination of well-known and familiar mental components and views.

The term "the physics of free will" is by no means oxymoronic. From among the many flawed and inadequate alternatives, both dualistic and monistic, emerges one credible, fully physical explanation of genuinely free will.

One is of course entitled to one's own opinion, but no longer must one choose between two equally insoluble mysteries as to our own nature – namely, Supernaturalism and Physicalism. Because we now can explain the seemingly nonphysical Self as being in fact entirely physical, Physicalism, remarkable as it is, no longer is an actual mystery. We quite explicably are fully physical, entirely natural. This leaves the remaining mystery, the paradoxical predicate of interaction between what is physical and what is not, for us to judge solely on its own merits.

Chapter 6. THE PHYSICAL MIND: COMMENTS ON ITS EVOLUTION AND ITS OPERATION

6.1 Evolution and Volition. This biological system's successful interaction with itself and its surroundings accounts for its evolution. In physicalist biology, any life process must develop from initially chance mutation - whether due to disarray, stellar radiation, or quantum variation - giving thereafter heritable variation. Likewise the re-entrant cognitive repertoire. While others would be better qualified than I to speculate on the details, presumably any slight initial re-entrant cognitive repertoire would survive and flourish on its merits, as would any improvement thereon.

[Note: In this chapter and hereafter we will frequently quote from the more extended excerpts furnished in Appendices 1 and 2.]

Evolution thus does seem to have given us, as Baars suggests, one conscious system to supervise many subconscious ones; and as he says it is a pattern recognizer. As such it is not an entity but a process; a collective and re-entrant process. There is (per Ryle) no "ghost in the machine;" rather, to repeat, the ghost **is** the machine. It is also what Dennett calls "a consideration-generator whose output is a series of proposals, some of which may of course be immediately rejected as irrelevant by the agent." However, there is no separable "agent;" there is only a survivalistic process of elimination as between the evaluative loops, the factotums. Beyond the awareness of our mental contents so well described by Hume, with factotums competing before the footlights, there are, as James notes —

"cases of inhibition by antagonistic thoughts. When the blocking is released we feel as if an inward spring were let loose, and this is the additional impulse or fiat upon which the act effectively succeeds. ...But where there is no blocking, there is naturally no hiatus between the thought process and the motor discharge"



Just so, over a century before James, d'Holbach had said -

"When he does not act according to this impulse, it is because there comes some new cause, some new motive, some new idea, which modifies his brain in a different manner, gives him a new impulse, determines his will in another way ...gives a new direction to his will, annihilates the effect of the former, and prevents the action by which it was to be procured.

"This is the mode in which reflection, experience, reason, necessarily arrests or suspends the action of man's will; without this, he would, of necessity, have followed the anterior impulse which carried him towards a then desirable object. In all this he always acts according to necessary laws, from which he has no means of emancipating himself."

Libet's corresponding suggestion was that -

"conscious volition is exercised in the form of 'the power of veto' (sometimes called free won't); the idea that conscious acquiescence is required to allow the unconscious buildup of the readiness potential to be actualized as a movement. While consciousness plays no part in the instigation of volitional acts, Libet suggested that it may still have a part to play in suppressing or withholding certain acts instigated by the unconscious."

James is saying that consciousness, while it does not instigate volitional acts, may delay them as we consider our options, sometimes (as d'Holbach subjectively observed and Libet objectively confirmed) to preference another option. We may without consciousness very nearly make a move to (say) scratch our nose, if not to pick it, only to veto that impulse without moving a muscle because at the moment we are in public view. Thus, as Huxley said and Wegner quoted,

"The feeling we call volition is not the cause of a voluntary act, but the symbol of that state of the brain

which is the immediate cause of that act. We are conscious automata.”

6.2 Allusion – Not Illusion. It is however an exaggeration to call "will" an illusion; as Wegner did - in fact, he so titled his book. Rather, the emotion of free will is quite precisely an *allusion*. A reference to a prior event; an ongoing action report on a deterministic brain-body action which just previously has been undertaken.

At times we operate "on autopilot," meaning that our body will execute a (learned) routine with the assistance of our brain but without our conscious involvement – although with conscious involvement we do have an opportunity at the last moment, given the re-entrant closed loop, to abort the action. On other occasions we contemplate the possible action for some time before approving its enactment by the brain-body. It would seem that while we are awake the repertory company is always available to step one by one before the footlights, whether for an actual performance (through immediate muscular actuation) or for a mere audition (not only rehearsing what the muscles might do if actuated but also simulating what worldly consequences might follow).

Thus we are at times unconscious automata, but at other times conscious automata. However this description should not be recited out of context, as being "an automaton" is typically taken to denote robotic, jerky, intermittently ruminative behavior. Indeed, we may once in a while behave that way, when "on overload" with competing alternatives. Normally, however, the action is much smoother; blended, loose, and typically "human." Even so we do neurobiologically execute routines which issue from antecedents tracing indefinitely far into the past.

But, then, why do we think, "I will do this, or I am doing that"? We do that not because it is precisely true, but precisely because it is useful. As James says,

"Even where the attention is voluntary, it is possible to conceive of it as an effect and not a cause, a product and not an agent."

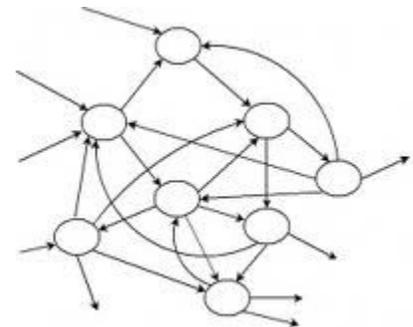
Wegner similarly says there that we "can never be sure that our thoughts cause our actions, as there could always be causes of which we are unaware that have produced both the thoughts and the actions." After all, correlation merely *suggests* causation. Rather, says Wegner, the feeling of free will is a progress report issued to consciousness as the body deterministically acts.

6.3 What Seems a Cause, is an Effect. Libet's data recordings do indicate that the feeling of free will does not cause the act; rather, it is an effect of the act. Surprise! We can't tell the difference, and we have always taken the feeling to authentically indicate that in a causal chain (from cognitive neurons to motor neurons, we would now say) the body acted at our command. And so it did, but not so directly as that – only as part of the causal cascade instigated by the body, of which the allusion to our having willed the act is but one consequence among many.

In each individual the chain of causality does trace back indefinitely through the environment and the biology of that individual, so that given strict causality (absent quantum uncertainty) one's life (and that of the universe) is indeed predetermined "before one is even born." However, we are not observing the drama from afar, we are in it and constituted by it. This is what Spinoza meant when he said that "Such a stone, being conscious merely of its own endeavour and not at all indifferent, would believe itself to be completely free." At least in the individual's own view, that view from within frees the individual from being the slave of the past – which would be fatalism.

Only in a Greek fable is Oedipus "powerless against the course of destiny in a harsh universe." On the physicalist view there are no transcendent forces at work; neither does one (when conscious) lack the ability to "choose otherwise." Rather, it is specifically by feedback of the present situation - within the process - that the "successive perceptions that constitute the mind" determine further action. Fatalism, in ignoring this feedback, goes "right off the track."

Epiphenomenalism is - similarly - a dead-end theory because it accepts a dead-end causality. It accepts the feeling of willing as being ineffectual, as being (correctly) "an effect and not a cause," which is (erroneously) the end of a causal cascade. If it were the end, if the factotums were not informed by the message, indeed it would follow that the will, or the feeling of willing, would be superfluous, without consequence. That is a profound mistake. The actual case is that the claim "I did that" is a message fed back to the factotums, which respond



accordingly. So the feeling of freely willing is by no means without consequence. It is taken into account as part of the status report, and as a basis for further action. That next action - not the previous one - is what "I will" to do.

Not that there is any perceptible difference. The brain-body undertakes the new action, deterministically, and issues its next report as to that action. But what "I" am is the bundle of percepts, all the factotums, the entire repertory company, which persistently acts according to the exigencies of the moment. Epiphenomenalism not so revised is a false as well as an empty teaching.

The metaphorical repertory company is constituted from and resides in working memory. Each factotum draws on memories, rational scenarios constructed from raw experience, not only of what just happened but also of similar events in the individual's more distant past, available in long-term memory, learned responses, and conditioned reflexes. It is thereby also able to run a reasonably good working simulation of the consequences to be expected upon enactment of some current option. One's nose internally itches, and that itch could be relieved by obstruction removal, grossly known as nose picking. So suggests one factotum; but another factotum, more attuned to social acceptance, warns of possible onlooker disapproval. OK, prudently put a hold on that impulse.

6.4 Teachable Factotums. So in the short term the factotums battle it out; but in the long term the factotums are teachable. Of course they are; they rely on memory – indeed, they are memory. Parents teach their children the etiquette of nasal hygiene, and the lesson is not forgotten. As time goes by the individual's array of rehearsals, the cognitive repertoire, develops. We learn from experience, and behave accordingly. Judged upon its past effects one behavioral avenue is widened while another is narrowed. Like a ship at the end of extended voyages, we are not now what we once were – we are now what we have since made of ourselves.

Hume and others define free will as "when one gets to act according to one's character." At first blush this might have seemed to be disingenuous - a cop-out - as one's character must be in turn determined by its antecedents; to resort to character is not to escape from determinism. Indeed so, it is not; but now that view may make more sense. "Character" and the like are the elderly factotums, those which have been built by extended learning. Our "character" develops on the basis of the ongoing effects of nature and nurture. And our "character" fills the role of the actually nonexistent playwright/critic for the repertory company. (When we dream, by the way, the critic is off duty and the company cavorts without consequence. Probably to our waking benefit.)

This is why Chrysippus was correct in saying "That the person is as he is as a result of Fate is neither here nor there, for it is still he - and not external factors alone - who is responsible for the behaviour. ...Voluntary actions have all of them necessary causes and therefore are necessitated." When the causal chain passes through the mind, the mind bears some responsibility for what comes out.

This opposes Cashmore's dismissive use of "simply" in his remark that "Any action, as 'free' as it may appear, simply reflects the genetics of the organism and the environmental history, right up to some fraction of a microsecond before any action." Agreed; but, not so "simple." Nature and nurture contribute to the cognitive repertoire; and it is that repertoire, incorporating the character, which shapes the immediate action of the individual. Cashmore's suggestion as to the legal system is tenable, even good, but not for the reasons he cites. Yet, the very recent (early 2010) date of Cashmore's argument show that epiphenomenalism still thrives.

Without presuming - at this point - any involvement of quantum mechanics, nothing happens in "free will" which denies the presumption of consistent causality. Yet, as we see it from within, forever flitting from one perching to another, considering the enaction of one rehearsed option or another, we do have free will.

And even as seen from outside, in large part we do, for all practical purposes, have free will. Determined we may be, but private also we are. In rehearsing, refreshing, and executing our options we do as we will, even as, in detail, in having only them to rehearse, refresh, and execute, we will as we must.

6.5 More Than a Grain of Truth. In the light of this view of mentality, Hobbes was correct to say that "Liberty and Necessity are Consistent ...to him that could see the connexion of those causes, the Necessity of all mens voluntary actions, would appeare manifest." As was Spinoza, to describe freedoms being "our capacity to know we are determined and to understand why we act as we do." And Hume, to argue that "it makes sense to hold a person responsible for an action only if the action was caused by his character."

Schopenhauer agreed with the present view in considerable detail, but that, for lack of the concept of ongoing self-revision, he resorted to dualism. When the Royal Norwegian Society posed the question "Is it possible to demonstrate human free will from self-consciousness," he did *not* (contrary to Wikipedia) answer in the negative, but rather said "My exposition does not eliminate freedom. It merely moves it ...up to a region which lies higher ...freedom is transcendental."

Freud was, in terms of the present view, correct to postulate "an inner welter of emotionally charged content, clamouring to be heard," and Fromm was correct to say that whereas "helplessness and doubt paralyse life, the cure is self-realisation, that is to say, the active expression of the individual's emotional and intellectual potentialities." As was James, in suggesting that "This case (getting out of bed on a freezing morning) seems to me to contain in miniature form the data for an entire psychology of volition." A prescient guess, perhaps now fulfilled.

The Baron d'Holbach rightly said that "Man will be an enigma to himself, as long as he shall believe himself double" – as Kant proceeded to demonstrate. Kant sought to "render freedom and determinism consistent by distinguishing between two worlds of which we are members" – two worlds which indeed seem, in the light of the present alternative, both spooky and wildly implausible. Where Kant inferred a transcendental, extra-physical realm of existence, we take the mind to be the aspect of the brain which is seen from within, giving subjective experience which is both privileged and physical. Yu said of Kant's two "worlds" that "we can conceive of them as either two ontologically distinct worlds (two world interpretation) or two aspects of the same world (two aspect interpretation)" – and our choice is the latter. Which leaves Kant's enigmatic interpretation at best some residual value as a comfortable metaphor.

James need not have suffered from "repeated bouts of near-suicidal depression, which often focused on the issue of free will," nor looked to "psychic phenomena and the soul of traditional metaphysics as a possible solution to the crisis of meaning" Nor need Watson, in response to James, have "decided to cut the mind-body knot, proclaiming his radical behavioristic manifesto" – a move which, says Baars, resulted in "a Dark Age comparable to the systematic purging of classical learning by the medieval Church."



Nor need Libet have proposed a theory of "the conscious mental field (CMF) to explain how the mental arises from the physical brain." Nor need countless other dubious hypotheses, some philosophically esoteric, some extra-physical and some quantum-based, have been offered.

I trust I have been clear. Without any exception to the deterministic laws of physics, we do in effect have free will, just as if we did enjoy escape from the laws of physics. While as seen from the outside, physiologically, we are not free, as seen from the inside, psychologically and behaviorally and ethically we are free, to a degree and on occasion. That is "the physics of free will."

We think, as was said above, "I will do this, or I am doing that" not because it is true, but because it is useful. We cannot subjectively tell the difference between the dualistic and the monistic descriptions of mentality. Nor, now that we have resolved the seeming paradox, need we do so. The lay interpretations of free will, and the consequent assignment of responsibility for options taken and actions accomplished, are as workable as most of us have always thought they were. And the mind's control over the body is neither as supernatural as many nor as superficial as a few have contended.

Chapter 7. RESPONSIBILITY AND CREATIVITY

7.1 The Blame Game. Earlier it was noted that typically we attach responsibility to an act when its chain of causality, whatever its total history, has passed through a human mind. In our lives and in our legal system we normally say that if an act is performed knowingly and intentionally it can be deemed "free," and regardless of prior causes we can be held responsible for it. Most of us consider this view to be quite justified. Is it?

We know that a string around the finger, or more often objects which happen to fall within our sweeping field of view, can trigger our memories of actions previously intended but deferred. Given that stimulus we respond as if we were robots. However, often we had meant ourselves to be triggered; we had planned it that way. So do we then *of our own free will* respond as planned, even though also we were determined - fated - to do so? Yes, both of those; and we feel "responsible" for our action as we do so. As the stage is set, so goes the play; but what is not obvious is that it may have been set only a moment in advance. That instant resetting is what constitutes, for each of us, free will.

Darrow defended Leopold and Loeb for their murderous act on grounds of the influence of antecedent causes. Indeed we are never fully conscious of the causes of our actions; we tend to dismiss such knowledge, leaving us with the conviction that we are first causes. We are *not* first causes, and we should get over that naive fantasy. We are *intermediary* causes, *enabling* causes – and yet that is quite sufficient to make us responsible.

We are responsible when, in processing the data stream, in responding to the stimuli, we act logically and for good reason, even if largely subconsciously – in which case we cannot possibly be aware of the details of the process. Our ignorance of the details which contribute to our actions is no reason for rejection of our responsibility for them. We did it ourselves, by means of our own powers, even if not at the conscious level. You broke it, you bought it. Or, you built it, and you deserve the credit.

In a nuanced sense, the common view is correct. We are indeed responsible for our acts when their chain of causality has passed through us. Take that and be satisfied with it if you wish. However, you might like to consider that responsibility attaches not because we are first, or ultimate, causes for our actions, but because we are proximate, or immediate, causes. As proximate causes we could have *done* otherwise if we had *been* otherwise, although as it was we acted as automata. That is, given our ingrained processors we could *not* have done otherwise; but those ingrained processors were ours alone. It's no good to say "my factotums made me do it." Yes, they did; but you built them. Rigid they may be in the short term, but they are in the long term malleable, and to some degree you could have forged them differently. And you also had a final opportunity for a last-minute veto.

So, were Leopold and Loeb responsible for not having taken themselves in hand prior to the act, even during their formative years? Or for not in the moment curbing their impulses? I don't know. It's not, even now, a clear issue. But that's what juries, and advocates, are for. With experts as advisors only, thanks.

My personal analogy in this regard has long been an eagle on a very long tether to an undersea weight. From the zenith the eagle can survey a distant horizon and choose a direction, but cannot move the anchor in the least. To do that it must first choose a goal but then lose view of it so as to come down, fly low, and pull hard. The analogy is that by looking afar we can decide how to change, but to actually change we must hunker down and work hard. We can get where we are going not from where we wish we were but from where we are. That is how character and convictions - better foundational factotums - are built.

7.2 Happenstance Creativity. It was said above that since we always generalize by abstraction to construct meaning, we are always creative to a degree. The factotums are fabrications, assembled shards of memory, which is why deliberation, slow and relaxed consideration of the problem, or ignoring it for a time, often indeed with a night's sleep, is so often fruitful. When consciousness is poised on the cusp of indecision, seeking inspiration, idle, half asleep, or dreaming, fragments which barely fit may tentatively fall together. Some people apparently have more success at doing this than others - their store of memories for some sorts of things proves to be particularly good, and they assemble them ingeniously. For this they are held in high regard as being "creative," and so they



are, even if it is by benefit of a deterministic patch job.

However, the creative patch job may not be entirely deterministic. Our pattern recognizer, our consideration evaluator, our rehearsal test routine, must discriminate signal from noise, with the result that in the absence of a clear signal it may mistake noise for signal. Such noise may be pseudo-random, meaning that it is a deterministic melange of scraps of originally informative signal, or it may be literally random as a consequence of some quantum event. When the no-longer patterned signal cannot be distinguished from the never-was-patterned quantum noise, the pattern recognizer for the cognitive repertoire can only be indiscriminately receptive. It will be receptive to the noise because it is there, not because of its source.

What arises from noise, whatever its source, will be largely nonsense, and therefore useless. Only on occasion may it be of value – illogically, randomly, wildly creative. It is creativity - and only creativity - which brings us to quantum indeterminacy, a topic so far deferred so as to determine what we might accomplish without it.

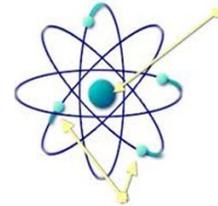
So far we have found Liberty emerging from Necessity by means of self-surveillance in a determinate neurobiological system. That process remains deterministic even if it benefits from the recently reported quantum expediting of macro-level brain processes. However, what we now consider is the *default behavior* of that determinate system – when, absent the usual signal, the brain’s pattern recognizer can access only the low-level, residual noise.

As has been well said by Harvard astrophysicist Robert Doyle,

“There is little doubt that the brain has evolved to the point where it can access quantum phenomena. ...Biophysics tells us the eye can detect a single quantum of light (photon), and the nose can smell a single molecule. ...

“Biologists knew ...from Charles Darwin’s work in 1859, that chance was the driver for evolution and so chance must be a real part of the universe. Indeed, it is known that quantum collisions of high-energy radiation with the macromolecules carrying genetic information create mutations that are a source of variation in the gene pool. ...

"The physical world is fundamentally undetermined, it began in chaos and remains chaotic and random at the atomic scale. ...Even for large objects, the laws of physics are statistical laws. ...Unfortunately, antipathy to chance [has] led many prominent physicists, then and now, to deny indeterminism and cling to a necessitarian deterministic physics. ...



"When ...Isaac Newton discovered apparently perfectly accurate dynamical laws of motion for the planets, he seemed to confirm a deterministic universe. But ...we never had observational evidence to support the presumed perfection. The physical laws had become a dogma of determinism. ...

"Before quantum uncertainty, many philosophers, mathematicians, and statistical scientists argued that chance was just a name for our ignorance of underlying deterministic processes. They denied the existence of real chance in the universe. As soon as quantum mechanics was established in the 1920's, first scientists and then philosophers began claiming that quantum indeterminism could explain free will. ...After a few years of thought, the scientists generally qualified their enthusiasm or reported admissions of failure. ...

"Attempts to use the strange non-intuitive aspects of quantum mechanics ...as models for the decision process have been hopeless failures. We must identify the critical aspect of quantum mechanical uncertainty that makes an'intelligible' contribution to human freedom while preserving moral responsibility."¹⁹

7.3 Micro Departures from Macro Reliability. All this seems to be scientifically and historically valid. For objects consisting of multitudes of subatomic particles, while in principle the laws of physics are statistical laws they are extremely, overwhelmingly, reliable. With continued mixing marbles are quite unlikely to sort themselves by color, and perpetual motion machines are quite unlikely to work. But neither would the universe re-run identically if it could be rewound and re-started as of a given time. There would be small departures, occurring due to quantum effects in small systems, which cumulatively would be significant. If restarted at 1900, for example, surely the seasons would change annually as before, but the Wrights might not invent the airplane.

This is clearly not an experiment we can ever actually run; but it does appear to be the case that while in

large part events in the universe are highly predictable, events in the undecided, or potentially creative, human mind are on occasion significantly random. It is doubtful that we will ever know the degree to which in any instance this has been the case.

Not only Doyle but also Compton, Popper, Dennett, and others present what they call a two-stage model of free will. A two-stage model, says Wikipedia, “separates the free stage from the will stage. In the first stage, alternative possibilities for thought and action are generated, in part indeterministically” – although in every instance presently cited the first stage is *wholly* indeterministic. “In the second stage, an *adequately* determined will evaluates the options that have been developed.... Poincaré ...had the critical insight that random combinations and possibilities are generated, some in an unconscious way with chance involved, then they are selected among, perhaps initially also by an unconscious process, but then by a definite conscious process of validation.”

This is what Doyle identifies as the entire Physics of Free Will. But the present proposition is that receptivity to quantum noise is only part of the story. The receptivity is present because of the need for the recognition of patterns at the macro level. It is only when momentarily there is no dominant signal, no supply of factotums, no candidate ideas, that the “selective procedure” acts on all that remains, which is the random (in either sense) background noise.

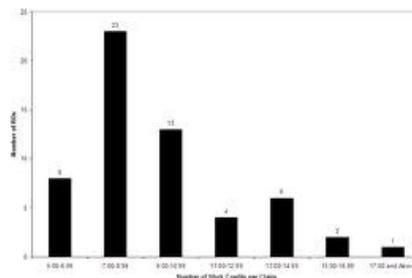
Just as most of the mutations of DNA are never successful in the individual much less in the species, the residual noise in the quiescent subconscious is for the most part discarded as uninformative nonsense. It can be only on rare occasions that this noise fortuitously propagates upward as if it were a normal, macro, determinate signal.

7.4 Only an Occasional Source of Free Will. Quantum uncertainty thus might manage to be the occasional source of free will, but contrary to Doyle and the other two-stage theorists it is far from being *always* the source. Due to self-surveillance we already have the emergence of Liberty from Necessity - Free Will from Determinism - *at the macro level*. Quantum uncertainty is a superposed process-perturbation device, a generator of noise which is routinely suppressed as trivial relative to the signal. Only in the absence of the signal may it happen to make a valuable contribution. By this argument, quantum noise is no more than an *auxiliary*, a *default*, an *accidental* source of freedom. Which makes humans no more “exceptions” to determinism than - I gather - a mildly hot wire which occasionally emits a few photons.

In terms of statistical principles, populations of only a few dozens or hundreds of similar but individually random events are sufficient for probabilistic characterization of the designated group by its mean and standard deviation. Likewise, a pattern soon emerges at the target when a stream of electrons passes through a slit, even though when one electron is fired at a time it becomes possible to detect the point on the screen at which it arrives.²⁰ Quantum events rarely occur in isolation; usually they are accompanied by many, many others which are similar, resulting in the far more likely macro effect. The solitary quantum event not only is rare, but rarely will it be in a position to access a sensitive portal to determinate effects; and even less often will it make it through the portal to achieve a determinate effect. Because the number of involved events multiplies vastly as we turn from the laboratory to the ordinary world, “adequate” determinism (Doyle’s term) routinely and resolutely emerges from quantum uncertainty. In ignorance of this, mystical physics - “quantum flapdoodle”²¹ - is too often the naive result.

In an AAAS article, science historian Craig Rusbult agrees: “A typical quantum experiment is small-scale and simple; by contrast, everyday situations are large-scale and complex. This difference in scale-and-complexity is important, but is usually ignored in mystical physics, and this is a mistake. [Indeed] we should not insist that concepts from our large-scale everyday experience are adequate for understanding the small-scale quantum realm. We also should avoid the reverse mistake, of extrapolating from small-scale to large-scale by assuming, as in mystical physics, that quantum descriptions of small-scale events ...can be applied to other levels.”²² Parsimony demands that we avoid mystical physics all the more when we find a macro (and determinate) explanation for the same phenomenon; namely, in this case, free will.

It is not the Patent Office alone which finds it difficult to distinguish the novel from the obvious. “Creativity” may issue from either deterministic neurological signals or (in their absence) from indeterministic quantum noise. In the present theory the selective procedure (which is the rehearsal/test loop in Appendix 3) is



identical whether the “option,” the exciting variation, was “macro” or “micro;” whether it occurred deterministically or indeterministically.

While quantum noise - “mutant” ideas - can be *one* source of the “freedom” in free will, it is not even the *normal* source, much less (as Doyle and others maintain) the *sole* source. Since we have an entirely credible alternative we have no need to predicate solely quantum creativity.

7.5 Survival of the Fittest Factotums. Due to the selective procedures which are applied, “fit” factotums (whatever their origin) survive in the mind just as “fit” individuals (whatever their origin) survive in the environment. Inheritance *without* mutation generally rules in both cases; from available determinate shards of memory we assemble “new” candidate actions, just as from available determinate fragments of parental DNA nature assembles “new” candidate entities – fertilized ovum.

The exceptions to the norm are the occasional mutations, which neurologically are signal/noise discrimination errors and biologically are copying errors, which depart from faithful inheritance. Among which, there is no reward for being different *per se*. Indeed, quite the opposite; just as most nonrational ideas die unborn, so do most mutant life forms. Both effective memes and effective genes propagate only according to their merits, not according to their novelty.



Of course, with random novelty may come, fortuitously in either case, exceptional merit. There is one difference: in the case of evolution, after the fact we can, from the DNA record, identify the mutation; in the case of creativity there is no contrastive record, so that no such distinction is possible. Indeterministic creativity cannot possibly be distinguished from deterministic creativity – nor need it be.

Both Popper and Doyle compared free will to Darwinian evolution and natural selection. And both, for lack of re-entrant cognitive repertoire theory, attributed all creativity (like all DNA variation) to quantum indeterminacy.

7.6 Spontaneous Variation in the Instable Human Brain. In a similar yet contrasting metaphor, written just a few years after Darwin’s *Origin* and with not the least inkling of quantum uncertainty, James attributed all creativity to ordinarily random (non-quantum), low-level determinacy -

“A remarkable parallel, which I think has never been noticed, obtains between the facts of social evolution on the one hand, and of zoological evolution as expounded by Mr. Darwin on the other. ...I maintain that the facts in question are all drawn from the lower strata of the mind, so to speak - from the sphere of its least evolved functions, from the region of intelligence which man possesses in common with the brutes. ...The new conceptions, emotions, and active tendencies which evolve are originally produced in the shape of random images, fancies, accidental out-births of spontaneous variation in the functional activity of the excessively instable human brain, which the outer environment simply confirms or refutes, adopts or rejects, preserves or destroys.”

The present conjecture combines James and Popper. That is, creativity issues from both macro (James) and micro (Popper) sources, with the former establishing the noise-responsive conditions which enable the latter. James stated the parent case, an accomplishment which to his own detriment (and ours) he seemed to have soon forgotten. Popper seems to have ignored the parent (macro) case and its necessary role in the micro case.

Chapter 8. CONCLUSIONS

8.1 Predictably Unpredictable. As we began this recapitulation we asked, “What, given the predictability of things physical, can account for our own unpredictability? Or, are we mistaken to draw so strong a distinction?”

We now can answer Yes, we were mistaken to draw so strong a distinction. The actions of things physical are less determined at the level of quantum events than is observable at human scale. However, that does not merit loss of confidence in repeatability of phenomena at less minute scale. As the scale increases, quantum uncertainty soon becomes functionally insignificant, giving us adequate determinism, the reliability in general of the past as a predictor of the future. Such causal Determinism, expressed as the adequately certain Laws of Nature, will apply also to our own mental activities whenever the adequately deterministic mental signals eclipse, as is usually the case, the mental quantum noise.

We also asked ourselves “How can I feel both that there is a reason for everything, and that there is none for what I choose to do – that I always could have chosen to do otherwise?” Feeling able to have “done otherwise” after the fact has long been considered not only a description of free will, but its very authentication. But then we consider that the proposition is untestable, since we do only what we do, never “otherwise.” Also on consideration we find that always there are antecedents, reasons for everything I do, including what I choose to do – so that *being who I was* I could *not* then have chosen to do otherwise. The closest I can come to doing otherwise is to learn, by watching current results, to *be* otherwise, hopefully to *do* otherwise at the next such opportunity.

Thus our mental processes are not as utterly free, or uncaused, as we had naively imagined. For the reason that macro-scale processes are adequately determined, we are in effect automata. On the other hand we are immensely complex automata, constantly sensing what we are doing and frequently revising our own internal mechanisms; it’s only moment by moment that we are automata, or rather a series of automata, each succeeding the one of the moment before. The result of loop closure, watching current results so as to *be* otherwise, is that as an ongoing but teachable individual each of us is as free as we ever mystically claimed to be.

Unconscious processes in the brain are the true initiators of volitional acts. Instant by instant, more rapidly than we can possibly perceive, our bundle of perceptions is informed, guided, and if need be reconstituted. With our bodies providing us with the feeling of having willed, we “follow the plan” we have ourselves already set forth. The plan is always in flux, limited by our ability to construct the consequences of currently possible actions while guided by our own character, our personality as constituted in our more stable memory loops.

Volition thus issues from the Self of the moment, with its immediate output responsive to its immediate inputs according to the character of our minds – a character in turn responsive to other inputs in a manner shaped by our fetal/lifetime experiences. All of which can be explained as a complex set of physical phenomena; nothing here establishes human exceptionality; nothing demands explanation by means of the supernatural.

8.2 Marvelous Automata. Each of us is thus a sensitive, intelligent, considerate, and adaptive automaton. From assorted fragments of memory we frequently assemble new ideas - new memory loops - as speculative rehearsals of what might yet come to pass. While perhaps quantum noise will have been a contributor in some instances of creativity, we can never possibly say for sure. Otherwise, and ordinarily, we are not even exceptions to the regularities of large-scale physics. Liberty then is not inconsistent with Necessity, but is indeed a version of and a product of Necessity. Free Will is itself Deterministic. Nothing about humans demands that they be seen as mysteriously, perhaps divinely, “exceptional.” It is not an impossibility, as some claim - as the majority, indeed, serenely insists - to explain Free Will as a physical phenomenon. “*The physics of free will*” is by no means oxymoronic.

Each of us then is as responsible as we ever mystically claimed to be, theism excepted. Determinism, despite recognizing a sequence of causes for the motive, is no escape from blame. Responsibility does properly attach when a chain of causality has passed through a human mind. As we grow we each build our own character as a set of persistent proclivities which to an extent predetermine our momentary decisions. *Even as we do as we will, we will as we must*; but within reasonable limits we can reconstruct that “must” to better meet our future needs.



Such is our human task. We must perform that task to the best of our abilities, each of us aided by and sensitive to family, friends, and culture but nevertheless responsible for what meaning we are able to construct from our own experiences. Given only a universe of impersonal causality, the challenge of accounting for free will arguably and tenably is met. It depends on matter observing itself in action. We do not need to postulate mystical interaction with a compassionate independent power – strong as the psychological and cultural merits of that predicate may be, and imperative as we may therefore have believed it to be.

As a self-made value, responsibility is as firm as we had naively thought it was. Not that it is absolute, for like meaning we make it ourselves. We make it when the chain of causality passes through the mind. Responsibility is imposed on us neither by a supposedly higher power nor by society, except as we respond to what we perceive to be that power and the needs of others. Nor are we relieved of it by the existence of prior causes and factors beyond our control – by determinism. We are just as responsible as we thought we were when we imagined ourselves to be uncaused causes. We are not that; and yet it is our own characters, which we have a part in shaping, which in turn shape our responses to circumstances and challenges.

Thus it indeed can be true that we are each a marvelous and yet physically “unexceptional” machine, with in it neither a ghost nor a divine spirit – while also it is true that we are not mere automata, fated to act as we do. There is indeed a middle ground between rampant fantasy and paralyzing fate. We can see ourselves as not angelic – and not robotic – but, as simply, fully, physical.

REFERENCES (I)

1. Forensic Engineer. BME Cornell 1951; MS Cornell 1954. Trained and experienced in mechanical engineering, automatic control systems, and forensic automotive accident reconstruction.
2. Robert Paul Woolf, *About Philosophy* (Pearson, 2009) (p. 101)
3. For differing views on “a thought is not itself a thing,” see http://en.wikipedia.org/wiki/Non-physical_entity
4. <http://en.wikipedia.org/wiki/Determinism>
5. Isaac Newton, *The Principia*, trans. Motte, p. 440
6. This likely paraphrase no longer can be found by search. In his *Optiks* (1730) Newton did posit “a powerful everliving agent, who being in all places, is more able by his will to move the bodies within his boundless uniform sensorium, and thereby to form and reform the parts of the universe, than we are by our will to move the parts of our bodies.” <http://www.fordham.edu/halsall/mod/newton-optics.html>
“Like most men at the close of the Seventeenth Century, Newton still believed in the existence of animal spirits in the human body. He described them as of an ethereal nature and subtle enough to flow through animal voices as freely as the magnetic effluvia flow through glass. For him, all animal motions resulted from this spirit flowing into the motor nerves and moving the muscles by inspiration. His followers, however, emphasized his mechanistic view of the universe to the exclusion of his religious and alchemical views.” <http://www.williamjames.com/History/ENLIGHT.htm>
7. Isaac Newton, *The Principia*, trans. Motte, p. 320
8. From the Scholium, in Second and later editions of *The Principia*, not in the Motte translation but as cited by <http://www.isaac-newton.org/pdf/Snobelen%20True%20Frame%20of%20Nature%202005.pdf>, footnotes 93-95. See also R. S. Westfall, *Force in Newton’s Physics*, London, 1971, quoting at length from Hall and Hall, *Unpublished Scientific Papers of Isaac Newton*, Cambridge university Press, 1962
9. Physicalism “is also called ‘materialism’, but the term ‘physicalism’ is preferable because it has evolved with the physical sciences to incorporate far more sophisticated notions of physicality than matter, for example wave/particle relationships and non-material forces produced by particles. ...Because it claims that only physical things exist, physicalism is generally a form of monism.” <http://en.wikipedia.org/wiki/Physicalism>
- 10 Serway and Jewett, *Principles of Physics*, Thompson Books (1994-2006), p. 104
11. <http://plato.stanford.edu/entries/epiphenomenalism/>
12. See <http://www.esoteric-philosophy.net/esodef.html>. Then see in Appendix 1, under Minsky, the distinction between the vague and the precise meanings of the word “energy.” To use the vague meaning is to venture into metaphysics.
13. *Free Will and Determinism*, The Teaching Company, 2008. Taught by the author, with class discussion, Fall 2010-Spring 2011, Osher Lifelong Learning Institute, Temple

University, Philadelphia, Pa.

14. en.wikipedia.org/wiki/Hypothetico-deductive_model
15. <http://www.universetoday.com/22570/venus-the-morning-star/>
16. <http://www.answers.com/topic/bundle-theory-of-the-mind-or-self>
17. http://en.wikipedia.org/wiki/Modularity_of_mind
18. http://en.wikipedia.org/wiki/Adaptive_unconscious, dated 31 July 2010, accessed September 4, 2010.
19. <http://www.informationphilosopher.com/freedom/physics/>, et cetera.
20. http://en.wikipedia.org/wiki/Double-slit_experiment
21. <http://www.scientificamerican.com/article.cfm?id=quantum-quackery>;
also http://en.wikipedia.org/wiki/Quantum_mysticism#_note-0
22. <http://www.asa3.org/ASA/education/views/qm-cr.htm>.
See also <http://www.asa3.org/ASA/education/rusbult.htm>, http://en.wikipedia.org/wiki/Quantum_mysticism#_note-0
and http://en.wikipedia.org/wiki/Quantum_mind/body_problem.

Appendix 1. SELECTIONS FROM THE LITERATURE

Here we recite passages drawn from centuries, indeed millennia, of literature regarding the problem of reconciling mind and body, particularly when expressed in terms of the apparent contradiction between determinism and free will. As the evidence mounts it should become evident that despite these historic efforts, short of sheer capitulation to either mystification (I don't know, and anyway I don't care) or mysticism (I can't know, whether or not I care), no clearly adequate resolution has been found.

Extracts from the original source text have been recited where practicable, some as scanned from contemporary hard copy, others as digitally available on-line and, in many instances, verified from hard copy. Wikipedia was found to be not only an efficient but a reliable source for such copy and for useful comments thereon. To confirm and search farther in any instance the interested reader would be well advised to access the cited Wikipedia article and proceed by means of its links and listed references.

A1.1 Before the Pre-Socratics. “Before the inception of the pre-Socratic schools of Greek philosophy,” says the Catholic Encyclopedia, “the first rude and popular conception of causes was mixed up with much that was extravagant and, in the proper sense of the word, superstitious. The powers of nature were personified, and thought of as intelligent and wilful. They were conceived of as far more powerful than man, but uncertain and capricious, so that it was necessary to propitiate them and enlist their favour by offering them sacrifices and praying to them. Thus there was the idea of power, and a loose attribution of effects to one or another of the natural forces that had vaguely come to be looked upon as causes. It was in order to provide a ground of unity ...that the early philosophers took up their search for the principles of things.”²³

A1.2 Democritus (ca. 460 BCE–ca. 370 BCE). Democritus and his predecessor Leucippus “were both strict determinists and thorough materialists, believing everything to be the result of natural laws, and they will have nothing to do with chance or randomness. ...The atomists attempted to explain the world without the presuppositions of purpose, prime mover, or final cause. ...The atomists were seeking plausible explanations for the world, and can be viewed as having hit on a hypothesis for which, two thousand years later, some evidence was found.”²⁴

“According to Democritus, the world consisted of nothing but tiny atoms moving randomly in an infinite void. Democritus argued that these atoms, through their accidental collisions and combinations, accounted for all the features of our world, including us.”²⁵

A1.3 Plato (428-347 BCE). “Plato famously held that there is a realm of abstract forms, essences, or universals apart from the physical world.”²⁶ “The fact that things change through time and vary from place to place does not seem to prevent us from having knowledge. From this, some philosophers, such as Plato and Augustine (354-430), draw the conclusion that Heraclitus was wrong to suppose that everything is in flux. Something stays the same, something that lays underneath the changing and varying surfaces we perceive, namely, the universal essence of things. ...Belief in universal essences is called ‘metaphysical realism,’ because it asserts that universal essences are real even though we cannot physically see them.”²⁷ A thought, in other words, is itself a thing.

A1.4 Aristotle (384-322 BCE). One of Plato's pupils, Aristotle, argued to the contrary that “forms are powerless to explain changes of things ...Forms are not causes of movement and alteration in the physical objects of sensation.”²⁸ With regard to the purported effects of the non-physical on the physical, Plato and Aristotle are opposites — they are respectively the dualist and the monist, the First Skeptic and the Second.

“Feelings and actions,” said Aristotle, “receive praise or blame when they are voluntary but pardon, sometimes even pity when they are involuntary.” This, says Free Will editor Pereboom, is the “most common type of route to compatibilism,”²⁹ developed also by Augustine, Aquinas, Hume, and many others. From volition, by way of action, they say, issues responsibility. But how is it that volitions, any more than forms, can be “causes of movement and alteration” in the physical body in which they reside?

A1.5 Chrysippus (c.280-207 BCE). Concerned as to the implications of determinism, or “fate,” Chrysippus “is said to have ‘sweated’ over the problem of reconciling fatalism with individual responsibility – and to some avail. ‘That the person is as he is as a result of Fate is neither here nor there, for it is still he – and not external factors

alone – who is responsible for the behaviour.’ ”³⁰

“When first a man has an appetite or will to something, to which immediately before he had no appetite nor will, the cause of his will is not the will itself, but something else not in his own disposing. So that whereas it is out of controversy that of voluntary actions the will is the necessary cause, and by this which is said the will is also caused by other things whereof it disposes not, it follows that voluntary actions have all of them necessary causes and therefore are necessitated.”³¹

According to Aulus Gellius (ca. 125 AD-ca. 180 AD), Chrysippus said “although it is true that by fate all things are forced and linked by a necessary and dominant reason, nevertheless the character of our minds is subject to fate in a manner corresponding to their nature and quality. ...But this state of affairs is itself brought about by that natural and necessary sequence of cause and effect which is called fate. ...Just as if you throw a cylindrical stone down a steep slope, you are indeed the cause and origin of its descent, nevertheless the stone afterwards rolls down not because you are still doing this, but because such is its nature and the ‘rollability’ of its form: similarly ...each man’s own will and the character of his mind govern the impulses of our thoughts and minds and our very actions.”³²

Chrysippus thus voices a basic contention of determinism, that even volition follows mechanistically from its antecedents. Yet Chrysippus also says that “it is still he – and not external factors alone – who is responsible for the behaviour;” so evidently in his view volition, despite being caused, entails responsibility. This is more an insightful amendment than it is a contradiction of Aristotle.

A1.6 William of Ockham (1280-1349). A principle found in Aristotle as well as Aquinas and others later became known as the “razor” of William of Ockham, which states that “It is useless to do with more what can be done with less.” While theologically “Ockham is a fideist, maintaining that belief in God is a matter of faith rather than knowledge,” in regard to knowledge “Ockham uses the razor to eliminate unnecessary hypotheses.”

“In metaphysics, Ockham champions nominalism (from nomina, meaning name), the view that universal essences, such as humanity or whiteness, are nothing more than concepts in the mind. ...Ockham advocates simplicity in order to reduce the risk of error. Every hypothesis carries the possibility that it may be wrong. The more hypotheses you accept, the more you increase your risk.”³³ Of course there may be differences of opinion (as with our two skeptics) as to what is “simple,” so while the rule is useful, it is not definitive.

Like the smile which cannot actually survive the departure of the Cheshire cat, “No universal is a substance existing outside of the mind. ...Objects work upon the senses of men, and out of these operations the active intellect frames its concepts, including the so-called universals, which, while they are in themselves subjective, yet correspond to objective realities.”³⁴

A1.7 Naturalism (ca 1500–). After a long eclipse during the Dark and Middle Ages³⁵, the belief that everything is the result of natural laws – Naturalism – was revived. Although, as noted by philosophy professor David Ray Griffin, “17th century thinkers such as ...Rene Descartes in the Catholic tradition and Robert Boyle and Isaac Newton in the Protestant did not try to explain everything in reductionist terms. The atoms, rather than moving randomly, were programmed by God, who had created the world ex nihilo. ...

“Boyle, employing the mechanistic view, argued that since the matter of which the body is composed is insentient and inert, our awareness of our consciousness and freedom proves there must be something in us that is different in kind from matter. ...

“Almost immediately, leading thinkers began making a transition to a naturalistic worldview ...that, while retaining the mechanistic view of nature, would discard God and the soul. The first step in this process was ...a growing aversion among natural philosophers to talk of divine intervention. This aversion produced a move towards a deistic view, according to which God, after creating the world with its motion and natural laws did not intervene. Although this move toward deism was partly motivated by the problem of evil, it was also partly motivated by the mechanistic, clockwork universe. Ironically ... this view of the universe, created by supernaturalists to support the belief in divine activity, quickly led to the conviction that the universe once set in motion, could run on its own, with no further tinkering by the divine mechanic. Although Newton had pointed to several phenomena, such as the orbits of the planets that seemed to him to require ongoing divine activity in the world, most natural philosophers found, as astronomer Pierre Laplace was alleged to have said, that they had ‘no need of that hypothesis.’ ”³⁶

These developments revived the puzzle of determinism versus free will. A strict determinist would say that, if they have “no need of that hypothesis” in the heavens, we also need no such hypothesis to account for

originality of thought. A strict libertarian would say that the feeling of free will trumps any argument from causality. And a compatibilist would claim to see a resolution of the problem — even if others might consider that to be nothing more than obdurate libertarianism.

A1.8 Renee Descartes (1596–1650). Descartes “is often regarded as the first thinker to provide a philosophical framework for the natural sciences as these began to develop. In his *Discourse on the Method* (1637), he attempts to arrive at a fundamental set of principles that one can know as true without any doubt. To achieve this ...he rejects any ideas that can be doubted, and then reestablishes them in order to acquire a firm foundation for genuine knowledge.

“Initially, Descartes arrives at only a single principle: thought exists. ‘Thought cannot be separated from me, therefore, I exist.’ Most famously, this is known as *cogito ergo sum* (in English, ‘I think, therefore I am’). ...’The simple meaning of the phrase is that if one is skeptical of existence, that is in and of itself proof that he does exist.’ ...

“Descartes ...suggested that the body works like a machine, that it has the material properties of extension and motion, and that it follows the laws of physics. The mind (or soul), on the other hand, was described as a nonmaterial entity that lacks extension and motion, and does not follow the laws of physics. Descartes argued that only humans have minds, and that the mind interacts with the body at the pineal gland. This form of dualism or duality proposes that the mind controls the body, but that the body can also influence the otherwise rational mind, such as when people act out of passion. Most of the previous accounts of the relationship between mind and body had been uni-directional. ...

“Cartesian dualism set the agenda for philosophical discussion of the mind-body problem for many years after Descartes’ death. The question of how a nonmaterial mind could influence a material body, without invoking supernatural explanations, remains controversial to this day. ...Later ...he admitted he had no idea how the mind interacted with the body.”³⁷

Descartes is thus a First Skeptic, claiming that there are two drastically differing domains, one which does and another which does not follow the laws of physics. His model “proposed that nonphysical events could cause small changes in the shape of the pineal gland. But such nonphysical effects, however slight, would mean that the physical account of motion is false — for that account says that there will be no such change of shape unless there is a physical force that causes it.”³⁸

A1.9 Thomas Hobbes (1588–1679). Just as Plato and his student Aristotle were respectively dualist and monist, First and Second Skeptics, so too were Descartes and his contemporary Thomas Hobbes. In fact, in 1641 Hobbes contributed on request a commentary on a pending work by the somewhat younger Descartes. Descartes, who did not discover the identity of either of his two critics, “did not approve of either. To Descartes, mind was the primal certainty and independent of material reality. Hobbes, on the other hand, had already fixed on motion as the fundamental fact, and his originality consisted in his attempt to use it for the explanation not of nature only, but also of mind and society.”³⁹

A decade later, in *Leviathan* (1651), under *Of a Christian Commonwealth*, Hobbes “raises the question of which scriptures we should trust, and why. If any person may claim supernatural revelation superior to the civil law, then there would be chaos, and Hobbes’ fervent desire is to avoid this. Hobbes thus begins by establishing that we cannot infallibly know another’s personal word to be divine revelation. ... ‘If a man pretend to me that God hath spoken to him supernaturally, and immediately, and I make doubt of it, I cannot easily perceive what argument he can produce to oblige me to believe it.’ [The] enormous amount of biblical scholarship in this third part ...[was] probably necessary for its time.”⁴⁰

As to freedom of the will, under *Of the Liberty of Subjects* Hobbes wrote that “Liberty, or FREEDOME, signifieth (properly) the absence of Opposition; (by Opposition, I mean externall Impediments of motion). ...A FREE-MAN, is ‘he, that in those things, which by his strength and wit he is able to do, is not hindred to doe what he has a will to.’ ...

“Liberty and Necessity are Consistent: As in the water, that hath not only Liberty, but a Necessity of descending by the Channel: so likewise in the Actions which men voluntarily doe; which (because they proceed from their will) proceed from Liberty; and yet because every act of mans will, and every desire, and inclination proceedeth from some cause, which causes in a continuall chaine (whose first link in the hand of God the first of all causes) proceed from Necessity. So that to him that could see the connexion of those causes, the Necessity of all mens voluntary actions, would appeare manifest.”⁴¹ The connection might appear manifest to some, but to

others it must so far seem tenuous.

The Information Philosopher says that “Thomas Hobbes was a determinist. ‘That which I say necessitates and determinates every action is the sum of all those things which, being now existent, conduce and concur to the production of the action hereafter.’ (Of Liberty and Necessity, 1654, § 11) ...For Hobbes, the idea that one could ever do otherwise ...‘implies a contradiction and is nonsense.’ ...But Hobbes was also the modern inventor of compatibilism, the idea that necessary causes and voluntary actions are compatible. (In antiquity, compatibilism was first proposed by the Stoic Chrysippus).”⁴²

A1.10 Baruch Spinoza (1632–1677). Spinoza “was a Dutch philosopher of Portuguese Jewish origin. Revealing considerable scientific aptitude, the breadth and importance of Spinoza’s work was not fully realized until years after his death. Today, he is considered one of the great rationalists of 17th-century philosophy, laying the groundwork for the 18th century Enlightenment and modern biblical criticism. By virtue of his ...Ethics [1676], in which he opposed Descartes’ mind–body dualism, Spinoza is considered to be one of Western philosophy’s most important philosophers. ...

“Spinoza was a thoroughgoing determinist who held that absolutely everything that happens occurs through the operation of necessity. For him, even human behaviour is fully determined, with freedom being our capacity to know we are determined and to understand why we act as we do. So freedom is not the possibility to say ‘no’ to what happens to us but the possibility to say ‘yes’ and fully understand why things should necessarily happen that way. By forming more ‘adequate’ ideas about what we do and our emotions or affections, we become the adequate cause of our effects (internal or external), which entails an increase in activity (versus passivity). This means that we become both more free and more like God. ...However, Spinoza also held that everything must necessarily happen the way that it does. Therefore, humans have no free will. They believe, however, that their will is free.

“As a youth he first subscribed to Descartes’s dualistic belief that body and mind are two separate substances, but later changed his view and asserted that they were not separate, being a single identity. He contended that everything that exists in Nature (i.e., everything in the Universe) is one Reality (substance) and there is only one set of rules governing the whole of the reality which surrounds us and of which we are part. Spinoza viewed God and Nature as two names for the same reality.”⁴³

“Things which have nothing in common cannot be one the cause of the other. ...if they have nothing in common, it follow that one cannot be apprehended by means of the other ...things which have nothing in common cannot be understood the one by means of the other. ...The reason people commonly divide substance into parts is that they depend on imagination. But if instead of imagining quantities, we conceive extension intellectually, it will clearly appear one and indivisible. Matter is everywhere the same and its parts are indistinguishable. ...

“The human body as well as the body of an animal must be a machine. ...Mind and body are one and the same thing, conceived first under the attribute of thought, secondly under the attribute of extension. ‘Substance thinking and substance extended are one and the same substance, comprehended now through one attribute, now through the other. So also a mode of extension and the idea of that mode [the body and the mind] (ibid) are one and the same thing, though expressed in two ways’ (III xiii, note). ...

“The exponents of free will often assert that they are intimately conscious of their freedom and that nothing could be more certain. ...Spinoza takes the trouble to show that this consciousness of freedom does not imply free will. Suppose little Tommy ...becomes very fussy and stamps his foot and wants what he wants when he wants it. ...But a wise parent knows that far from being free he is not his sweet little self because the poisons of fatigue are controlling his actions and his desires. ...‘Men think themselves free, inasmuch as they are conscious of their volitions and desires, and never even dream, in their ignorance, of the causes which have disposed them to wish and desire.’ (Part I, Appendix). Thus what is called the consciousness of freedom is nothing but the unconconsciousness of causation.”⁴⁴

“I say that a thing is free,” he wrote in a letter (1674), “which exists and acts solely by the necessity of its own nature. ...Further conceive, I beg, that a stone, while continuing in motion, should be capable of thinking and knowing, that it is endeavouring, as far as it can, to continue to move. Such a stone, being conscious merely of its own endeavour and not at all indifferent, would believe itself to be completely free, and would think that it continued in motion solely because of its own wish. This is that human freedom, which all boast that they possess, and which consists solely in the fact, that men are conscious of their own desire, but are ignorant of the causes whereby that desire has been determined.

“Thus an infant believes that it desires milk freely; an angry child thinks he wishes freely for vengeance, a

timid child thinks he wishes freely to run away. Again, a drunken man thinks, that from the free decision of his mind he speaks words, which afterwards, when sober, he would like to have left unsaid. So the delirious, the garrulous, and others of the same sort think that they act from the free decision of their mind, not that they are carried away by impulse. As this misconception is innate in all men, it is not easily conquered ...they yet believe themselves to be free; because in some cases their desire for a thing is slight, and can easily be overruled by the recollection of something else, which is frequently present in the mind.”⁴⁵

“Nothing regarded in its own nature can be called perfect or imperfect; especially when we are aware that all things which come to pass, come to pass according to the eternal order and fixed laws of nature. ...

“The chief good is that he [man; the student] should arrive, together with other individuals if possible, at the possession of the aforesaid character. What that character is we shall show in due time, namely, that it is the knowledge of the union existing being the mind and the whole of nature. ...

“This, then, is the end for which I strive, to attain to such a character myself, and to endeavor that many should attain to it with me. In other words, it is part of my happiness to lend a helping hand, that many others may understand even as I do, so that their understanding and desire may entirely agree with my own. In order to bring this about, it is necessary to understand as much of nature as will enable us to attain to the aforesaid character, and also to form a social order such as is most conducive to the attainment of this character by the greatest number with the least difficulty and danger.”⁴⁶

A1.11 John Locke (1632–1704). John Locke, “widely known as the Father of Liberalism, was an English philosopher and physician regarded as one of the most influential of Enlightenment thinkers. Considered one of the first of the British empiricists, following the tradition of Francis Bacon, ...Locke’s theory of mind is often cited as the origin of modern conceptions of identity and the self, figuring prominently in the work of later philosophers such as Hume, Rousseau and Kant. Locke was the first to define the self through a continuity of consciousness. He postulated that the mind was a blank slate or *tabula rasa*. Contrary to pre-existing Cartesian philosophy, he maintained that we are born without innate ideas, and that knowledge is instead determined only by experience derived from sense perception.”⁴⁷

Written shortly after Newton’s *Principia* (1687), Locke’s *An Essay Concerning Human Understanding* (1690) “sets out Locke’s theory of ideas, including his distinction between passively acquired simple ideas, such as ‘red,’ ‘sweet,’ ‘round,’ etc., and actively built complex ideas, such as numbers, causes and effects, abstract ideas, ideas of substances, identity, and diversity.”⁴⁸

“Now, experience is of two kinds. First, there is sensation by which yellow, white, heat, cold, soft, hard, bitter, we call sensible qualities. Second, the mind, although it has no innate ideas and is purely receptive in sensation, operates on the sensory ideas it receives. These operations we can perceive by introspection, and thus we are furnished with a second set of ideas, called ideas of reflection, such as perception, thinking, doubting, believing, reasoning, knowing, willing, and all the different actings of our own minds. Besides these two sources of ideas, sensation and reflections there is no other. ...

“The formation of complex ideas out of all these simple ones depends on three activities of the mind: compounding, abstracting, and relating. ...We have many compound ideas of books, long shelves of them. But by abstracting their common qualities, and discarding their individual peculiarities, e.g., the circumstances of time and place, the exact size of each, and so on, we frame for ourselves the abstract idea of book. ...

“The most important ideas of relation are doubtless the ideas of cause and effect. One cannot fail to notice that qualities and substances begin to exist and later pass away. ...By comparing the producer and the product the mind forms the ideas of cause and effect.”⁴⁹ See also William of Ockham.

Locke’s idea of abstraction from sensory perception is carried to a rather different end by Father Robert Connor as he asks, “Is man truly capable of knowing something beyond what he sees with his eyes or hears with his ears? ...Cognitive realism ...agrees that ...‘nothing is in the intellect that was not first in the senses.’ Nevertheless, the limits of these ‘senses’ are not exclusively sensory. ...Man not only knows colors, tones, and forms; he also knows objects globally... He knows, therefore, extrasensory truths.”⁵⁰

A1.12 David Hume (1711–1776). Writing a century after Descartes, Hume was, says *Includipedia*, “the first great philosopher of the modern era to carve out a thoroughly naturalistic philosophy. This philosophy partly consisted in the rejection of the historically prevalent conception of human minds as being miniature versions of the Divine mind,” with powers which “possessed God’s certification.” Instead, Hume held, “the best we can do is to apply the best explanatory and empirical principles available to the investigation of human mental phenomena. ...Hume

advocated a moral theory based on human actions and human responsibility rather than metaphysics and religion. As part of his theory, Hume created historically influential arguments for compatibilism, the idea that causal determinism is compatible with free will.

“In opposition to Christian thinkers ...who argued that in order for a person to be morally responsible his actions must not be determined by any physical cause, Hume wrote that moral responsibility requires determinism: Hume argued that it makes sense to hold a person responsible for an action only if the action was caused by his character, rather than by random events or external compulsion.

“Hume said that moral responsibility requires an action to be (1) caused by the person’s character (e.g. stealing a bag of cash because you don’t care about the victim), and (2) not caused by external compulsion or force (e.g. stealing a bag of cash because a man with a gun forces you to). In line with this, Hume defines free will to be when one gets to act according to one’s character. Hume said that thinkers who believe moral responsibility requires actions to be uncaused are mistakenly thinking of the first kind of cause (character) as being the same as the second kind (compulsion), and that Hume’s theory of causation makes the situation clear.”⁵¹

Hume claimed that incompatibilism is merely “a verbal dispute, since everyone, he says, accepts both determinism and free will.” He acknowledged as dubious the as ⁵² sumption that if common sense agrees to two claims, then those two claims must be consistent. Supposedly more forcefully, he argued that necessarily both views must be true, since “we wouldn’t hold someone responsible if their actions didn’t flow from their character.”⁵³ This does nothing, however, to rule out an error of attribution in one respect or the other, nor to establish a possible causal means whereby “their actions flow from their character.”

In his *Enquiry Concerning Human Understanding* (1748), under the heading *Of Liberty and Necessity*, Hume wrote “It seems evident that, if all the scenes of nature were continually shifted in such a manner that no two events bore any resemblance to each other, but every object was entirely new, without any similitude to whatever had been seen before, we should never, in that case, have attained the least idea of necessity, or of a connexion among these objects. We might say, upon such a supposition, that one object or event has followed another; not that one was produced by the other. The relation of cause and effect must be utterly unknown to mankind. Inference and reasoning concerning the operations of nature would, from that moment, be at an end; and the memory and senses remain the only canals, by which the knowledge of any real existence could possibly have access to the mind. Our idea, therefore, of necessity and causation arises entirely from the uniformity observable in the operations of nature, where similar objects are constantly conjoined together, and the mind is determined by custom to infer the one from the appearance of the other. These two circumstances form the whole of that necessity, which we ascribe to matter. Beyond the constant <conjunction> of similar objects, and the consequent <inference> from one to the other, we have no notion of any necessity or connexion.”

In his earlier *A Treatise of Human Nature* (1740), under the heading *Of the Will and Direct Passions/of Liberty and Necessity*, Hume wrote that "After we have perform'd any action; tho' we confess we were influenc'd by particular views and motives; 'tis difficult for us to persuade ourselves we were govern'd by necessity, and that 'twas utterly impossible for us to have acted otherwise; the idea of necessity seeming to imply something of force, and violence, and constraint, of which we are not sensible. ...We feel that our actions are subject to our will on most occasions, and imagine we feel that the will itself is subject to nothing; because when by a denial of it we are provok'd to try, we feel that it moves easily every way. ...But these efforts are all in vain; and whatever capricious and irregular actions we may perform ...we can never free ourselves from the bonds of necessity."⁵⁴

Under the heading *Of the Sceptical and Other Systems of Philosophy/Of Personal Identity*, Hume said, “There are some philosophers. who imagine we are every moment intimately conscious of what we call our SELF; that we feel its existence and its continuance in existence; and are certain, beyond the evidence of a demonstration, both of its perfect identity and simplicity. ...But self or person is not any one impression, but that to which our several impressions and ideas are suppos'd to have a reference. If any impression gives rise to the idea of self, that impression must continue invariably the same, thro' the whole course of our lives; since self is suppos'd to exist after that manner. But there is no impression constant and invariable. Pain and pleasure, grief and joy, passions and sensations succeed each other, and never all exist at the same time. It cannot, therefore, be from any of these impressions, or from any other, that the idea of self is deriv'd; and consequently there is no such idea. But farther, what must become of all our particular perceptions upon this hypothesis? All these are different, and distinguishable, and separable from each other. ...After what manner, therefore, do they belong to self; and how are they connected with it?

“For my part, when I enter most intimately into what I call myself, I always stumble on some particular perception or other, of heat or cold, light or shade, love or hatred, pain or pleasure. I never can catch myself at any

time without a perception, and never can observe any thing but the perception. When my perceptions are remov'd for any time, as by sound sleep; so long am I insensible of myself, and may truly be said not to exist. And were all my perceptions remov'd by death, and cou'd I neither think, nor feel, nor see, nor love, nor hate after the dissolution of my body, I shou'd be entirely annihilated, nor do I conceive what is farther requisite to make me a perfect non-entity.

"[We are each] nothing but a bundle or collection of different perceptions, which succeed each other with an inconceivable rapidity, and are in a perpetual flux and movement. ...The mind is a kind of theatre, where several perceptions successively make their appearance; pass, re-pass, glide away, and mingle in an infinite variety of postures and situations. ...They are the successive perceptions only, that constitute the mind; nor have we the most distant notion of the place, where these scenes are represented, or of the materials, of which it is compos'd. ...

"As a memory alone acquaints us with the continuance and extent of this succession of perceptions, 'tis to be considered, upon that account chiefly, as the source of personal identity. Had we no memory, we never shou'd have any notion of causation, nor consequently of that chain of causes and effects, which constitute our self or person."⁵⁵

In his Treatise Hume also drew an analogy between the self and "a ship, of which a considerable part has been chang'd by frequent reparations, [which] is still considered as the same."

A1.13 Baron d'Holbach (1723–1789). In *The System of Nature* (1770), Volume 1, on Nature and Man, Paul Henri Thiry, the Baron d'Holbach, made an unrelenting case for naturalism and determinism — unrelenting in that, contrary to Hume (as above) and many others (even now), he did not exempt from its scope the elements of "character." Said d'Holbach, "Man has always deceived himself when he abandoned experience to follow imaginary systems. – He is the work of nature. – He exists in Nature. – He is submitted to the laws of Nature. – He cannot deliver himself from them: – cannot step beyond them even in thought. ...There is not, there can be nothing out of that Nature which includes all beings. ...

"Therefore, instead of seeking out of the world he inhabits for beings who can procure him a happiness denied to him by Nature, let him study this Nature, learn her laws, contemplate her energies, observe the immutable rules by which she acts. – Let him apply these discoveries to his own felicity, and submit in silence to her precepts, which nothing can alter. – Let him cheerfully consent to be ignorant of causes hid from him under the most impenetrable veil. ...

"The motion or impulse to action, of which he is susceptible, is that not physical? His visible actions, as well as the invisible motion interiorly excited by his will or his thoughts, are equally the natural effects, the necessary consequences, of his peculiar construction, and the impulse he receives from those beings by whom he is always surrounded.

"The will ...is a modification of the brain, by which it is disposed to action or prepared to give play to the organs. This will is necessarily determined by the qualities, good or bad, agreeable or painful, of the object or the motive that acts upon his senses; or of which the idea remains with him, and is resuscitated by his memory. In consequence, he acts necessarily; his action is the result of the impulse he receives either from the motive, from the object, or from the idea, which has modified his brain, or disposed his will.

"When he does not act according to this impulse, it is because there comes some new cause, some new motive, some new idea, which modifies his brain in a different manner, gives him a new impulse, determines his will in another way ...gives a new direction to his will, annihilates the effect of the former, and prevents the action by which it was to be procured.

"This is the mode in which reflection, experience, reason, necessarily arrests or suspends the action of man's will; without this, he would, of necessity, have followed the anterior impulse which carried him towards a then desirable object. In all this he always acts according to necessary laws, from which he has no means of emancipating himself.

"In short, the actions of man are never free; they are always the necessary consequence of his temperament, of the received ideas, of the notions, either true or false, which he has formed to himself of happiness: of his opinions, strengthened by example, forfeited by education, consolidated by daily experience....

"Man ...will be an enigma to himself, as long as he shall believe himself double; that he is moved by an inconceivable spiritual power, of the laws and nature of which he is ignorant; his intellectual, as well as his moral faculties, will remain unintelligible to him if he does not contemplate them with the same eyes as he does his corporeal qualities; if he does not view them as submitted in every thing to the same impulse, as governed by the

same regulations. The system of his pretended free agency is without support; experience contradicts it every instant, and proves that he never ceases to be under the influence of necessity in all his actions;”⁵⁶

In his Volume 2, in discussing Divinity d’Holbach continued his case for physicality, asking “How can the physical actions of a material substance have any influence over an immaterial substance, devoid of parts, having no point of contact? ...If there can be no common measure between the workman and his work – if there can be no analogy between them, because the one is immaterial, the other corporeal, How do they reciprocally act upon each other? ...Pure spirits, according to the only idea man can form of them, having no organs, no parts, cannot see any thing; can neither hear our prayers, attend to our solicitations, nor have compassion for our miseries”⁵⁷

A1.14 Immanuel Kant (1724–1804). Kant says that traditional philosophy “is lost in antinomies, that is, in contradictory propositions, and that the intellect is not capable of distinguishing which of the opposed propositions is true.” As he states his Third Antimony,

“Thesis: Besides the causality which is in accordance with the laws of nature (and therefore necessary), there is a causality which is free. Antithesis: There is no freedom; everything in the world takes place entirely according to the laws of nature.”⁵⁸

This thesis is exactly the position of our dualistic First Skeptic, and the antithesis is that of our monistic Second Skeptic. To resolve this contradiction, says Stanford, “Kant takes us to be both free and determined: free insofar as we are members of the noumenal world, determined insofar as we are members of the world of sense. The noumenal world is neither in time nor governed by the laws of nature, but rather (somehow) grounds the laws that govern the world of sense. The sensible world is in time, governed by laws of nature and open to empirical investigation; we are capable of attaining cognition of objects in this world.” ...

“Kant shares Hume’s view that causal necessity governs human actions and other events, insofar as they are all considered part of the natural world, and that humans are nonetheless free. But Kant rejects Hume’s view that moral and natural actions must be viewed as part of a single chain of causes, effects, and explanations. Indeed, if they were, and if we accepted natural causal laws as universal and deterministic, there could be no freedom of the sort Kant is ultimately after for his moral philosophy. ...

“Lest the notion of ‘two worlds’ seem spooky or wildly implausible, Kant states: ‘The concept of a world of understanding is ... only a standpoint that reason sees itself constrained to take outside appearances in order to think of itself as practical.’”⁵⁹

“While the phenomenal world is the empirical world in which we experience objects as they appear to us,” says Johns Hopkins undergrad Andy Yu, “the noumenal world is the rational world in which we conceive of things-in-themselves. Although Kant does not explicitly state how we are to conceive of these worlds, we can conceive of them as either two ontologically distinct worlds (two world interpretation) or two aspects of the same world (two aspect interpretation). ...

“Simply put, he argues for a dualistic conception of us as being simultaneously present in both worlds. This way, we can maintain that while we are causally determined in the phenomenal world and subject to the laws of nature, we are also at the same time free in the noumenal world and subject to the laws of reason. Accordingly, the recognition of this dual presence in both worlds solves the tension between free will and causal determinism.”⁶⁰

Evidently, Kant felt compelled by the implications of determinism not only to be a transcendentalist but to devise a dualism uniquely his own. Should we succeed in our present undertaking we will have validated Kant’s antithesis — and Kant’s dualism will have lost its attraction. Yet his thoughtful positions on responsibility and morality might survive.

A1.15 Arthur Schopenhauer (1788–1860). Schopenhauer was “a German philosopher known for his pessimism and philosophical clarity. Schopenhauer’s most influential work, *The World as Will and Representation*, emphasized the role of man’s basic motivation, which Schopenhauer called will. His analysis of will led him to the conclusion that emotional, physical, and sexual desires can never be fulfilled. Consequently, he favored a lifestyle of negating human desires, similar to the teachings of ancient Greek Stoic philosophers, Buddhism, and Vedanta. Schopenhauer’s metaphysical analysis of will, his views on human motivation and desire, and his aphoristic writing style influenced many well-known thinkers.”⁶¹

“On the Freedom of the Will was an essay presented to the Royal Norwegian Society of Sciences in 1839 by Arthur Schopenhauer as a response to the academic question that they had posed: ‘Is it possible to demonstrate human free will from self-consciousness?’

“Essentially, Schopenhauer claimed that as phenomenal objects appearing to a viewer, humans have absolutely no free will. They are completely determined by the way that their bodies react to stimuli and causes, and their characters react to motives. As things that exist apart from being appearances to observers, however, humans are free will.

“According to Schopenhauer, when a person inspects his or her self-consciousness, they find the feeling ‘I can do whatever I will as long as I am not hindered.’ But, Schopenhauer claimed that this is merely physical freedom. He asserted ‘You can do what you will, but in any given moment of your life you can will only one definite thing and absolutely nothing other than that one thing.’”

“Motivation is causality that passes through a knowing mind. ...For animals, the motive must be immediately present. Humans, however, can also respond to motives that are abstract concepts and mere thoughts. Therefore, humans are capable of deliberation in which a stronger abstract motive outweighs other motives and necessarily determines the will to act. This is a relative freedom in which humans are not determined by objects that are immediately present.

“I can do what I will: I can, if I will, give everything I have to the poor and thus become poor myself — if I will! But I cannot will this, because the opposing motives have much too much power over me for me to be able to. On the other hand, if I had a different character, even to the extent that I were a saint, then I would be able to will it. But then I could not keep from willing it, and hence I would have to do so.

“As little as a ball on a billiard table can move before receiving an impact, so little can a man get up from his chair before being drawn or driven by a motive. But then his getting up is as necessary and inevitable as the rolling of a ball after the impact. And to expect that anyone will do something to which absolutely no interest impels them is the same as to expect that a piece of wood shall move toward me without being pulled by a string.

“Every human has a unique way of reacting to motives. This is called a character. It is the nature of the individual will ...Character does not change. It remains the same throughout life. This is presupposed whenever a person is evaluated as a result of their past actions. Given the same circumstances, what was done once will be done again. Behavior, however, can change when a character learns how to attain its goal through a different way of acting. The means change, but not the ends. This is the result of improved cognition or education. ...

“Everything that happens, happens necessarily. Through that which we do, we find out what we are. To wish that some event had not taken place is a silly self-torture, for this means to wish something absolutely impossible.’

“Schopenhauer claimed that the necessity of our actions can coexist with the feeling of freedom and responsibility in a way that was explained by Kant. When a person has a mental picture of himself as a phenomenon existing in the experienced world, his acts appear to be strictly determined by motives that affect his character. This is empirical necessity. But when that person feels his inner being as a thing-in-itself, not phenomenon, he feels free. According to Schopenhauer, this is because the inner being or thing-in-itself is called will. When we feel our freedom, we are feeling our inner essence and being, which is a transcendently free will. When it appears in an [external] observer’s mind, as the experienced world, the will does not appear free. Man does at all times only what he wills, and yet he does this necessarily. But this is because he already is what he wills.”⁶²

While the text recited is reasonably accurate, the Wikipedia reviewer was less accurate in concluding that “therefore the Royal Society’s question has been answered ‘No.’” Schopenhauer, however, said in conclusion that “My exposition does not eliminate freedom. It merely moves it out, namely, out of the area of simple actions, where it demonstrably cannot be found, up to a region which lies higher, but is not so easily accessible to our knowledge. In other words, freedom is transcendental.”⁶³

A1.16 Charles Darwin (1809–1882). The English naturalist and author of *On the Origin of Species* (1859), David Ray Griffin remarks, “had developed a theory of how humans could have evolved through natural selection of random variations. ...Darwin still believed in a creator God, thinking evolution intelligible only on the assumption that God, in creating the universe, had built in laws of evolutionary development.

“[But] ...Darwin’s successors rejected his deism in favor of a completely atheistic worldview. Neo-Darwinism is an explicitly atheistic theory, devoted to showing how the evolutionary process, without any guidance whatsoever, could have produced the forms of life present in our world. Atheistic naturalism, more

generally, has been the more-or-less official ideology of the scientific community for over a century."⁶⁴

We know well that Darwin provided a powerful physicalist explanation of the known profusion of the species, given selection acting slowly over once-unimaginably vast periods of time. But did free will also naturally evolve, and if so, how? Or is it not even part of what is natural? For some, as the current Catholic stance shows, despite an acceptance of Darwinian evolution of the body the alleged nonphysicality of free will continues to anchor the argument for human exceptionalism.

A1.17 Thomas Henry Huxley (1825–1895). Huxley was an English biologist known as "Darwin's Bulldog" for his vigorous advocacy of Charles Darwin's theory of evolution. He was, it would seem, a Neo-Darwinist, saying, in his 1874 essay *On the Hypothesis that Animals Are Automata*, that, just as "the steam-whistle which accompanies the work of a locomotive engine is without influence upon its machinery ...it seems to me that in men, as in brutes, there is no proof that any state of consciousness is the cause of change in the motion of the matter of the organism.

"If these positions are well based, it follows that our mental conditions are simply the symbols in consciousness of the changes which takes place automatically in the organism; and that, to take an extreme illustration, the feeling we call volition is not the cause of a voluntary act, but the symbol of that state of the brain which is the immediate cause of that act. We are conscious automata."⁶⁵

A1.18 William James (1842–1910). James was, says Wikipedia, "a pioneering American psychologist and philosopher" who in 1884 "defined the common terms 'hard determinism' and 'soft determinism' (now more commonly called 'compatibilism'). ...James called compatibilism a 'quagmire of evasion.'"⁶⁶

In his voluminous *Principles of Psychology* (1890), James says, in a chapter captioned *Attention* (p. 403/381) [/ denoting the current, Harvard edition], that attention is "the taking possession by the mind, in clear and vivid form, of one of what seem several simultaneously possible objects or trains of thought. Focalization, concentration, of consciousness are of its essence. It implies withdrawal from some things in order to deal effectively with others.

"Even where the attention is voluntary, it is possible to conceive of it as an effect and not a cause, a product and not an agent. ...An idea must be there before we can attend to it. Attention only fixes and retains what the ordinary laws of association bring 'before the footlights' of consciousness (p. 450/426).

"Our psychic life has rhythm: it is a series of transitions and resting-places, of 'flights and perchings.' We rest when we remember the name we have been searching for; and we are off again when we hear a noise that might be the baby waking from her nap (p. 242/236)."⁶⁷

Two noteworthy chapters in *The Principles*, says Stanford, "are 'The Emotions' and 'Will.' The first sets out the theory — also enunciated by the Danish physiologist Carl Lange — that emotion follows, rather than causes, its bodily expression: 'Common-sense says, we lose our fortune, are sorry and weep; we meet a bear, are frightened and run; we are insulted by a rival, are angry and strike. The hypothesis here to be defended says that this order of sequence is incorrect...that we feel sorry because we cry, angry because we strike, afraid because we tremble...' (p. /1065–6).

"In his chapter on 'Will' James opposes the theory of his contemporary Wilhelm Wundt that there is one special feeling — a "feeling of innervation" — present in all intentional action. In his survey of a range of cases, James finds that some actions involve an act of resolve or of outgoing nervous energy, but others do not (p. /1131)."⁶⁸

Quoting James directly, "The question is this: Is the bare idea of a movement's sensible effects its sufficient mental cue, or must there be an additional mental antecedent, in the shape of a fiat, decision, consent, volitional mandate, or other synonymous phenomenon of consciousness, before the movement can follow? I answer: Sometimes the bare idea is sufficient, but sometimes an additional conscious element, in the shape of a fiat, mandate, or express consent, has to intervene and precede the movement. The cases without a fiat constitute the more fundamental, because the more simple, variety. ...

"Wherever movement follows unhesitatingly and immediately the notion of it in the mind, we have ideomotor action. We are then aware of nothing between the conception and the execution. All sorts of neuromuscular processes come between, of course, but we know absolutely nothing of them. We think the act, and it is done; and that is all that introspection tells us of the matter. ...I sit at table after dinner and find myself from time to time taking nuts or raisins out of the dish and eating them. My dinner properly is over, and in the heat of the conversation I am hardly aware of what I do; but the perception of the fruit, and the fleeting notion that I may eat

it, seem fatally to bring the act about. ...

“We know what it is to get out of bed on a freezing morning in a room without a fire. ... We suddenly find that we have got up. ...It was our acute consciousness of both the warmth and the cold during the period of struggle, which paralyzed our activity then and kept our idea of rising in the condition of wish and not of will. The moment these inhibitory ideas ceased, the original idea exerted its effects.

“This case seems to me to contain in miniature form the data for an entire psychology of volition. ...We may then lay it down for certain that every representation of a movement awakens in some degree the actual movement which is its object; and weakens it in a maximum degree whenever it is not kept from so doing by an antagonistic representation present simultaneously to the mind....

“Consciousness is in its very nature impulsive. We do not have a sensation or a thought, and then have to add something dynamic to it to get a movement. Every pulse of feeling which we have is the correlate of some neural activity that is already on its way to instigate a movement. ...The popular notion that mere consciousness as such is not essentially a fore-runner of activity ...is a very natural inference from those special cases in which we think of an act for an indefinite length of time without the action taking place. These cases, however, are not the norm; they are cases of inhibition by antagonistic thoughts. When the blocking is released we feel as if an inward spring were let loose, and this is the additional impulse or fiat upon which the act effectively succeeds. ...But where there is no blocking, there is naturally no hiatus between the thought process and the motor discharge (p. /1130-35).”⁶⁹

A decade earlier, in *Great Men, Great Thoughts, and the Environment* (1880), James had said that “A remarkable parallel, which I think has never been noticed, obtains between the facts of social evolution on the one hand, and of zoölogical evolution as expounded by Mr. Darwin on the other. ...I have no hesitation whatever in holding firm to the Darwinian distinction even here. I maintain that the facts in question are all drawn from the lower strata of the mind, so to speak, - from the sphere of its least evolved functions, from the region of intelligence which man possesses in common with the brutes. ...The new conceptions, emotions, and active tendencies which evolve are originally produced in the shape of random images, fancies, accidental out-births of spontaneous variation in the functional activity of the excessively instable human brain, which the outer environment simply confirms or refutes, adopts or rejects, preserves or destroys.”⁷⁰

Reflecting on the life and works of William James, Bernard Baars (see below) said in 2010 that “William James’ *Principles of Psychology* (1890) is commonly regarded as the greatest summary of empirical knowledge about consciousness of the 19th century. ...James’s book was greeted almost immediately as a masterpiece ...and yet, he also triggered seven decades of scientific rejection and trivialization of human consciousness. ...

“James suffered from repeated bouts of near-suicidal depression, which often focused on the issue of free will. He felt compelled to rescue metaphysical free will as a personal cure, and also to resolve an endless philosophical and cultural crisis. By 1904 James was looking⁷¹ to psychic phenomena and the soul of traditional metaphysics as a possible solution to the crisis of meaning and spiritual comfort that [not only affected] William James personally, but also many of his contemporaries and successors. ...

“It was John B. Watson who decided to cut the mind-body knot, proclaiming his radical behavioristic manifesto two years after James died in 1910. To make psychology into a ‘respectable’ science, based on physical observations like the mature sciences of that time, Watson argued for a complete purge of psychological terms involving consciousness, volition and self. Whatever was left over, Watson argued, could be re-interpreted in purely physical terms. ...

“Consciousness and its huge related vocabulary were expelled from ‘respectable’ philosophy and science. The result was a kind of psychic wound in the Western intellectual tradition, a Dark Age comparable to the systematic purging of classical learning by the medieval Church. ...We are seeing a cautious renaissance of consciousness science today, but there is much we have not yet rediscovered from the 25 centuries of human thought that flowered in James’ *Principles* of 1890, only to be torn out root and branch by the 1920s.”⁷²

A1.19 Sigmund Freud (1856–1939). “Contrary to what most people believe” says Derek J. Smith, “the unconscious was not discovered by Freud. In 1890, when psychoanalysis was still unheard of, William James, in *Principles of Psychology*, his monumental treatise on psychology, examined the way Schopenhauer, von Hartmann, Janet, Binet and others had used the term ‘unconscious’ and ‘subconscious.’ ...Freud and his colleague Josef Breuer “took Leibniz’s earlier suggestion of unconscious perception, and added in a welter of unconscious semantics and motivation as well, thus setting the scene for the emergence of psychodynamic theory during the first half of the 20th century.

“The picture they painted of an inner welter of emotionally charged content, clamouring to be heard but only if suitably camouflaged, still colours our everyday conceptualisation of free will. Indeed, one common modern view of free will is that it is at least in part just a ‘post–hoc rationaliser,’ a system which has no editorial control over what our deeper motivations have us do, but which can then explain the resulting behaviours away. It is a mechanism which thinks it is in charge, but is not.”⁷³

A1.20 Jules Henri Poincaré (1854–1912). “A French mathematician, theoretical physicist, and a philosopher of science. ...Poincaré’s famous lectures before the Société de Psychologie in Paris (published as *Science and Hypothesis*, *The Value of Science*, and *Science and Method*) were cited by Jacques Hadamard as the source for the idea that creativity and invention consist of two mental stages, first random combinations of possible solutions to a problem, followed by a critical evaluation.

“Although he most often spoke of a deterministic universe, Poincaré said that the subconscious generation of new possibilities involves chance.

‘It is certain that the combinations which present themselves to the mind in a kind of sudden illumination after a somewhat prolonged period of unconscious work are generally useful and fruitful combinations... all the combinations are formed as a result of the automatic action of the subliminal ego, but those only which are interesting find their way into the field of consciousness... A few only are harmonious, and consequently at once useful and beautiful, and they will be capable of affecting the geometrician’s special sensibility I have been speaking of; which, once aroused, will direct our attention upon them, and will thus give them the opportunity of becoming conscious... In the subliminal ego, on the contrary, there reigns what I would call liberty, if one could give this name to the mere absence of discipline and to disorder born of chance.’

“Poincaré’s two stages – random combinations followed by selection – became the basis for Daniel Dennett’s two-stage model of free will.”⁷⁴

From Two-Stage Model of Free Will in Wikipedia, “A two-stage model of free will separates the free stage from the will stage. In the first stage, alternative possibilities for thought and action are generated, in part indeterministically. In the second stage, an adequately determined will evaluates the options that have been developed....

“Around 1906 Poincaré speculated on how his mind works when he is solving mathematical problems. He had the critical insight that random combinations and possibilities are generated, some in an unconscious way with chance involved, then they are selected among, perhaps initially also by an unconscious process, but then by a definite conscious process of validation. ...William James read Poincaré and the great thinker knew James work, but there is no sign of any direct influence.”⁷⁵

A1.21 Arthur Holly Compton (1892-1962). Nobel prize-winning physicist Compton “was one of a handful of scientists and philosophers to propose a two-stage model of free will. Others include William James, Henri Poincaré, Karl Popper, Henry Margenau, and Daniel Dennett. In 1931, Compton championed the idea of human freedom based on quantum uncertainty. ...Reacting to criticisms that his ideas made chance the direct cause of our actions, Compton clarified the two-stage nature of his idea in an *Atlantic Monthly* article in 1955. First there is a range of random possible events, then one adds a determining factor in the act of choice.’When one exercises freedom, by his act of choice he is himself adding a factor not supplied by the physical conditions and is thus himself determining what will occur.”⁷⁶

A1.22 Albert Einstein (1879–1955). In 1930-31, in a conversation with Rabindranath Tagore, Bengali poet, philosopher and Nobel laureate, Einstein said, according to Home and Robinson, “If the moon, in the act of completing its eternal way around the earth, were gifted with self–consciousness, it would be fully convinced that it was traveling its way of its own accord... So would a Being, endowed with higher insight and more perfect intelligence, watching man and his doings, smile about man’s illusion that he was acting according to his own free will”⁷⁷

“Albert Einstein in *Mein Glaubensbekenntnis* (August 1932): ‘I do not believe in freedom of will. Schopenhauer’s words, ‘Man can indeed do what he wants, but he cannot want what he wants’, accompany me in

all life situations and console me in my dealings with people, even those that are really painful to me. This recognition of the unfreedom of the will protects me from taking myself and my fellow men too seriously as acting and judging individuals and losing good humour.’⁷⁸

Einstein said, “The physicist's greatest tool is his wastebasket.”⁷⁹ At Princeton, Albert Einstein was like a kindly uncle. When he arrived in 1935, he was asked what he would require for his study. He replied, “A desk, some pads and a pencil, and a large wastebasket—to hold all of my mistakes.”⁸⁰

A1.23 Erich Fromm (1900–1980). Fromm was “a German social psychologist, psychoanalyst, humanistic philosopher, and democratic socialist.”⁸¹ “The Freudian tradition of psychoanalysis sees the mind as a slave more or less totally to its underlying biology. By contrast, Fromm (1941/1965) saw personal freedom as able to rise from and above the biology, thus defying the forces of determinism. ... Both helplessness and doubt paralyse life, he writes, and the cure is self-realisation, that is to say, ‘the active expression of his [the individual’s] emotional and intellectual potentialities.’⁸²

A1.24 Kenneth Craik (1914–1945). Kenneth Craik “was a philosopher and psychologist who studied philosophy at the University of Edinburgh, Scotland, and received his doctorate from Cambridge University in 1940. ...In 1943 he wrote *The Nature of Explanation*. In this book he laid the foundation for the concept of mental models, that the mind forms models of reality and uses them to predict similar future events. He was one of the earliest practitioners of cognitive science. He was killed at the age of 31 in a bicycle accident.”⁸³

In *What is a mind?* (2000)⁸⁴, Suzanne Cunningham cites Craik, writing (p. 91), “Consciousness allows us to take in information, evaluate its relevance for us at the time, and consider possible behaviors that might be desirable in light of that information. ...Consciousness allows us to consider and evaluate possible courses of action in imagination, where we can try to anticipate various outcomes without committing ourselves to actually carrying out one of the behaviors until we decide which of them is most likely to succeed. ...This view has its roots in the work of Kenneth Craik (1943). He says,

“If the organism carries a ‘small-scale model’ of external reality and of its own possible actions within its head, it is able to try out various alternatives, conclude which is the best of them, react to future situations before they arise, utilise the knowledge of past events in dealing with the future, and in every way to react in a much fuller, safer and more competent manner to the emergencies which face it.”⁸⁵

A1.25 Norbert Wiener (1894–1964). From Wikipedia, Wiener “was an American mathematician. A famous child prodigy, Wiener later became an early studier of stochastic and noise processes, contributing work relevant to electronic engineering, electronic communication, and control systems. Wiener is regarded as the originator of cybernetics, a formalization of the notion of feedback, with many implications for engineering, systems control, computer science, biology, philosophy, and the organization of society. ...

“During World War II, his work on the automatic aiming and firing of anti-aircraft guns caused Wiener to study communication theory and eventually to formulate cybernetics.”⁸⁶ “The idea of “cybernetics” came to Wiener at the beginning of the forties, prompted by his work on anti-aircraft defence and by contacts with colleagues in Mexico (“Behavior, purpose and teleology” with A. Rosenblueth and J. Bigelow, *Philos.Sci* 1943).”⁸⁷ “The term cybernetics stems from the Greek *kybernetes*, steersman, governor, pilot, or rudder — the same root as government. ...The word cybernetics was first used in the context of ‘the study of selfgovernance’ by Plato in *The Laws* to signify the governance of people. ...Cybernetics was defined by Norbert Wiener, in his book of that title [1948], as the study of control and communication in the animal and the machine. ...[By] the most recent definition, ‘Cybernetics is the study of systems and processes that interact with themselves and produce themselves from themselves.’ ...Cybernetics is closely related to control theory and systems theory.

“Both in its origins and in its evolution in the second-half of the 20th century, cybernetics is equally applicable to physical and social (that is, language-based) systems. ...Cybernetics is preeminent when the system under scrutiny is involved in a closed signal loop, where action by the system in an environment causes some change in the environment and that change is manifest to the system via information, or feedback, that causes the system to adapt to new conditions: the system changes its behavior.”⁸⁸

A1.26 Gilbert Ryle (1900–1976). From Wikipedia, Ryle was a British philosopher “principally known for his

critique of Cartesian dualism, for which he coined the phrase ‘the ghost in the machine.’ ...He attacks the idea of 17th and 18th century thinkers (such as Descartes) that nature is a complex machine and that human nature is a smaller machine with a ‘ghost’ in it to account for intelligence, spontaneity and other such human qualities. ...Ryle asserted that the workings of the mind are not distinct from the actions of the body. They are one and the same. Mental vocabulary is, he insists, merely a different manner of describing action. He also claimed that the nature of a person’s motives are defined by that person’s dispositions to act in certain situations. There are no overt feelings, pains, or twinges of vanity. There is instead a set of actions and feelings that are subsumed under a general behavior-trend or propensity to act, which we term ‘vanity.’ ”⁸⁹

“He argued that if there is an inner being inside the brain that could steer its own thoughts then this would lead to an absurd repetitive cycle or ‘regress’ before a thought could occur: ‘According to the legend, whenever an agent does anything intelligently, his act is preceded and steered by another internal act of considering a regulative proposition appropriate to his practical problem. . . . Must we then say that for the agent’s . . . reflections how to act to be intelligent he must first reflect how best to reflect how to act? The endlessness of this implied regress shows that the application of the appropriateness does not entail the occurrence of a process of considering this criterion.’ Ryle 1949”⁹⁰

A1.27 Karl Popper (1902–1994). Popper “was an Austro-British philosopher and a professor at the London School of Economics. ...When he gave the first Arthur Holly Compton Memorial Lecture in 1955, Popper revisited the idea of quantum indeterminacy as a source of human freedom. ...Popper called not for something between chance and necessity but for a combination of randomness and control to explain freedom, though not yet explicitly in two stages with random chance before the controlled decision. ...Then in his 1977 book with John Eccles, *The Self and its Brain*, Popper finally formulates the model in a temporal sequence. And he compares free will to Darwinian evolution and natural selection,

‘New ideas have a striking similarity to genetic mutations. Now, let us look for a moment at genetic mutations. Mutations are, it seems, brought about by quantum theoretical indeterminacy (including radiation effects). Accordingly, they are also probabilistic and not in themselves originally selected or adequate, but on them there subsequently operates natural selection which eliminates inappropriate mutations. Now we could conceive of a similar process with respect to new ideas and to free-will decisions, and similar things. That is to say, a range of possibilities is brought about by a probabilistic and quantum mechanically characterized set of proposals, as it were - of possibilities brought forward by the brain. On these there then operates a kind of selective procedure which eliminates those proposals and those possibilities which are not acceptable to the mind.’ ”⁹¹

A1.28 Daniel C. Dennett (1942–). Dennett is (says Wikipedia) “an American philosopher whose research centers on the philosophy of mind, philosophy of science and philosophy of biology, particularly as those fields relate to evolutionary biology and cognitive science.

“While he is a confirmed compatibilist on free will, in *On Giving Libertarians What They Say They Want*, Chapter 15 of his 1978 book *Brainstorms*, Dennett articulated the case for a two-stage model of decision making in contrast to libertarian views. “ ‘The model of decision making I am proposing has the following feature: when we are faced with an important decision, a consideration-generator whose output is to some degree undetermined produces a series of considerations, some of which may of course be immediately rejected as irrelevant by the agent (consciously or unconsciously). Those considerations that are selected by the agent as having a more than negligible bearing on the decision then figure in a reasoning process, and if the agent is in the main reasonable, those considerations ultimately serve as predictors and explicators of the agent’s final decision.’ ”⁹²

“According to Daniel Dennett, however, many scientists and philosophers still believe, either explicitly or implicitly, in Descartes’ idea of some centralized repository where the contents of consciousness are merged and assembled, a place he calls the Cartesian theater.

“In *Consciousness Explained* (1991), Dennett offers several lines of evidence to dispute the idea of Cartesian materialism. ...To avoid the perceived shortcomings of Cartesian materialism, Dennett instead proposes the Multiple Drafts Model — a model of consciousness which lacks a central Cartesian theater.

“Despite Dennett’s insistence that there are no special brain areas that store the contents of consciousness,

many neuroscientists reject this assertion. Indeed, what separates conscious information from unconscious information remains a question of interest, and how information from disparate brain regions are assembled into a coherent whole (the Binding problem) remains a question which is actively investigated. Recently Global Workspace Theory has argued that perhaps the brain does possess some universally accessible 'workspace'.⁹³

Cunningham adds that "In more recent articles he emphasizes a modular view of the mental — a view in which the mind consists of semiautonomous modules (networks of neurons organized to carry out specific functions). Unlike his early view — in which there appeared to be two dominant modules relating to consciousness, one for speech and one for behavior — his more recent account allows for numerous competing modules, none of which is the 'stream of consciousness.' As he put it in 1997, 'The 'stream of consciousness' is not a single, definitive narrative. It is a parallel stream of conflicting and continuously revised contents, no one narrative thread of which can be singled out as ...the true version of conscious experience.'⁹⁴

A1.29 Benjamin Libet (1916–2007). Libet was, says Wikipedia, "a researcher in the physiology department of the University of California, San Francisco, and a pioneering scientist in the field of human consciousness. ...

"In the 1970s, Libet was involved in research into neural activity and sensation thresholds. ...His most famous experiment (1983) demonstrates that the unconscious electrical processes in the brain called Bereitschaftspotential (or readiness potential) discovered by Deecke and Kornhuber in 1964 precede conscious decisions to perform volitional, spontaneous acts, implying that unconscious neuronal processes precede and potentially cause volitional acts which are retrospectively felt to be consciously motivated by the subject. The experiment has caused controversy as it challenges the pre-scientific philosophical and religious views of 'free will'. It has also inspired further study. ...

"Libet required an objective method of marking the subject's conscious experience of the will to perform an action in time, and afterward comparing this information with data recording the brain's electrical activity during the same interval. For this, Libet required specialized pieces of equipment.

"The first of these was the cathode ray oscilloscope, an instrument typically used to graph the amplitude and frequency of electrical signals. With a few adjustments, however, the oscilloscope could be made to act as a timer: instead of displaying a series of waves, the output was a single dot that could be made to travel in a circular motion, similar to the movements of a second hand around a clock face. This timer was set so that the time it took for the dot to travel between intervals marked on the oscilloscope was approximately forty-three milliseconds. As the angular velocity of the dot remained constant, any change in distance could easily be converted into the time it took to travel that distance.

"To monitor brain activity during the same period, Libet used an electroencephalogram (EEG). The EEG uses small electrodes placed at various points on the scalp that measure neuronal activity in the cortex, the outermost portion of the brain, which is associated with higher cognition. The transmission of electrical signals across regions of the cortex causes differences in measured voltage across EEG electrodes. These differences in voltage reflect changes in neuronal activity in specific areas of the cortex.

"To measure the actual time of the voluntary motor act, an electromyograph (EMG) recorded the muscle movement using electrodes on the skin over the activated muscle of the forearm. The EMG time was taken as the zero time relative to which all other times were calculated.

"Researchers carrying out Libet's procedure would ask each participant to sit at a desk in front of the oscilloscope timer. They would affix the EEG electrodes to the participant's scalp, and would then instruct the subject to carry out some small, simple motor activity, such as pressing a button, or flexing a finger or wrist, within a certain time frame. No limits were placed on the number of times the subject could perform the action within this period.

"During the experiment, the subject would be asked to note the position of the dot on the oscilloscope timer when "he/she was first aware of the wish or urge to act" (control tests with Libet's equipment demonstrated a comfortable margin of error of only 50 milliseconds). Pressing the button also recorded the position of the dot on the oscillator, this time electronically. By comparing the marked time of the button's pushing and the subject's conscious decision to act, researchers were able to calculate the total time of the trial from the subject's initial volition through to the resultant action. On average, approximately two hundred milliseconds elapsed between the first appearance of conscious will to press the button and the act of pressing it. ...

"Researchers also analyzed EEG recordings for each trial with respect to the timing of the action. It was noted that brain activity involved in the initiation of the action, primarily centered in the secondary motor cortex occurred, on average, approximately five hundred milliseconds before the trial ended with the pushing of the

button. That is to say, researchers recorded [see Figure 2, superposing traces for multiple tests] mounting brain activity related to the resultant action as many as three hundred milliseconds before subjects reported the first awareness of conscious will to act. In other words, apparently conscious decisions to act were preceded by an unconscious buildup of electrical charge within the brain — this buildup came to be called *Bereitschaftspotential* or readiness potential.

“Libet’s experiments suggest that unconscious processes in the brain are the true initiator of volitional acts, and free will therefore plays no part in their initiation. If the brain has already taken steps to initiate an action before we are aware of any desire to perform it, the causal role of consciousness in volition is all but eliminated.

“Libet finds that conscious volition is exercised in the form of ‘the power of veto’ (sometimes called free won’t); the idea that conscious acquiescence is required to allow the unconscious buildup of the readiness potential to be actualized as a movement. While consciousness plays no part in the instigation of volitional acts, Libet suggested that it may still have a part to play in suppressing or withholding certain acts instigated by the unconscious. ...Libet’s experiments have received support from other research related to the Neuroscience of free will.

“It has been suggested that consciousness is merely a side-effect of neuronal functions, an epiphenomenon of brain states. Libet’s experiments are proffered in support of this theory; our reports of conscious instigation of our own acts are, in this view, a mistake of retrospection...

“In the later part of his career, Libet proposed a theory of the conscious mental field (CMF) to explain how the mental arises from the physical brain. The two main motivations prompting this proposal were: (1) the phenomenon of the unity of subjective conscious experience and (2) the phenomenon that conscious mental function appears to influence nerve cell activity. ...

“The CMF is the mediator between the physical activities of nerve cells and the emergence of subjective experience. Thus the CMF is the entity in which unified subjective experience is present and provides the causal ability to affect or alter some neuronal functions. Libet proposed the CMF as a “property” of an emergent phenomenon of the brain; it does not exist without the brain but emerges from the appropriate system of neural activity. This proposal is related to electromagnetic theories of consciousness.” For further details of Libet’s experiments and for various interpretations of⁹⁵ the results, see this Wikipedia article and the references and links cited therein.

Dubious as may be the “conscious mental field,” an objection even to Libet’s “free won’t” has been voiced. “While this is an interesting possibility, it does invite an obvious question. If the wish to perform an act is developed preconsciously, why doesn’t the decision to censor the act have its own preconscious antecedents? Libet (1996) argues that it might not need to do so as voluntary control imposes a change on a wish that is already conscious. Yet, it seems very odd that a wish to do something has preconscious antecedents while a wish not to do something does not.”⁹⁶

These experiments and others are discussed in a separate Wikipedia article on Neuroscience of Free Will. “One significant finding of these studies is that a person’s brain seems to commit to certain decisions before the person becomes aware of having made them. Early studies found delays of about half a second, but with contemporary brain scanning technology scientists in 2008 were able to predict whether subjects would press a button with their left or right hand up to 10 seconds before the subject became aware of having made the choice. One proposed explanation, a forward model of motor control, is mentioned. In this model, our conscious selves are updated of our own movements somewhat independently of the subconscious pathways controlling the actual movement.

“It may be possible, then, that our intuitions about the role of our conscious “intentions” have led us astray; it may be the case that we have confused correlation (of self awareness) with causation (of the movement). This possibility is bolstered by various known introspection illusions — studies showing that humans may not have access to various internal processes. These studies have only just begun to shed light on the role that consciousness plays in actions and it is too early to draw very strong conclusions.” We will accordingly consider such results only as being consistent with, not as central proof of, the explanatory theory yet to be presented.

Peter Hankins notes, “Our conscious thoughts seem to come into our minds from nowhere: you can’t catch yourself deciding to think something, however quickly you turn round. There is really nothing mysterious about this. The processes which give rise to conscious thoughts cannot themselves be conscious, or they in turn would need to be underpinned by other conscious processes, and so on. The act of making a decision must always precede, if only marginally, conscious awareness of having made a decision.”⁹⁷ Seen in this light, Libet’s experimental findings could hardly have been otherwise!

A1.30 Marvin L. Minsky (1927–). Minsky is “an American cognitive scientist in the field of artificial intelligence (AI), co-founder of Massachusetts Institute of Technology's AI laboratory, and author of several texts on AI and philosophy. In the early 1970s, Minsky and Seymour Papert started developing what came to be called The Society of Mind theory. The theory attempts to explain how what we call intelligence could be a product of the interaction of non-intelligent parts.”⁹⁸

From one review of *The Society of Mind* (1985), “The cornerstone of Minsky's theory is the conception of minds as collections of enormous numbers of semi-autonomous, intricately connected agents that are themselves mindless. ...Minsky looks at a mental phenomenon and then asks himself what sort of mechanisms in the mind could account for it. ...In Minsky's view, people are extremely complex machines, though Minsky would argue that when we use the word machine, we tend to think, erroneously, of very simple machines that ‘behave only in lifeless, mechanical ways’ rather than in terms of machines as complex as the human brain, with its ‘billions of cells, each one complicated by itself and connected to many thousands of others.’ ”⁹⁹ And from another review, “The mind learns by images, which perform as agents that connect, interact and even ‘censor’ in a staggeringly subtle ‘society’ of microprocedures.”¹⁰⁰

From the indicated pages of the text, “Good theories of the mind must span at least three different scales of time: slow, for the billion years in which our brains have evolved; fast, for the fleeting weeks and months of infancy and childhood; and in between, the centuries of growth of our ideas through history... (18)

“ ‘If any part of matter be devoid of thought, what part can we suppose to think? Matter can differ from matter only in form, bulk, density, motion and direction of motion: to which of these, however varied or combined, can consciousness be annexed? If matter be once without thought, it can only be made to think by some new modification, but all the modifications which it can admit are equally unconnected with cogitative powers.’ Samuel Johnson. ...

“How could solid-seeming brains support such ghostly things as thoughts? This question troubled many thinkers of the past. The world of thoughts and the world of things appeared to be too far apart to interact in any way. So long as thoughts seemed so utterly different from everything else, there seemed to be no place to start.

“A few centuries ago it seemed equally impossible to explain Life, because living things appeared to be so different from anything else. Plants seemed to grow from nothing. Animals could move and learn. Both could reproduce themselves -- while nothing else could do such things. But then that awesome gap began to close. Every living thing was found to be composed of smaller cells, and cells turned out to be composed of complex but comprehensible chemicals. ...This book will show how the tiny machines that we'll call ‘agents of the mind’ could be the long sought ‘particles’ that those theories need.” (19)

“In childhood, our agencies acquire various types of goals. Then we grow in overlapping waves, in which our older agencies affect the making of the new. This way, the older agencies can influence how our later ones will behave. (46) Is ‘you’ the body of those memories whose meanings change only slowly? (54) There are no doors inside our minds, only connections among our signs. To overstate the case a bit, what we call ‘consciousness’ consists of little more than menu lists that flash, from time to time, on mental screen displays that other systems use. (57)

“Why can we explain so many things in terms of causes and effects? Is it because there is a cause for everything – or do we merely learn to ask only about the kinds of happenings that have causes? Is it that causes don’t exist at all but are inventions of our minds? The answer is all of the above. Causes are indeed made up by minds – but only work in certain parts of certain worlds. (129)

“Let’s call this a simulacrum: a reproduction of only the higher-level effects of a stimulus. A simulacrum at the very highest level could lead a person to recollect virtually no details about a remembered object of event, yet be able to apprehend and contemplate its most significant structures and while experiencing a sense of its presence. ...Not only can it work more swiftly while using less machinery, but we can combine the parts of several simulacra to imagine things we have never seen before – and even to imagine things that couldn’t possibly exist. (170)

“Why do we have the sense that things proceed in smooth, continuous ways? Is it because, as some mystics think, our minds are part of some flowing stream? I think it’s just the opposite: our sense of constant, steady change emerges from the parts of mind that manage to insulate themselves against the continuous flow of time! ...

“Existence seems continuous to us not because we continually experience what is happening in the present, but because we hold to our memories of how things were in the recent past. Without those short-term memories, all would seem entirely new at every instant, and we would have no sense at all of continuity or, for

that matter, of existence. . . We notice change in spite of change, not because of it.

“Our sense of constant contact with the world is not a genuine experience; instead, it is a form of immanence illusion. We have the sense of actuality when every question asked of our visual systems is answered so swiftly that it seems as though those answers were already there. (257)

“We often speak of having mental energy and momentum or of succumbing to depletion or inertia. Do ‘mental quantities’ really exist within the mind? ... The answer is that words like ‘energy’ and ‘force’ are not used with much precision in everyday psychology. They still have the connotations that they carried several centuries ago, when they referred to commonsense ideas about vitality. Then, ‘energy’ referred to vigor of action and expression, and ‘force’ referred to the binding strength of a commitment or to the fighting strength of an army.

“Modern scientists use a concept of energy that, though narrower and more precise, not only explains more perfectly why engines stop when they run out of fuel, but also applies to our bodies as well: each of the cells of which we’re made, including those inside the brain, requires some chemical energy in the form of food and oxygen. ... *Machines and brains require ordinary energy to do their jobs — and need no other, mental forms of energy. Causality is quite enough to keep them working toward their goals.* (283)

“In some respects our bodies act exactly like ordinary objects: they have shapes we can see and touch, and they have locations that change when we’re dropped or pushed. Yet in other ways, our bodies act quite differently from other things, and this appears to be because of minds. But what on earth are minds? For ages people have wondered about the relationship between the mind and body; some philosophers became so desperate as to suggest that only the mental world is real and the real world is merely an illusion. (That idea just makes the problem worse, because it can’t even explain why there seems to be a physical world.) Most thinkers have ended up with images that portray two different kinds of worlds, one of matter and one of mind, somehow connected by mysterious threads of spiritual causality, somewhat like the films and tendrils formed when sticky stuff is pulled apart. Certain modern physicists have even speculated that these connections are somehow involved with the ‘uncertainty principle’ in physics, perhaps because that problem also confounds their usual conceptions of causality. I see no merit in such ideas because as far as I’m concerned, the so-called problem of body and mind does not hold any mystery: *Minds are simply what brains do.*

“Whenever we speak about a mind, we’re speaking of the processes that carry our brains from state to state. And this is what makes minds appear to us so separate from their physical embodiments: it is because concerns about minds are really concerns with relationships between states — and this has virtually nothing to do with the natures of the states themselves. ... It does not matter in the least what are the individual agents’ colors, sizes, shapes, or any other properties that we could sense. So naturally minds seem detached from physical existence. It doesn’t matter what agents are; it only matters what they do — and what they are connected to. (287)

“We each believe that we possess an Ego, Self, or Final Center of Control, from which we choose what we shall do at every fork in the road of time. To be sure, we sometimes have the sense of being dragged along despite ourselves, by internal processes which, though they come from within our minds, nevertheless seem to work against our wishes. But on the whole we still feel that we can choose what we shall do. Whence comes this sense of being in control? According to the modern scientific view, there is simply no room at all for ‘freedom of the human will.’ Everything that happens in our universe is either completely determined by what’s already happened in the past or else depends, in part, on random chance. ...

“Every action we perform stems from a host of processes inside our minds. We sometimes understand a few of them, but most lie far beyond our ken. But none of us enjoys the thought that what we do depends on processes we do not know; we prefer to attribute our choices to volition, will, or self-control ... because we’re largely made of systems designed to learn to achieve their goals. In childhood, everyone learns to recognize, dislike, and resist various forms of aggression and compulsion. Naturally we’re horrified to hear about agents that hide in our minds and influence what we decide.

“No one wants to submit to laws that come to us like the whims of tyrants who are too remote for any possible appeal. And it’s equally tormenting to feel that we’re a toy to mindless` chance, caprice, or probability — for though these leave our fate unfixed, we’d still not play the slightest part in choosing what shall come to be. So, though it’s futile to resist, we continue to regard both Cause and Chance as intrusions on our freedom of choice. There remains only one thing to do: we add another region to our model of our mind. We imagine a third alternative, one easier to tolerate; we imagine a thing called ‘freedom of will,’ which lies beyond both kinds of constraint. (306)

“This means that the dominion controlled by Will can only hold what, up to now, we don’t yet understand. In ancient times, that realm was huge, when every planet had its god, and every storm or animal did manifest

some spirit's wish. But now for many centuries, we've had to watch that empire shrink.

“Does this mean that we must embrace the modern scientific view and put aside the ancient myth of voluntary choice? No. We can't do that: too much of what we think and do revolves around those old beliefs. Consider how our social lives depend upon the notion of responsibility and how little that idea would mean without our belief that personal actions are voluntary. ...What could we make our children learn if neither they nor we perceived some fault or virtue anywhere? We also use the idea of freedom of will to justify our judgments about good and evil. ...But if we suspected that such choices were not made freely, but by the interference of some hidden agency, we might very well resent that interference. Then we might become impelled to try to wreck the precious value-schemes that underlie our personalities or become depressed about the futility of a predestination tempered only by uncertainty. Such thoughts must be suppressed.

“No matter that the physical world provides no room for freedom of will: that concept is essential to our models of the mental realm. Too much of our psychology is based on it for us to ever give it up. We're virtually forced to maintain that belief, even though we know it's false — except, of course, when we're inspired to find the flaws in all our beliefs, whatever may be the consequence to cheerfulness and mental peace.” (307)

A1.31 Bernard J. Baars (1946–). Baars is “former Senior Research Fellow in Theoretical Neurobiology at the Neurosciences Institute in San Diego. Baars pioneered a cognitive theory of consciousness called Global Workspace Theory, which is widely cited in philosophical and scientific sources. Together with William P. Banks, Baars has edited the journal *Consciousness & Cognition* for more than fifteen years. He has written an introductory text for cognitive neuroscience, called *Cognition, Brain & Consciousness: An Introduction to Cognitive Neuroscience* (2007). Baars was founding President of the Association for the Scientific Study of Consciousness.”¹⁰¹ His several books include *A Cognitive Theory of Consciousness* (1988) and *In the Theater of Consciousness* (1997).

From Wikipedia, “Drawing from James, Baars’ Global Workspace Theory (GWT) ... is proposed to correspond to a ‘momentarily active, subjectively experienced’ event in working memory (WM) — the ‘inner domain in which we can rehearse telephone numbers to ourselves or, more interestingly, in which we carry on the narrative of our lives. It is usually thought to include inner speech and visual imagery.’”¹⁰²

“We develop only a single theoretical metaphor: a ‘publicity metaphor’ of consciousness, suggesting that there is a ‘global workspace’ system underlying conscious experience. The global workspace is the publicity organ of the nervous system; its contents, which correspond roughly to conscious experience, are distributed widely throughout the system. This makes sense if we think of the brain as a vast collection of specialized automatic processors, some of them nested and organized within other processors. Processors can compete or cooperate to gain access to the global workspace underlying consciousness, enabling them to send global messages to any other interested systems. Any conscious experience emerges from cooperation and competition between many different input processors. ...

“Voluntary control of action can be treated as a special kind of problem-solving, with both conscious and unconscious components. Properties like selectivity, limited capacity, self-consciousness, the ability to report conscious contents, knowledge of the world, reflective consciousness; consciousness as the domain of rationality; consciousness as the “glue” for combining different perceptual features, as the domain of error-correction and trouble-shooting, as a tool for learning; and the relationship between consciousness and novelty, voluntary control, and self ---- all these points are consistent with, and appear to follow from the present framework.

“There is evidence suggesting that ‘unattended’ streams of information are processed and represented even though they are not conscious. Further, habituated perceptual events --- those to which we have become accustomed --- apparently continue to be represented in the nervous system“ (1988).¹⁰³“Evolution, he points out, seems to have given us one conscious system to supervise many subconscious ones.”¹⁰⁴

“In the working theatre, focal consciousness acts as a ‘bright spot’ on the stage, directed there by the selective ‘spotlight’ of attention. The bright spot is further surrounded by a ‘fringe’ of vital but vaguely conscious events. The entire stage of the theatre corresponds to ‘working memory’, the immediate memory system in which we talk to ourselves, visualize places and people, and plan actions. Information from the bright spot is globally distributed through the theatre, to two classes of complex unconscious processors: those in the darkened theatre ‘audience’ mainly receive information from the bright spot; while ‘behind the scenes’ unconscious contextual systems shape events in the bright spot.” (1997)¹⁰⁵

“Using the theater metaphor, we can think of self as the director behind the scenes. In the jargon of global workspace theory, it would be called the ‘dominant goal context hierarchy.’ But ‘stage director’ is fine for our

purposes.”¹⁰⁶

In a JCS article on Understanding Subjectivity (1996), Baars said that “Gilbert Ryle famously pointed out an apparent contradiction in the everyday notion of ‘the self as observer’. ...If we had an observing self contemplating the contents of consciousness, he argued, how would we explain the self itself? By another observer inside the inner self? That would lead to a infinite regress of observing selves each looking into the mind of the preceding one. ... Ryle’s arguments against the ‘ghost in the machine’ persuaded countless scientists and philosophers that ‘the self’ is a snare and a delusion.

“The only trouble with Ryle’s impossibility proof is that some notion of self is indispensable and not noticeably problematic in daily life, and indeed in much contemporary psychology and brain science. Ryle’s impossibility proof applies only if the concept of self is not decomposed into cognitive or brain entities that are better understood than the word ‘self’. As Daniel Dennett has written, ‘Homunculi are bogeymen only if they duplicate entire the talents they are rung in to explain.’ (Dennett, 1978, p. 123).

“Consider William James’ ‘self as observer’. It is hard to see anything impossible about it if we think of observers as pattern recognizers. Many brain systems ‘observe’ the output of another, and we now know a great deal about pattern recognizers in the brain. There seems to be plentiful brain and psychological evidence regarding self-systems. All that is not to deny the existence of genuine mysteries about self. But there seem to be aspects of self that are not beyond human understanding.”¹⁰⁷

A1.32 Daniel M. Wegner (1948–). Wegner, says Wikipedia, is “an American social psychologist, is a professor of psychology at Harvard University and a fellow of the American Association for the Advancement of Science. He is known for his work on mental control (e.g., thought suppression) and conscious will, and for originating the study of transactive memory and action identification.

“His book, *The Illusion of Conscious Will* (2002) tackles the long-debated notion of free will through the scope of experimental psychology. Wegner’s ideas have sparked interest among psychologists, neuroscientists, theologians, and philosophers interested in the nature of consciousness and freedom of action.”¹⁰⁸

The book opens with the quote, “All theory is against the freedom of the will; all experience is for it.” Samuel Johnson, *Boswell’s Life of Johnson* (1791). As Wegner explains, whereas “The scientific explanation accounts for behavior as a mechanism ... we feel that we cause ourselves to behave. ...One might assume that the experience of consciously willing an action and the causation of that action are the same thing. As it turns out, however, they are entirely distinct, and the tendency to confuse them is the illusion of conscious will that this book is about.” (p. 2-3.)

“We tend to see ourselves as the authors of an act primarily when we have experienced relevant thoughts about the act at an appropriate internal in advance and so can infer that our own mental processes have set the act in motion. Actions we perform that are not presaged in our minds, in turn, would appear not to be caused by our minds. The intentions we have to act may or may not be causes, but this doesn’t matter as it is only critical that we perceive them as causes if we are to experience conscious will. ...We can never be sure that our thoughts cause our actions, as there could always be causes of which we are unaware that have produced both the thoughts and the actions.” (p. 63 ff.) Or, more generally, correlation is not a proof of causation. “Conscious will is an illusion ...in the sense that the experience of consciously willing an action is not a direct indication that the conscious thought has caused the action.

Conscious will, viewed this way, may be an extraordinary illusion indeed — the equivalent of a magician’s producing an elephant from the folds of his handkerchief. ...Calling this an illusion may be a bit strong, and it might be more appropriate to think of this as a construction or fabrication. But the term illusion does convey the possibility that we place an erroneously large emphasis on how will appears to us and assume that this appearance is a deep insight.” (p. 2)

“To quote Spinoza in *The Ethics* (1677), ‘Men are mistaken in thinking themselves free; their opinion is made up of consciousness of their own actions, and ignorance of the causes by which they are determined.’ ” (p. 28.) Quoting Huxley (1874) (*ibid*), “Volition ...is an emotion indicative of physical changes, not a cause of such changes ...we are conscious automata.” (p. 317.)

“Will is a feeling. David Hume ...proposed to define the will ...as ‘nothing but the internal impression we feel and are conscious of, when we knowingly give rise to any new motion of our body, or new perception of our mind.’ ...The will is not some cause or force or motor in a person — but rather is the personal conscious feeling of such causing, forcing, or motoring. ...Still the action isn’t willed if the person says it was not. ...Consciously willing an action requires a feeling of doing, a kind of internal ‘oomph’ that somehow certifies authentically that

one has done the action.” (p. 3-4.) Reciting Libet’s results, “the brain started first, followed by the experience of conscious will, finally followed by action. ...Conscious wanting, like action, is a mental event caused by other events.” (p. 55.)

Wegner notes that Antonio Damasio, in *Descartes’ Error: Emotion, Reason, and the Human Brain* (1994), “has described the general function of emotions as ‘somatic markers,’ deep and unavoidable reminders of the body’s interests in what we do and what we experience.” (p. 236.) ...”Conscious will is the somatic marker of personal authorship, an emotion that authenticates the action’s owner as the self. ...” (p. 327.) James had made the same attribution a century before, and with credit to Lange before him.

“The experience of will is an indicator to which we refer as we steer.” (p. 317.) ...“In the same sense that laughter reminds us that our bodies are having fun, or that trembling alerts us that our bodies are afraid, the experience of will reminds us that we’re doing something. ...The occurrence of conscious will brands the act deeply, associating the act with self through feeling, and so renders the act one’s own in a personal and memorable way. Will is a kind of authorship emotion.” (p. 325.)¹⁰⁹

A1.33 Robert Doyle (ca 1940–). With a Ph.D in Astrophysics from Harvard, Doyle is now an Associate in the Harvard Astronomy Department. In addition to being, on the Internet, the prolific Information Philosopher, Doyle has published "Free Will: it’s a normal biological property, not a gift or a mystery," *Nature*, 459, June 2009.¹¹⁰ Expanding on this topic, in his on-line Chapter 4.4 - *The Physics of Free Will* (undated), he says that “The physical world is fundamentally undetermined, it began in chaos and remains chaotic and random at the atomic scale (as well as some macroscopic regions of the cosmos).

“Even for large objects, the laws of physics are statistical laws. We have known this since Ludwig Boltzmann’s work in 1877. Statistical physics was brilliantly confirmed at the level of atomic collisions by Max Born in 1926, and by Werner Heisenberg in 1927, with his quantum mechanical uncertainty principle. Unfortunately, antipathy to chance led many prominent physicists, then and now, to deny indeterminism and cling to a necessitarian deterministic physics.

Biologists knew even earlier, from Charles Darwin’s work in 1859, that chance was the driver for evolution and so chance must be a real part of the universe. Indeed, it is known that quantum collisions of high-energy radiation with the macromolecules carrying genetic information create mutations that are a source of variation in the gene pool.

“Charles Sanders Peirce, strongly influenced by Darwin, was the greatest philosopher to embrace chance, and he convinced his friend William James of it. James described the role of chance in free will in his essay, *The Dilemma of Determinism*.

“Information philosophy has identified the cosmic creative processes (we call them "ergodic") that can overcome the chaotic tendency of indeterministic atomic collisions and create macroscopic, information-rich, structures. When these emergent structures are large enough, like the sun and planets, their motions become very well ordered and incredibly stable over time.

“When ...Isaac Newton discovered apparently perfectly accurate dynamical laws of motion for the planets, he seemed to confirm a deterministic universe. But as Newton knew, and as Peirce and later Karl Popper were to argue, we never had observational evidence to support the presumed perfection. The physical laws had become a dogma of determinism.

“Before quantum uncertainty, many philosophers, mathematicians, and statistical scientists argued that chance was just a name for our ignorance of underlying deterministic processes. They denied the existence of real chance in the universe. As soon as quantum mechanics was established in the 1920’s, first scientists and then philosophers began claiming that quantum indeterminism could explain free will. ...After a few years thought, the scientists generally qualified their enthusiasm or reported admissions of failure.

“Quantum uncertainty remains the best explanation for breaks in the causal chain of strict determinism. But attempts to use the strange non-intuitive aspects of quantum mechanics ...as models for the decision process have been hopeless failures. We must identify the critical aspect of quantum mechanical uncertainty that makes an "intelligible" contribution to human freedom while preserving moral responsibility.

“In 1929 Neils Bohr described his views of "complementarity" in the *Fundamental Principles* underlying the Description of Nature. He applied complementarity to life and organic nature, to mind and body, to subject and object, and, most importantly, to free volition and causality. Although his ideas are vaguely stated, we can see the dialectical reconciling of chance and determinism that goes back to Hegel, James, and Poincaré and forward to Compton, Gomes, Popper, Margenau, and Eccles.

“Our Cogito model simply identifies the source of randomness as the inevitable noise, both thermal noise and quantum noise, that affects both proper storage of information and accurate retrieval of that information at later times. These read/write errors are an appropriately random source of unpredictable new ideas and alternative action possibilities.

“If the Micro Mind is a random generator of frequently outlandish and absurd possibilities (think of the unconscious and the Freudian id), the complementary Macro Mind is a macroscopic structure so large that quantum effects are negligible.

“Our Cogito model gives the determinists what they say they want, an intelligible account of free will in which our decisions are adequately determined, yet completely free and sometimes unpredictable by any external agent and even by ourselves some of the time. We are unpredictably creative.”¹¹¹

“The Cogito solution is not single random events, one per decision, but many random events in the brain as a result of ever-present noise, both quantum and thermal noise, that is inherent in any information storage and communication system. The mind, like all biological systems, has evolved in the presence of constant noise and is able to ignore that noise, unless the noise provides a significant competitive advantage, which it clearly does as the basis for freedom and creativity.”

Under “Objections to the Cogito Model,” Doyle discusses those who “could not see how to reconcile the randomness of indeterminism with the determinism required for responsibility. They also tended to be metaphysical dualists, so they did not have a purely physical model for free will.”¹¹² Doyle then recites, but on those grounds dismisses, the positions of Arthur Holly Compton, Karl Popper, Henry Margenau, Ernst Cassirer, Daniel Dennett, Paul Valery, Robert Kane, Laura Waddell Ekstrom, Mark Balaguer, Richard Double, Alfred Mele, Randolph Clarke, Thomas Nagel, and Bernard Williams.

Dennett, for instance, “could not understand the place for a quantum event, how exactly and when and where a quantum event in the brain could be amplified to help with decision making and not harm our control and responsibility for our actions.” On the same grounds we will not further present those positions.

In his online Standard Argument Against Free Will, Doyle adds “Just because some events are *adequately* determined does not justify the widespread belief in an *absolute* universal determinism. Some events are unpredictable from prior events. They are *causa sui*, starting new causal chains.

“The ‘chain’ of events behind a particular cause may go back to inherited characteristics before we were born, others may go back to environmental and educational factors, but some may go back to uncaused creative events in our minds during deliberations. We say correctly that our actions are ‘determined’ by our (adequately determined) will. This determination does not imply universal strict determinism.

“Our will chooses from free alternative possibilities, at least some of which are creative and unpredictable. The will itself is indeed not ‘free’ (in the sense of uncaused), but we *are* free.”¹¹³

“Some argue that brain structures are too large to be affected at all by quantum events. But there is little doubt that the brain has evolved to the point where it can access quantum phenomena. The evolutionary advantage for the mind is freedom and creativity. Biophysics tells us the eye can detect a single quantum of light (photon), and the nose can smell a single molecule.”¹¹⁴

A1.34 Luke Muehlhauser (1985–). IT consultant, 3 years university, no degree. Blog: commonsenseatheism.com. Under The Enchanted Naturalist’s Guide to Reality (Nov 15 2009), Muehlhauser says “Think of it. The world once had nothing but dead matter, and yet it managed – completely by accident and without the intervention of an intelligent actor – to wake up one day and become self-aware. I think that is more amazing than any story about a magical being injecting life into dead matter. Ours is a story about dead matter that awakened itself. ...

“I am the pattern of matter in my brain. It doesn’t matter that the atoms in my brain are exchanging quarks. It doesn’t even matter whether my brain is made of proteins or silicon. What matters is the pattern of matter. That’s what constitutes my thoughts, personality, emotions, beliefs and desires. That’s what constitutes me. Of course, I am changing all the time. As a matter of semantics, my identity passes through a causal-historical chain. My brain is different than it was the previous moment, but my identity passed through one to the other because my brain of a moment ago caused my brain of now. ...

“We do not make uncaused choices. Our choices are determined. But we do have the ability to do what we want.”¹¹⁵

A1.35 Anthony R. Cashmore (ca 1940–). In *The Lucretian Swerve: the Biological Basis of Human Behavior*

and the Criminal Justice System (February 2010), Anthony Cashmore of the Department of Biology, University of Pennsylvania said, “It is widely believed, at least in scientific circles, that living systems, including mankind, obey the natural physical laws. However, it is also commonly accepted that man has the capacity to make ‘free’ conscious decisions that do not simply reflect the chemical makeup of the individual at the time of decision. ...

“The Epicureans, in attempting to reconcile the phenomenon of cause and effect that they saw to be characteristic of the physical world, with the contrasting apparent freedom of individual behavior, posed the following problem: ‘If all movement is always interconnected, the new arising from the old in a determinate order – if the atoms never swerve so as to originate some new movement that will snap the bonds of fate, the everlasting sequence of cause and effect – what is the source of the free will possessed by living things throughout the earth?’ As described by Lucretius, their reconciliation of this problem was to propose that atoms occasionally exhibit ‘random swerves.’

“Whereas philosophers have discussed for centuries the apparent lack of a causal component for free will, many biologists still seem to be remarkably at ease with this notion of free will; and furthermore, our judicial system is based on such a belief. It is the author’s contention that a belief in free will is nothing other than a continuing belief in vitalism—something biologists proudly believe they discarded well over 100 years ago.

“Many discussions about human behavior center around the relative importance of genes and environment, a topic often discussed in terms of nature versus nurture. ...It is often suggested that individuals are free to choose and modify their environment and that, in this respect, they control their destiny. This argument misses the simple but crucial point that any action, as ‘free’ as it may appear, simply reflects the genetics of the organism and the environmental history, right up to some fraction of a microsecond before any action. ...

“An individual cannot be held responsible for either his genes or his environment. ...Yet a basic tenet of the judicial system and the way that we govern society is that we hold individuals accountable (we consider them at fault) on the assumption that people can make choices that do not simply reflect a summation of their genetic and environmental history.

“It is my belief that, as more attention is given to the mechanisms that govern human behavior, it will increasingly be seen that the concept of free will is an illusion, and the fallacy of a basic premise of the judicial system will become more apparent. ...Here I propose that the time is opportune for society to reevaluate our thinking concerning the concept of free will, as well as the policies of the criminal justice system. ...The role of the jury would be to simply determine whether or not the defendant was guilty of committing the crime; the mental state of the defendant would play no part in this decision. However, if a defendant were found guilty, then a court-appointed panel of experts would play a role in advising on matters of punishment and treatment.”¹¹⁶

Appendix 2. NEUROSCIENCE

A2.1 Neuroscience, from Wikipedia, is “a scientific discipline that studies the structure, function, development, genetics, biochemistry, physiology, pharmacology, pathology of the nervous system, and psychology. Traditionally it was seen as a branch of biological sciences. However, recently there has been a convergence of interest from other disciplines, including computer science, statistics, physics, philosophy, mathematics, and medicine. The scope of neuroscience has now broadened to include any systematic scientific experimental and theoretical investigation of the central and peripheral nervous system of biological organisms. The methodologies employed by neuroscientists have been enormously expanded, from biochemical and genetic analysis of dynamics of individual nerve cells and their molecular constituents to imaging representations of perceptual and motor tasks in the brain.

“Furthermore, neuroscience is at the frontier of investigation of the brain and mind. The study of the brain is becoming the cornerstone in understanding how we perceive and interact with the external world and, in particular, how human experience and human biology influence each other. It is likely that the study of the brain will become one of the central intellectual endeavors in the coming decades.”¹¹⁷

In a 2004 article, the Dana Alliance for Brain Initiatives says that “We humans are learning machines, and the brain is the engine that drives the machine. Crammed into the three pounds of convoluted tissue inside our skulls is a dynamic mass of a hundred billion or more nerve cells, each one capable of making thousands of connections with others. These are the nuts and bolts of the learning machine.

“From the day we are born – and even before – the brain is primed for learning, ready to capture the experiences of our lives and encode them into its web of nerve connections. Learning organizes and shapes and strengthens the brain's connections. It fine-tunes the brain, preparing us for all that life has to offer, whether mundane or extraordinary. And according to the latest brain research, actively engaging our brains in learning throughout life can have a significant impact on how well we age. ...

“Every aspect of brain function, whether it's solving a mathematical problem, hitting a ball with a club, or listening to music, is represented in the brain as patterns of electrical and chemical signals traveling between nerve cells. Each thought, action, or sensory perception stimulates distinct sets of nerve cells and brain chemicals. One can imagine each cell as a musician in an elaborate symphony orchestra, playing its individual notes in harmony with other sections of the orchestra to generate pieces of the musical score. The concerto that emerges from all the sections working together is nothing less than human behavior itself.

“Nerve cells, or neurons, are the workhorses of the brain. Their fibers, or axons, form connections called synapses with other neurons. When activated, a neuron sends low-level electrical currents down its axon, releasing brain chemicals (neurotransmitters) that diffuse across the gap where one neuron meets another and latch onto receptors on the receiving neuron. This sets off a cascade of changes inside the receiving cell—changes that ultimately pass the signal along, like runners in a relay race.

“When we experience something repeatedly, such as practicing a musical score, we are reactivating the same circuit of synapses over and over again. After several repetitions, the synapse physically changes, enhancing the efficiency of the circuit and encoding the experience or behavior into a long-term memory....

“ ‘The adult brain, and even the adult aging brain, is fine-tuned by experience in both its performance and its abilities, essentially organizing itself in accord with its experience to prepare for the future,’ says William T. Greenough, Ph.D., a Dana Alliance member and neurobiologist at the University of Illinois at Urbana-Champaign. ‘Since one of the best predictors of future needs is past demands, having a brain that is optimally tuned to prior experience is ideal.’

“This capacity of the brain to structurally adjust itself to reflect our life experience – which scientists called plasticity – is what enables us to learn and to change the brain by learning.”¹¹⁸

As reported in Discover Magazine in 2009, recent research does suggest that quantum information processing may be expediting macro-level, hence deterministic, brain processes. “On the face of things, quantum mechanics and the biological sciences do not mix. Biology focuses on larger-scale processes, from molecular interactions between proteins and DNA up to the behavior of organisms as a whole; quantum mechanics describes the often-strange nature of electrons, protons, muons, and quarks—the smallest of the small. ...

“In the quantum world, though, an electron in one biomolecule might hop to a second biomolecule, even though classical laws of physics hold that the electrons are too tightly bound to leave. The phenomenon of hopping across seemingly forbidden gaps is called quantum tunneling. ...From tunneling to entanglement, the special properties of the quantum realm allow events to unfold at speeds and efficiencies that would be

unachievable with classical physics alone. ...Yet new experiments keep finding quantum processes at play in biological systems.”¹¹⁹

A2.2 Nervous system, from Wikipedia. “The nervous system is an organ system containing a network of specialized cells called neurons that coordinate the actions of an animal and transmit signals between different parts of its body. ...Neurons send signals to other cells as electrochemical waves travelling along thin fibres called axons, which cause chemicals called neurotransmitters to be released at junctions called synapses. ...Motor neurons, situated either in the central nervous system or in peripheral ganglia, connect the nervous system to muscles or other effector organs. Central neurons, which in vertebrates greatly outnumber the other types, make all of their input and output connections with other neurons. The interactions of all these types of neurons form neural circuits that generate an organism’s perception of the world and determine its behavior.

“Nerves are large enough to have been recognized by the ancient Egyptians, Greeks, and Romans, but their internal structure was not understood until it became possible to examine them using a microscope. ...One very important subset of synapses are capable of forming memory traces by means of long-lasting activity-dependent changes in synaptic strength. The best-known form of neural memory is a process called long-term potentiation (LTP). ...

“Descartes believed that all of the behaviors of animals, and most of the behaviors of humans, could be explained in terms of stimulus-response circuits, although he also believed that higher cognitive functions such as language were not capable of being explained mechanistically. ...However, experimental studies of electrophysiology, beginning in the early 20th century and reaching high productivity by the 1940s, showed that the nervous system contains many mechanisms for generating patterns of activity intrinsically, without requiring an external stimulus. ...A modern conception views the function of the nervous system partly in terms of stimulus-response chains, and partly in terms of intrinsically generated activity patterns—both types of activity interact with each other to generate the full repertoire of behavior.”¹²⁰

Christopher Frith, a Functional Imaging research professor at University College, London, says (1992) that “One of the central aspects of motor control involves a forward model, a non-conscious pre-motor system operating prior to the actual execution of movement and its sensory feedback. This forward mechanism, Frith argues, generates a conscious sense of agency for action.”¹²¹

The latest understanding, from Stanislas Dehaene, Chair of Experimental Cognitive Psychology at the College of France, is that “The neurons that take in sensory information send it to a neural network that he and his colleagues call the router. Like the router in a computer network, the brain’s version can be reconfigured to send signals to different locations. ...We couldn’t possibly carry a separate network of neurons for every response to every possible situation. But we can learn rules, and we can use those rules to rearrange an all-purpose router.”¹²¹

Continues Dehaene, “The human brain efficiently solves certain operations such as object recognition and categorization through a massively parallel network of dedicated processors. However, human cognition also relies on the ability to perform an arbitrarily large set of tasks by flexibly recombining different processors into a novel chain. Simulations show that, when presented with dual-task stimuli, the network exhibits parallel processing at peripheral sensory levels, a memory buffer capable of keeping the result of sensory processing on hold, and a slow serial performance at the router stage...”¹²³ See also Craik and Weiner, above.

A2.3 Attention, from Wikipedia. “Attention is the cognitive process of selectively concentrating on one aspect of the environment while ignoring other things. Attention has also been referred to as the allocation of processing resources. Examples include listening carefully to what someone is saying while ignoring other conversations in a room (the cocktail party effect) or listening to a cell phone conversation while driving a car. Attention is one of the most intensely studied topics within psychology and cognitive neuroscience. ...

“In a typical experiment, subjects would use a set of headphones to listen to two streams of words in different ears and selectively attend to one stream. ...In the early-selection models ...attention shuts down or attenuates processing in the unattended ear before the mind can analyze its semantic content. In the late-selection models ... the content in both ears is analyzed semantically, but the words in the unattended ear cannot access consciousness. This debate has still not been resolved. ...

“Inevitably situations arise where it is advantageous to have cognition independent of incoming sensory data or motor responses. There is a general consensus in psychology that there is an executive system based in the frontal cortex that controls our thoughts and actions to produce coherent behavior. This function is often referred to as executive function, executive attention, or cognitive control. No exact definition has been agreed upon.

However, typical descriptions involve maintaining behavioral goals, and using these goals as a basis for choosing what aspects of the environment to attend to and which action to select....

“[Stanford neurobiologist Eric Knudsen, in a] recent review ...describes a more general model which identifies four core processes of attention, with working memory at the center:

- Working memory temporarily stores information for detailed analysis.
- Competitive selection is the process that determines which information gains access to working memory.
- Through top-down sensitivity control ...the momentary content of working memory can influence the selection of new information, and thus mediate voluntary control of attention in a recurrent loop. ...
- Bottom-up saliency filters automatically enhance the response to infrequent stimuli, or stimuli of instinctive or learned biological relevance.”¹²⁴

In this review and in neuroscientific jargon the “top” is the prefrontal cortex, and the “bottom” is bodily sensation. “Connections from one zone to another are reciprocal,” says researcher M M Mesulam, “and allow higher synaptic levels to exert a feedback (top-down) influence upon earlier levels of processing.”¹²⁵

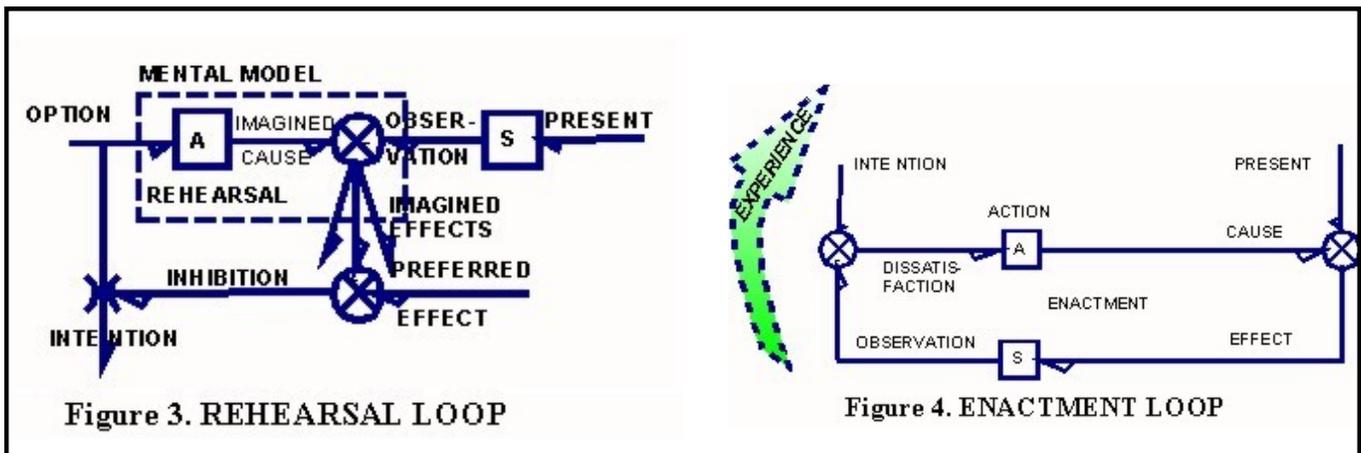
Appendix 3. A BLOCK DIAGRAM REPRESENTATION

A3.1. This Appendix presents a functional block diagram developed by the writer a decade ago, in pursuit of the thought of conditionally acting on an intention. It consists of basically two loops of cascading cause and effect acting in the brain. At some prior stage an option for action arose. The first loop was for the rehearsal or mapping of what one might follow from the option under present circumstances; the second loop was for its subsequent enactment. In the rehearsal loop (Figure 3) were –

- an option (top left) (an idea) to be tentatively applied in a mental model (broken line) to an actuator A (the muscles), with
- the result (rightward arrows, top) being applied, at a first summing point (X),
- to alter the presently sensed (S) environment (leftward arrows, top), so as to predict
- various likely imagined effects (several downward arrows), which are serially
- compared at a second summing point (X) with whatever is at hand as a
- preferred effect (first leftward arrow); whereupon either
- a mismatch would inhibit (throttle) ($> <$) that option, or
- a match (when found) would dis-inhibit the option, allowing it to fully develop into an intention.

In the latter event, in the enactment loop (Figure 4) –

- from the approved and hopeful intention (left downward arrow), applied undiminished through a first summing point (X), becoming an immediate dissatisfaction (first rightward arrow), would cause
- an actuator (A) (the muscles) to act (second rightward arrow) on the environment (right downward arrow) at a second summing point (X), so that
- the sensed (S) real effect (leftward arrow) would be an observation rising to oppose, at the first summing point (X), the intention,
- gradually reducing the initial dissatisfaction, until with equality of intention and observation – zero dissatisfaction – the enactment is complete.



Successful or not, experience would be fed back (curved upward arrow) from the enactment loop to the rehearsal loop so as to update and improve the remembered mental models.

By such means a variety of possible actions could be reviewed in terms of how they would interact with the circumstances of the currently observed present, judged against an existing set of criteria. All options would be inhibited, or squelched, unless a match was found with a preferred effect, in which instance the approved result would be enacted.

All of the diagramed elements are present, I submit, in unlearned tasks. Some of them can be collapsed as tasks are learned, that is, memorized. Knudsen’s remark that “Bottom-up saliency filters automatically enhance the response to ...stimuli of instinctive or learned biological relevance” seems relevant.

This cybernetic diagram is solidly grounded in feedback control theory, a then-young field in which in the

late 50's and early 60's I had published several papers. The presumption in any such diagram is that events occur primarily in separable "blocks" whereby an "input" determines an "output," often by modulating raw energy available from some external source. Such a representation can rigorously define the relationships inherent in an otherwise vague linguistic description.

A3.2. A USEFUL METAPHOR. Of course I was (and am) venturing out of my field of expertise, speculating for the sake of whatever it might prove to be worth. In hindsight, given the literature I have been able to review since then, this metaphor for how we think still seems to be original, correct, and – as far as it goes – useful.

In accompanying comments I suggested then that "we all, characteristically, not only develop workable world views, make maps of the territory, use them, and refine them, but typically, we enjoy doing so. We do not often stop and review our old, familiar maps of reality. It is the new maps, however, which we can and sometimes do enjoy both in the making and in the verification."

By way of confirmation I recited the statement by child-development scientist Alison Gopnik that "Babies solve problems in exactly the same way that scientists work — by repeatedly testing 'hypotheses' against real occurrences, then modifying their initial theories to fit reality better." Gopnik further said in her 1999 book *The Scientist in the Crib* that "Explanation ...is an intensely pleasurable experience that marks the successful completion of a natural drive. Our joy in explanation guarantees that we will keep trying to construct better, truer theories of the world. Getting the world right, like having sex, gives us a long-term evolutionary advantage." (p. 163-4.) Her current book *The Philosophical Baby*, excerpted in her¹²⁶ recent article *The Great Pretenders in Discover Presents The Brain*, continues the theme. (Gopnik has also speculated that, as he wrote the *Treatise in France*, Hume drew inspiration from Buddhist teachings recapitulated by Jesuit scholars there.) See also Craik, Weiner, and Frith, above.

A3.3. A COMPANY OF FACTOTUMS. I would now refer to each rehearsal loop as a factotum, while the present repertory cast would consist of multiple differing copies of that loop. In individual rehearsal, each option would be weighed against an array of preferred effects, and each would accordingly be to some degree inhibited. Among the entourage assembled before the footlights, in *ideo-motor* action (James) the currently least inhibited option would stand out as the strongest factotum. So a more complete diagram would show a multiplicity of rehearsal loops – factotums – competitively feeding the enactment loop, as shown in Figure 5.

It is a simple matter to augment Figure 5, which had initially portrayed only unconscious behavior, so as to portray conscious behavior, including nominally Free Will, as in Figure 6. The competitive factotums at the top right are now joined by the passive factotums at the top left, which in case of cognitive dissonance will re-run and update the competitive factotums. The small upward feedback arrow at the lower left denotes the feeling of free will (per Libet and Wegner), which is a body feedback, the somatic marker of personal authorship (per Damasio). It is part of the feedback of experience, which also is now more energetic, updating the factotums as to what happened not only "some time ago" but also "just now." Grounding the selection process is the sturdy set of factotums which constitute character, or personality. Obviously much more detail could be inserted, but this much seems fundamental.

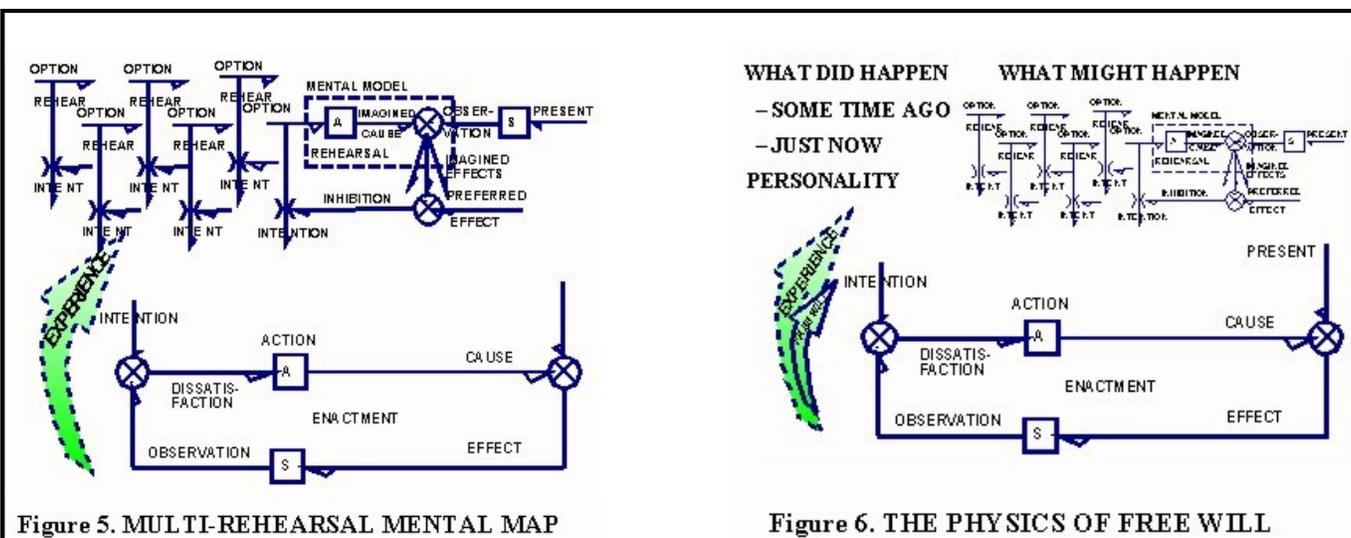


Figure 5. MULTI-REHEARSAL MENTAL MAP

Figure 6. THE PHYSICS OF FREE WILL

REFERENCES (II)

23. <http://www.newadvent.org/cathen/03459a.htm>. "Superstition" stems from supersisto, "to stand in terror of the deity," including "vain observances, which include magic and occult arts," as noted at <http://www.newadvent.org/cathen/14339a.htm>.
24. <http://en.wikipedia.org/wiki/Democritus>
25. Appendix I. A History of Scientific Naturalism, in *Scientific Naturalism: A Great Truth That Got Distorted*, by David Ray Griffin, *Theology and Science*, Vol. 2, No. 1, 2004
26. <http://en.wikipedia.org/wiki/Nominalism>
27. <http://www.iep.utm.edu/ockham/>
28. <http://www.iep.utm.edu/a/aristotl.htm#H4>
29. Aristotle, *From the Nichomachean Ethics*, Book III, as cited in Derk Pereboom (Ed.), *Free Will* (1997) (p. 1); and Introduction (p.ix)..
30. David Cooper, *Introduction to World Philosophies* (p. 136)
31. <http://www.informationphilosopher.com/solutions/philosophers/chrysippus/>
32. The Stoics, as cited in Derk Pereboom (Ed.), *Free Will* (1997) (p. 15)
33. The Internet Encyclopedia of Philosophy, at <http://www.iep.utm.edu/ockham/>. See also <http://www.statemaster.com/encyclopedia/William-of-Ockham#Nominalism>.
34. www.philosophie-recherche.de/pn/modules.php?op=modload&name=News&file=article&sid=58
35. http://en.wikipedia.org/wiki/Modern_era
36. Appendix I. A History of Scientific Naturalism, in *Scientific Naturalism: A Great Truth That Got Distorted*, by David Ray Griffin, *Theology and Science*, Vol. 2, No. 1, 2004.
37. http://en.wikipedia.org/wiki/Ren%C3%A9_Descartes
38. <http://plato.stanford.edu/entries/epiphenomenalism/>
39. <http://psy.rin.ru/eng/article/178-101.html>
40. http://en.wikipedia.org/wiki/Leviathan_%28book%29
41. www.gutenberg.org/etext/3207
42. <http://www.informationphilosopher.com/solutions/philosophers/hobbes/>
43. http://en.wikipedia.org/wiki/Baruch_Spinoza
44. As paraphrased by Gordon H. Clark, on Spinoza, in his *Thales to Dewey* (1957/1997). somatic marker of personal authorship (per Damasio). It is part of the feedback of experience, which also is now more energetic, updating the factotums as to what happened not only "some time ago" but also "just now." Grounding the selection process is the sturdy set of factotums which constitute character, or personality. Obviously much more

detail could be inserted, but this much seems fundamental.

45. Correspondence/58 (62). Spinoza to Schuller, <http://bdsweb.tripod.com/en/letters.htm>
46. <http://www.class.uidaho.edu/mickelsen/texts/Spinoza-Improvement.txt>
47. http://en.wikipedia.org/wiki/John_Locke#The_self
48. http://en.wikipedia.org/wiki/An_Essay_Concerning_Human_Understanding
49. As paraphrased by Gordon H. Clark, on Locke, in his *Thales to Dewey* (1957/1997).
50. <http://www.columbia.edu/cu/augustine/arch/god.html>
51. http://www.includipedia.com/wiki/David_Hume
52. Course Guidebook (p. 35) , Free Will and Determinism, Shaun Nichols, Professor of Philosophy and Cognitive Science, University of Arizona, © 2008 The Teaching Company
53. Ibid
54. <http://www.class.uidaho.edu/mickelsen/texts/Hume%20Treatise/hume%20treatise2.htm#PART%20III>
55. <http://www.class.uidaho.edu/mickelsen/texts/Hume%20Treatise/hume%20treatise1.htm#PART%20II>.
56. www.gutenberg.org/etext/8909
57. <http://www.gutenberg.org/etext/8910>
58. <http://www.radicalacademy.com/philkant2.htm>
59. <http://plato.stanford.edu/entries/kant-hume-morality/>
60. Prometheus - Johns Hopkins Undergraduate Philosophy Journal ~ <http://www.prometheus-journal.com/2009/02/>
61. http://en.wikipedia.org/wiki/Arthur_Schopenhauer
62. http://en.wikipedia.org/wiki/On_the_Freedom_of_the_Will
63. Arthur Schopenhauer, *On the Freedom of the Will*, Dover Philosophical Classics (1841)
64. Appendix I. A History of Scientific Naturalism, in *Scientific Naturalism: A Great Truth That Got Distorted*, by David Ray Griffin, *Theology and Science*, Vol. 2, No. 1, 2004
65. *On the Hypothesis That Animals Are Automata, and Its History* (1874), <http://aleph0.clarku.edu/huxley/CE1/AnAuto.html>
66. http://en.wikipedia.org/wiki/William_James
67. William James, *The Principles of Psychology*, 1890, available in the Harvard Edition, 1981.
68. <http://plato.stanford.edu/entries/james/>.

69. William James, *The Principles of Psychology*, 1890, available in the Harvard Edition, 1981.
70. *Great Men, Great Thoughts, and the Environment*, Lecture delivered before the Harvard Natural History Society. Published in the *Atlantic Monthly*, October, 1880. Wikisource.http://en.wikisource.org/wiki/Great_Men,_Great_Thoughts,_and_the_Environment
71. <http://psychclassics.yorku.ca/James/consciousness.htm>
72. <http://www.consciousness.arizona.edu/2010TSCPlenaryBaars.htm>
73. Smith, *Selfhood and Consciousness*, <http://www.smithsrisca.demon.co.uk/mental-philosophy-glossary-Cness.htm>
74. http://en.wikipedia.org/wiki/Henri_Poincar%C3%A9#Free_will
75. http://en.wikipedia.org/wiki/Two-stage_model_of_free_will
76. http://en.wikipedia.org/wiki/Arthur_Compton
77. Home D, Robinson A (1995), *Einstein and Tagore: Man, Nature and Mysticism*. *J Conscious Stud* 2:167–179, as quoted in *The Lucretian Swerve* by Anthony R. Cashmore (which follows).
78. http://en.wikipedia.org/wiki/Arthur_Schopenhauer, note 3
79. <http://albert-einsteinquotes.blogspot.com/>
80. <http://www.betternetworker.com/articles/view/personal-development/mindset/einsteins-ability-risk-and-willingness-be-wrong-ron-white>
81. http://en.wikipedia.org/wiki/E._Fromm#Critique_of_Freud
82. Smith, *Selfhood and Consciousness*, <http://www.smithsrisca.demon.co.uk/mental-philosophy-glossary-Cness.htm>
83. http://en.wikipedia.org/wiki/Kenneth_Craik
84. *What is a mind?: an integrative introduction to the philosophy of mind* ~ Suzanne Cunningham. Publisher: Hackett Publishing (2000) (p. 90).
85. Craik, Kenneth J[ohn] W[illiam] (1914-1945). “One of the founders of the field now known as cognitive science, Craik published only one small book in his short lifetime, *The Nature of Physical Explanation* (1943), which laid the foundation for the concept of mental models. He drew parallels between the operations performed by minds and machines and suggested that perception and performance are based on mental models of the environment.” <http://www.gach.com/Gach/L1744-01.HTM>
86. http://en.wikipedia.org/wiki/Norbert_Wiener
87. <http://www.iss.org/lumwiener.htm>
88. <http://en.wikipedia.org/wiki/Cybernetics>
89. http://en.wikipedia.org/wiki/Gilbert_Ryle
90. <http://dictionary.sensagent.com/homunculi/en-en/>

91. http://en.wikipedia.org/wiki/Karl_Popper#Free_Will
92. <http://en.wikipedia.org/w/index.php?title=Special%3ASearch&search=d+dennett>
93. http://en.wikipedia.org/wiki/Cartesian_materialism
94. What is a mind?: an integrative introduction to the philosophy of mind ~ Suzanne Cunningham. Publisher: Hackett Publishing (2000) (p. 84)..
95. http://en.wikipedia.org/wiki/Benjamin_Libet Cites Libet, B., Gleason, C. A., Wright, E. W., and Pearl, D. K. (1983). Time of conscious intention to act in relation to onset of cerebral activity (readiness-potential). The unconscious initiation of a freely voluntary act. *Brain*, 106:623-642, and Libet, B. (1985). Unconscious cerebral initiative and the role of conscious will in voluntary action. *Behavioral and Brain Sciences*, 8:529-566.
96. Max Velmans, How Could Conscious Experiences Affect Brains?, *Journal of Consciousness Studies*, 9(11), 2002, pp.3-29. <http://cogprints.org/2750/1/JCSVelmans2001.final.htm>
97. <http://www.consciousentities.com/pseudodoxia.htm>."Peter Hankins is author of the Conscious Entities weblog" ~ from <http://machineslikeus.com/news/cryptic-consciousness>
98. http://en.wikipedia.org/wiki/Marvin_Minsky
99. http://www.emcp.com/intro_pc/reading12.htm
100. <http://www.amazon.com/Society-Mind-Marvin-Minsky/dp/0671657135>
101. <http://www.consciousness.arizona.edu/2010TSCPlenaryBaars.htm>
102. http://en.wikipedia.org/wiki/Global_Workspace_Theory
103. Bernard J. Baars, A brief guide to the book, in *A Cognitive Theory of Consciousness*.(1988-1998). Electronic version published by author, on line at <http://vesicle.nsi.edu/users/baars/BaarsConsciousnessBook1988/index.html>
104. Smith, Selfhood and Consciousness, <http://www.smithsrisca.demon.co.uk/mental-philosophy-glossary-Cness.htm>
105. Bernard J. Baars, In the Theatre of Consciousness ~ Global Workspace Theory, *A Rigorous Scientific Theory of Consciousness*. *Journal of Consciousness Studies*, 4, No. 4, 1997, pp. 292-309
106. p. 8 – Lecture 9. *Consciousness: The WebCourse*. !B.J. Baars & K.A. McGovern, 2005.
107. <http://www.imprint.co.uk/online/baars.html>
108. http://en.wikipedia.org/wiki/Daniel_Wegner
109. Daniel Wegner, *The Illusion of Conscious Will* (2002). I was referred to Wegner's book during a University of Arizona on-line course on Consciousness by course presenter Dr. Bernard Baars.
110. <http://www.bobdoyleblog.com/>
111. <http://www.informationphilosopher.com/freedom/physics/>
112. <http://www.informationphilosopher.com/freedom/cogito/>

113. http://www.informationphilosopher.com/freedom/standard_argument.html
114. <http://www.informationphilosopher.com/freedom/cogito/>
115. <http://commonsenseatheism.com/?p=4841>
116. www.pnas.org/cgi/doi/10.1073/pnas.0915161107
117. <http://en.wikipedia.org/wiki/Portal:Neuroscience>
118. Current Advances in Brain Research: Learning Throughout Life ~ www.dana.org
119. <http://discovermagazine.com/2009/feb/13-is-quantum-mechanics-controlling-your-thoughts>
120. http://en.wikipedia.org/wiki/Nervous_system
121. http://www.imprint.co.uk/jcs_9_4.html; see also http://en.wikipedia.org/wiki/Neuroscience_of_free_will
122. Discover - November 2010. <http://discover.coverleaf.com/discovermagazine/201011?pg=31#pg31>
123. The brain's router: a cortical network model of serial processing in the primate brain. PLoS Comput Biol. 2010 Apr 29;6(4):e1000765. <http://www.ncbi.nlm.nih.gov/pubmed/20442869>
124. <http://en.wikipedia.org/wiki/Attention>. See also http://bic.berkeley.edu/despolab/publications/pdfs/Miller2005_Searching_for_the_top_in_top-down_control.pdf
125. From Sensation to Cognition. Brain. 1998 Jun;121 (Pt 6):1013-52. <http://www.ncbi.nlm.nih.gov/pubmed/9648540>
126. Cited from a review which paraphrased p. 155 of Gopnik, Meltzoff, and Kuhl, "The Scientist in the Crib: Minds, Brains, and how Children Learn," Morrow, William & Co, 1999.

