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Welcome

Welcome to the internet publication of Metaphysics by Default. This web site is maintained by the author as an academic resource for the general public.

In these pages I draw upon the works of naturalists — and upon those of metaphysical philosophers. This must seem an odd juxtaposition of materials, given that naturalists and metaphysical philosophers lock horns at every crossing. We, being audience to many a deadlocked battle, can readily believe that the disciplines of earth and ether are incompatible — or what is worse, we may believe that each discipline prospers only at the expense of the other.

These common notions are not sound. There is no compromise, but reconciliation is possible. Natural science and metaphysical philosophy *can* coexist peacefully in the modern mind. This document is proof.

The essay itself comprises nineteen chapters. The chapters are best read in sequential order, starting with a timeless word of encouragement that is *Chapter 1*.

Readers who desire to judge the philosophy's practical value may prefer to skip ahead to *Chapter 18*. Metaphysics by Default offers ready aid to the beleaguered ethicist or ecologist, and Chapter 18 explores this potential utility.

Readers who wonder at the inclusion of so much history in a modern work should hazard first the dedication of *Chapter 19*. The dedication invokes divine qualities of Hellenic spirit which are lost to us, and which this modern essay perforce recovers.

Supporting documents are available through site navigation:

- ***(new)*** A public *forum* is open, and all are welcome to contribute posts.
- A *schedule* lists the dates of upcoming public lectures, along with transcripts and abstracts from previous lectures in Vancouver, Saint Petersburg and *Rome*.
- *Appendices* organize the essay's ancillary software programs and mathematical derivations.
- *Works cited* within the essay are listed after the appendices.
- All chapters have been bound into a single Adobe *PDF* file for easier printing and transfer. (Click icon to download.)

It is this author's hope that the knowledge marshalled herein will be of value to every reader — even if some material serves only as a spur towards better knowledge elsewhere. Please feel free to *e-mail* frank and private comments.

Thank you for visiting this site.

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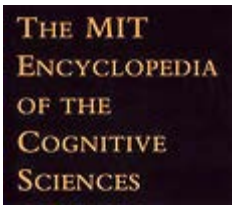

Editors of *The MIT Encyclopedia of the Cognitive Sciences* have recognized this work as an authoritative reference on current philosophical issues in the cognitive sciences.

This work is featured in the January 2001 edition of *World Revolution*.

The *Copernic Report on Metaphysics* has ranked this work among the twenty major metaphysical web sites. As of October 2002, public interest has lifted this work to a global copernic ranking of fourth place.

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next Chapter 1: A Word of Encouragement

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Chapter 1
A Word of Encouragement

Medieval Arabs knew the Persian philosopher Abu Nasr al-Farabi as the "Second Master" — second only to Aristotle.[1] In the passage below al-Farabi cheers his students, giving them hope of acquiring philosophical wisdom:

> [As regards] those who seek the right path. When one of them rejects anything as false, he will be lifted towards a better symbol which is nearer to the truth and is not open to that objection; and if he is satisfied with it, he will be left where he is. When that better symbol is also rejected by him as false, he will be lifted to another rank, and if he is then satisfied with it, he will be left where he is.
>
> Whenever a symbol of a given standard is rejected by him as false, he will be lifted to a higher rank, but when he rejects all the symbols as false and has the strength and gift to understand the truth, he will be made to know the truth and will be placed into the class of those who take the philosophers as their authorities.
>
> If he is not yet satisfied with that and desires to acquire philosophical wisdom and has himself the strength and gift for it, he will be made to know it.[2]

Those words have encouraged students for over a thousand years. No doubt they will continue to do so a thousand years hence. We should pocket al-Farabi's encouragement and carry it with us as we hike through philosophies old and new in the chapters ahead.

We enter the next chapter beside the sunny writing desk of one of al-Farabi's students.[3] This gentleman is, as we will soon see, a man for whom a philosophy has proved decidedly unsatisfactory.

next Chapter 2: Dar al-Hikma

Chapter 1 Endnotes

[1] Ian Richard Netton, *Al-Farabi and His School* (London: Routledge, 1992) 1. See also: Encyclopaedia Britannica articles on *al-Farabi* and *the analogy of religion and philosophy*.

[2] Richard Walzer, trans., *Al-Farabi on the Perfect State* (Oxford: Clarendon Press, 1985) 282-83.
[3] See Chapter 2, note 6, for some details of al-Farabi's posthumous influence.

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Chapter 2
Dar al-Hikma

> If al-Hakim had not bestowed protection and safety upon the faithful, the hypocrite, godless and Muslim [alike], my response to you would have been an exemplary punishment and the cutting of your aorta.
>
> — from a scholarly correspondence, Cairo, A.D. 1017 (408 A.H.)[1]

With that slap a religious scholar rolls up his reply to a list of philosophical questions. His reply takes the form of a warning, as denoted forthrightly in its title: *The Warning.* He has answered a dozen questions: some directly, some indirectly, some not at all. One compounded question he has pointedly refused to answer:

> *Question:*
> What is the conscious self? And what is intellect? And what is the limit of created beings beyond the physical and spiritual worlds?[2]

That's a tough one. The reply is brief:

> *Reply:*
> The replies to all these questions are found with us, the assembly of propagandists, and with the Imam al-Hakim. It [sic] is given to those who deserve receiving it. You, however, have severed your connections, and... cannot expect to receive it. However, if you repent and return upon the path of the faithful, we will give you the knowledge about these things and many other things to nourish you.[3]

We can imagine behind this exasperation a father who's already fielded too many precocious questions along the lines of, "Why is the sky blue?" And there's something to that reading of the correspondence. What is not apparent is the fact that these men speak for philosophical camps already well acquainted with each other's positions.

The questions have come from a court official, Hasan ibn Haydarah al-Farghani al-Akhram. He is one of the sanguine leaders of a populist religious movement. These partisans have taken as their authorities Plato, Plotinus, and a band of Muslim Neoplatonists. To their way of thinking, individual souls are

dropped to Earth from, and participate in, an overarching "Universal Soul." A contemporary of al-Akhram states the relation of individual soul to Universal Soul, and the purpose of that relation:

> [T]he soul was dropped into this world from without, without being apprised of any guilt attached to it.... [T]his was done as an opportunity for the soul to be refined and purified....[4]

The replies to al-Akhram's questions come from Hamid al-Din al-Kirmani, chief theologian of all Ismaili institutions in the Fatimid empire. His preferred Greek sage is not Plato, but Aristotle. He has introduced a soul-theory into Ismaili Muslim doctrine which is closer to Aristotle's than to Plato's.

Al-Kirmani has no intention of defending his theory on al-Akhram's terms, but he does state his views elsewhere; as in his treatise, *The Comfort of Reason*.[5] Paul Walker paraphrases:

> For al-Kirmani... intellect is divided into ten separate intellects and none of them is exactly equivalent to the universal intellect or universal soul of his predecessors. Soul, for him, is simply not a universal being but is rather the particular animating form of the individual living body which commences its existence when the individual itself comes into being....[6]

Al-Kirmani and al-Akhram were reviving a classical debate begun almost 1,400 years before, when Aristotle broke with his instructor Plato over much the same issue.[7] These Muslim Hellenists, like their Hellenic authorities, just understood the soul in fundamentally different ways.

Fig. 2.1
Plato and Aristotle debate the soul's nature.

Plato points to the soul's heavenly origin and destination. Aristotle directs his master's attention to the soul's physical life, here in the world below.

1,400 years later the old argument had resurfaced in Cairo. But why Cairo? And why in 1017?

One man, really. In the early eleventh century Cairo revolved around the man who was patron both to the orthodox al-Kirmani and also to the extremist al-Akhram. This arch-patron was the caliph, al-Hakim bi-'Amr Allah. Al-Hakim was an imposing figure. Physically intimidating, he was in character more so: bold, austere, and above all, intelligent. Not a ruler to waste time with belly dancers[8] and astrologers.[9] His pronouncement against astrology suggests his sober nature:

> I question the sanity of him who gave the stars powers to influence human affairs for good or evil; who says they determine the lot of humans in worldly gain and possession. Whoever believed in star power beyond its effect on physical dispensation of living matter has given God a partner.[10]

Some eighty years previous, al-Farabi had introduced the Arab world to Plato's ideal of the philosopher-king.[11] And now al-Hakim was honoring that ideal by nurturing a Hellenistic community within the security of his palace walls. Muslim scholars of the Greek sciences carried out their work under al-Hakim's protection, and with his personal encouragements. The caliph even went so far as to organize inter-departmental conferences at the palace.[12]

Scholars conducted practical sciences at Dar al-'Ilm, the "House of Knowledge." They entertained the theoretical sciences at Dar al-Hikma, the "House of Wisdom." As the repository of wisdom, Dar al-Hikma was also a central library for the empire. It was al-Hakim's personal treasure. Tall cabinets housed hundreds of thousands of academic and religious volumes,[13] many transported by camel caravan from libraries thousands of miles distant. The subjects of astronomy, architecture and Greek philosophy by themselves filled over 6,500 volumes.[14] Classical works as a whole filled 18,000 volumes.[15]

Al-Hakim had succeeded in restoring at Dar al-Hikma a wing of the lost Library of Alexandria. A court chronicler relates Dar al-Hikma's inauguration:

> The jurists took up residence there, and the books from the palace libraries were moved into it.... After the building was furnished and decorated, and after all the doors and passages were provided with curtains, lectures were held there by the Qur'an readers, astronomers, grammarians and philologists, as well as physicians. Guardians, servants, domestics and others were hired to serve there.
>
> Into this house they brought all the books that the commander of the faithful al-Hakim bi-Amr Allah ordered to bring there, that is, the manuscripts in all the domains of science and culture, to an extent to which they had never been brought together for a prince. He allowed access to all this to people of all walks of life, whether they wanted to read books or dip into them. One of the already mentioned blessings, the likes of which had been unheard of, was also that he granted substantial salaries to all those who were appointed by him there to do service: jurists and others. People from all walks of life visited the House; some came to read books, others to copy them, and yet others to study. He also donated what people needed: ink, writing reeds, paper and inkstands....[16]

Much of what Europe would later learn of Hellenic and Hellenistic philosophy was on public display at Dar al-Hikma in 1017, stacked alongside those less fortunate texts which Europe would come to know only by name.

Protected by al-Hakim, men like al-Kirmani and al-Akhram could drink freely at this oasis. To these medieval Egyptians[17] it seemed only natural that Plato and Aristotle should inform their raucous debate on the soul's nature.

Dar al-Hikma was looted in A.D. 1068.[18] It was destined to the same fate as its Alexandrian progenitor.

The Fatimid Hellenism represented by al-Kirmani and al-Akhram expired along with its institution.[19] But al-Akhram's breathless, tumbling question remains:

> What is the conscious self? And what is intellect? And what is the limit of created beings beyond the physical and spiritual worlds?

It is an obscure and multi-faceted puzzle. All who contribute towards a solution gain from the efforts of those who've contributed before. Ancient works can furnish precedents to modern concepts; precedents that enrich and deepen ideas which might otherwise wither rootless.

This essay develops a metaphysical thesis which is, to the best of my knowledge, new to the world. Viewed in isolation, the thesis would appear entirely novel[20] — not at all antiquarian. The concerns of upcoming chapters are light-years removed from those of Cairo's jasmined courtyards; or so some chapter materials, and chapter titles, would suggest.

In the face of this apparent incongruity, I can say that Dar al-Hikma does in fact harbor a unique and meaningful precedent. And if we are patient enough to plant the modern thesis within the context of Dar al-Hikma's precedent, the thesis will take root.

Men at Dar al-Hikma ventured close to this thesis in the early eleventh century. The relevant Arabic texts are handsome in their frankness, and little known. I hope it will please the reader to learn of them while exploring a metaphysical philosophy which is fully modern — a metaphysics at home among the natural sciences.

I'll set the vignette of al-Kirmani and al-Akhram aside for now. I'll recall these Ismaili leaders when the essay has progressed far enough to render their precedent meaningful.

Where to begin?

There were many ideas with merit, scattered throughout Dar al-Hikma's collection. We can picture Dar al-Hikma in our mind's eye. Curtains and carpets muffle the voices of instructors. We walk by a physician, an astronomer, men and women from the general public. We stop at a wall of cabinets. A calligraphy graces the one

before us. It's a table of contents for the cabinet devoted to the polymorphous *sheikh yunani*: the "Greek sage."

The contents of this cabinet were among the first to burn in 1068. Berber tribesmen salvaged the bindings for shoe leather. The pages they tossed onto a smoldering ash heap so massive it was later known as the "Hills of Books."[21]

The Berbers destroyed those Greek texts because they imagined them to be "Oriental";[22] hence, heretical. Maybe a few were. But Oriental or orthodox, it hardly matters now. The books were burned, and that's that. In our mind's eye the cabinet devoted to the Greek sage — is locked.

Fortunately, scholarship is a handy crowbar. One tug and the padlock rips free. The door bangs hard against its hinges. We snag a thin leather volume from within and flip it spinning onto a reading desk. It lands with a splat.

This one. This will do for a start. We'll begin, here.

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next Chapter 3: Proclus' *Elements*

Chapter 2 Endnotes

[1] Hamid al-Din Al-Kirmani, "The Warning," full title, "al-Wa'izah fi nafy da'wa uluhiyat al-Hakim bi-Amr Allah," *Majallat Kulliyyat al-Adab*; *Jami'at Fu'ad al-Awwal*, 14.1 (1952): 1-29 [Arabic]. This particular sentence has been paraphrased in English previously. See David Bryer, "The Origins of the Druze Religion," *Der Islam* 52.1 (1975): 68. The sentence has been translated to English, in full, under direction of this author; July, 1999. It is ostensibly a response to al-Akhram's assertion of Caliph al-Hakim's divinity, but the intensity of the outburst suggests a deeper concern, or frustration, with al-Akhram and the other radicals.

[2] Hamid Haji, *A Distinguished Da'i Under the Shade of the Fatimds: Hamid al-Din al-Kirmani*, (London: Hamid Haji, 1998) 57. Scholars have translated some of the terms in this quotation variously. *Nafs* is understood as "conscious self," "self," or "soul." *'Aql* is understood as "intellect" or "mind." *Hadd* is understood as "limit," "goal," "object," or "highest point."

[3] Haji 57.

[4] Abdallah Najjar, *The Druze: Millennium Scrolls Revealed*, trans. Fred I. Massey (Atlanta: American Druze Society; Committee on Religious Affairs, 1973) 97. Quotation is from Epistle 70 of the Druze *Hikma* canon [probable author Baha' al-Din].

[5] The "Seventh Rampart" of *The Comfort of Reason (Rahat al-'Aql)* describes the physiologic and psychological qualities of plants, animals and human beings. For a Russian translation of *Rahat al-'Aql*, see Andrey Smirnov's *online publication*. For an English translation of the table of contents see Paul E. Walker, *Hamid al-Din al-Kirmani: Ismaili Thought in the Age of al-Hakim* (London:

I.B. Tauris, 1999) 131-41, Appendix C.
[6] Walker, *Hamid al-Din al-Kirmani* 59. Walker provides an overview of al-Kirmani's theory of the ten intellects, and its relation to al-Farabi's philosophy, in Walker, *Hamid al-Din al-Kirmani* 89-92. Al-Farabi's original theory of the ten intellects is summarized in M. M. Sharif, ed. *A History of Muslim Philosophy: With Short Accounts of Other Disciplines and the Modern Renaissance in Muslim Lands*, 2 vols. (Karachi: Royal Book Company, 1983) 457-60.
[7] This basic disagreement may explain in part why Aristotle chose to establish his own Athenian school, instead of remaining to administer Plato's academy. At any rate, the two philosophers' texts on the soul make clear their differences in approach. It is difficult to imagine the author of *De Anima* as an acolyte of the author of *Phaedo*.
[8] Sadik A. Assaad, *The Reign of Al-Hakim Bi Amr Allah* (Beirut: The Arab Institute for Research and Publishing, 1974) 32. Quoting:

> "Unlike the majority of Muslim Caliphs he did not indulge in a Harim and seems to have freed all his female slaves. The life of frivolity seems to have been against his principles and one of his idiosyncrasies was that singers and dancers were not welcomed in his palace."

[9] Heinz Halm, *The Fatimids and their Traditions of Learning*, (London: I.B. Tauris; The Institute of Ismaili Studies, 1997) 87. Quoting:

> "[T]he caliph al-Hakim's edict of 1013 against astrology and the astrologers is in the same tradition [as that of his great-grandfather, al-Mansur]:
>
> He forbade idle talk about the stars. Several astrologers thereupon emigrated, but some of them stayed behind. These were banished, and the population was warned against hiding any of them. Then some of the astrologers showed remorse and were forgiven, and they swore that they would never again look at the stars."

[10] Najjar 149-50. Text preserved by Hamza b. 'Ali (or perhaps by Baha' al-Din) in epistle 85 of the Druze canon. Abdallah Najjar places the quoted text inside a section of "biographical notes" on al-Hakim. But authorship is not certain. For authorship possibilities, see Nejla M. Abu-Izzeddin, *The Druzes: A New Study of Their History, Faith and Society*, (Leiden: E. J. Brill, 1984) 108-10. Possibly the text is a quotation from al-Hakim's A.D. 1013 edict against astrology (per note 9). Or the text could be a dictation from al-Hakim to one of the two primary authors of the Druze epistles. Or the text may even be an independent addition by one of these two authors.
[11] Walzer 245-53.
[12] Halm 74. Quoting:

> "From the House of Knowledge a number of mathematicians, logicians and jurists, as well as several physicians were summoned by al-Hakim; the representatives of each discipline appeared before him separately, in order to argue in his presence; thereupon he presented all of them with robes of honour and gifts."

[13] Abu-Izzedin 83.
[14] D. Sourdel, "Dar al-Hikma," *Encyclopaedia of Islam* (Leiden: E. J. Brill, 1965).
[15] Halm 91.
[16] Halm 73-74.
[17] Both al-Kirmani and al-Akhram were probably born elsewhere, as suggested by the localities embedded within their names. Al-Kirmani may have been born in the Iranian district of Kirman. See J. T. P. De Bruijn, "Al-Kirmani, Hamid al-Din Ahmad B. 'Abd Allah," *Encyclopaedia of Islam* (Leiden: E. J. Brill, 1986). Al-Akhram's full name (Hasan ibn Haydarah *al-Farghani* al-Akhram) suggests birth in the Iranian district of Farghana. See Mumtaz Ali Tajddin Sadik Ali, *Ismailis Through History* (Karachi: Islamic Book Publisher, 1997) 322.
[18] Court officials, unpaid in a time of famine, made off with the library's contents in lieu of salary. Berber tribesmen confiscated texts from the court officials afterwards. See Halm 77-78.
[19] Dar al-Hikma was closed at the end of the eleventh century. A smaller library was reopened in 1123, but the orthodox Sunni caliph Salah al-Din closed this remnant and sold off the remaining books in 1171. See D. Sourdel, "Dar al-Hikma," *Encyclopaedia of Islam*.
[20] Mercifully, as of August 2004 this statement is no longer entirely true. Philosopher Thomas W. Clark has recently published a paper which parallels my thesis at the most critical points. Mr. Clark characterizes the parallel in my *addendum to Chapter 10*.
[21] Halm 77-78. The landmark was still visible some 400 years after the incident; but farming and/or urban development may have leveled it. At any rate, this author has been unable to determine the location of the site, and would welcome with surprise any information pinpointing it.
[22] Halm 78. Many of the scholars and religious leaders in Cairo hailed from the eastern provinces of the Muslim world: to the east and north of modern-day Iraq. See, for example, note 17, concerning al-Kirmani and al-Akhram.

Chapter 3
Proclus' *Elements*

The book is Proclus' *Elements of Theology*. By 1017 this fifth-century text had likely made its way to Dar al-Hikma. It would have been slotted in the cabinet beside its more popular (and pseudonymous) abridgment, (Aristotle's) *Discourse on the Pure Good*, later known as the *Book of Causes*.[1]

The *Elements of Theology* is Proclus' systematic exposition of Neoplatonism. Its primary deduction — the immortality of the soul. The *Elements* may be the most orderly proof of immortality ever composed by a Hellenic philosopher. In this essay I will present a few Elements which abstract Proclus' argument. This presentation will pass quickly to a critique. The critique brings Proclus' image of the soul into focus, as it disentangles the knot of his immortality argument.

This exercise in criticism is preparation for the modern metaphysical thesis which is to come — and it's an exercise which this author dislikes. I must raise critical remarks across three ascending chapters before I can pause to bolt the remarks together, as a single thought, in the preparatory conclusion of Chapter 7. Many readers may imagine the critical material to be unnecessary, or even pointless. It is neither — but here I think a proper explanation would run too far ahead, so I'll refrain. Chapter 7 will come soon enough. Only, here especially I must beg for the reader's patience and trust.

We take up the seamed volume. Leather opens to paper, paper opens to words.

The text of Proclus' *Elements* consists of two hundred and eleven Neoplatonic propositions, organized by a method similar to that which mathematicians use in the construction of mathematical proofs.[2] When a mathematician wants to prove a novel theorem, he uses in his proof theorems which have been proved before. Those axioms are foundational, in the sense that they are uncontroversial and accepted as authoritative by the mathematical community.

In the same spirit Proclus starts at first principles, intuitively. He builds on this foundation, citing his foundational propositions as the authorities for subsequent arguments. Proclus may have chosen his method with a mathematical structure in mind.[3] Be that as it may, the work is ordered logically.[4] He composes each proposition of two parts: an argument and a conclusion. (In mathematical terms, the argument is analogous to a proof, and the conclusion to a theorem proved axiomatically.)

The conclusion comes first. Proclus states it in a single

sentence.

After the conclusion comes the argument, in which Proclus deduces the conclusion he has just stated. Each argument is one paragraph in length.

A few choice propositions will make clear Proclus' method. Ten of the 211 propositions are reprinted below.[5] These particular propositions constitute a significant portion of Proclus' argument for the soul's indestructible and imperishable nature. The propositions are cogent, although numbered in a way which puts the selected ten slightly out of order when read in isolation. For this reason I have moved two propositions forward. So ordered the selected ten state much of Proclus' case.

Here are the ten propositions, reprinted in full, with notes. Afterwards, a *twenty-first-century critique* of Proclus' noble fifth-century thoughts.

Ten propositions from Proclus' *Elements of Theology*:

> Prop. 33. *All that proceeds from any principle and reverts upon it has a cyclic activity.*
>
> For if it reverts upon that principle whence it proceeds (Prop. 31),[6] it links its end to its beginning, and the movement is one and continuous, originating from the unmoved and to the unmoved again returning. Thus all things proceed in a circuit, from their causes to their causes again. There are greater circuits and lesser, in that some revert upon their immediate priors, others upon the superior causes, even to the beginning of all things. For out of the beginning all things are, and towards it all revert.[7]

Proposition 33 introduces "cyclic activity," conceived as the necessary return of any created thing to the source of its creation. The water cycle may serve as an illustration of the concept:

The sun frees water from the ocean as vapor. That vapor "proceeds" away from the ocean; forming clouds, raining upon the land, and trickling into rivers. The rivers "revert" the water to its origin, the ocean. Proclus envisions all existence as running through such reversive cycles.

> Prop. 17. *Everything originally self-moving is capable of reversion upon itself.*
>
> For if it moves itself, its motive activity is directed upon itself, and mover and moved exist simultaneously as one thing. For either it moves with one part of itself and is moved in another; or the whole moves and is moved; or the whole originates motion which occurs in a part, or *vice versa*. But if the mover be one part and the moved

> another, in itself the whole will not be self-moved, since it will be composed of parts which are not self-moved: it will have the appearance of a self-mover, but will not be such in essence. And if the whole originates a motion which occurs in a part, or *vice versa*, there will be a part common to both which is simultaneously and in the same respect mover and moved, and it is this part which is originally self-moved. And if one and the same thing moves and is moved, it will (as a self-mover) have its activity of motion directed upon itself. But to direct activity upon anything is to turn towards that thing. Everything, therefore, which is originally self-moving is capable of reversion upon itself.[8]

Proposition 17 examines cyclic activity in a self-motive body. Such a body is both its originating cause and also its effect; both a beginning and an end. By Proposition 33 the cause to which it reverts must therefore be itself.

> Prop. 15. *All that is capable of reverting upon itself is incorporeal.*
>
> For it is not in the nature of any body to revert upon itself. That which reverts upon anything is conjoined with that upon which it reverts: hence it is evident that every part of a body reverted upon itself must be conjoined with every other part — since self-reversion is precisely the case in which the reverted subject and that upon which it has reverted become identical. But this is impossible for a body, and universally for any divisible substance: for the whole of a divisible substance cannot be conjoined with the whole of itself, because of the separation of its parts, which occupy different positions in space. It is not in the nature, then, of any body to revert upon itself so that the whole is reverted upon the whole. Thus if there is anything which is capable of reverting upon itself, it is incorporeal and without parts.[9]

Proposition 15 explores the meaning of "conjunction": the joining of parts adjacent to one another. Conjunction is only possible where parts are immediately adjacent. Parts more distant are not conjoined. As corporeal bodies are composed of parts located at various distances from one another, those parts cannot wholly conjoin. Unfortunately, self-reversion requires just such a conjunction. It follows that self-reverting entities must be without parts; hence, incorporeal.[10]

> Prop. 16. *All that is capable of reverting upon itself has an existence separable from all body.*
>
> For if there were any body whatsoever from which it

> was inseparable, it could have no activity separable from the body, since it is impossible that if the existence be inseparable from bodies the activity, which proceeds from the existence, should be separable: if so, the activity would be superior to the existence, in that the latter needed a body while the former was self-sufficient, being dependent not on bodies but on itself. Anything, therefore, which is inseparable in its existence is to the same or an ever greater degree inseparable in its activity. But if so, it cannot revert upon itself: for that which reverts upon itself, being other than body (Prop. 15), has an activity independent of the body and not conducted through it or with its co-operation, since neither the activity itself nor the end to which it is directed requires the body. Accordingly, that which reverts upon itself must be entirely separable from bodies.[11]

Proposition 16 strengthens Proposition 15. It argues that any taint of corporeality on a self-reversive entity would render self-reversion impossible. For this reason self-reversion must be not only incorporeal, but also cleanly separable from all corporeal bodies.

> Prop. 43. *All that is capable of reversion upon itself is self-constituted.*
>
> For if it is by nature reverted upon itself, and is made complete by such reversion, it must derive its existence from itself, since the goal of natural reversion for any term is the source from which its existence proceeds (Prop. 34).[12] If, then, it is the source of its own well-being, it will certainly be also the source of its own being and responsible for its own existence as a substance. Thus what is able to revert upon itself is self-constituted.[13]

Proposition 43 equates "well-being" with completion of the reversive cycle. If an incorporeal body can act as the source of its own well-being by reverting upon itself, it is considered to be self-constituted.

> Prop. 46. *All that is self-constituted is imperishable.*
>
> For if it be destined to perish, it will then desert itself and be severed from itself. But this is impossible. For being one, it is at once cause and effect. Now whatever perishes is in perishing severed from its cause: for each thing is held together and conserved so long as it is linked with a principle which contains and conserves it. But the self-constituted, being its own cause, never deserts its cause since it never deserts itself. Therefore all that is self-constituted is imperishable.[14]

Proposition 46 draws upon Proposition 43 in arguing for the

imperishable nature of the self-constituted. The self-constituted is imperishable because it is never severed from its principle cause (which is itself).

> Prop. 49. *All that is self-constituted is perpetual.*
>
> For anything which is not perpetual must be so in one of two ways, either as being composite or as existing in another (Prop.48).[15] But the self-constituted is simple, not composite (Prop. 47),[16] and exists in itself, not in another (Prop.41).[17] It is therefore perpetual.[18]

Proposition 49 argues that the self-constituted exists perpetually because it has no composite parts susceptible to decomposition; and also because it exists without external aid.

> Prop. 83. *All that is capable of self-knowledge is capable of every form of self-reversion.*
>
> For that it is self-reversive in its activity is evident, since it knows itself: knower and known are here one, and its cognition has itself as object; as the act of a knower this cognition is an activity, and it is self-reversive since in it the subject knows itself. But if in activity, then also in existence, as has been shown: for everything whose activity reverts upon itself has also an existence which is self-concentrated and self-contained (Prop. 44).[19]

Proposition 83 addresses cognition for the first time. Cognition is shown to be a kind of self-reversive activity, as demonstrated in the act of self-knowledge. Hence self-knowledge must share in those traits common to any self-reversive activity. For example, it must have an existence which is self-contained. (By inference, its existence must also be self-constituted, per Prop. 43.)

> Prop. 186. *Every soul is an incorporeal substance and separable from body.*
>
> For if it know itself, and if whatever knows itself reverts upon itself (Prop.83), and what reverts upon itself is neither body (since no body is capable of this activity [Prop.15]) nor inseparable from body (since, again, what is inseparable from body is incapable of reversion upon itself, which would involve separation [Prop.16]), it will follow that soul is neither a corporeal substance nor inseparable from body. But that it knows itself is apparent: for if it has knowledge of principles superior to itself, it is capable *a fortiori* of knowing itself, deriving self-knowledge from its knowledge of the

causes prior to it.[20]

Proposition 186, like Proposition 83, applies previous results to the special activity of cognition. The results apply equally to cognition's home, the soul. The soul, being self-knowing, must also be incorporeal and separable from the body.

Prop. 187. *Every soul is indestructible and imperishable.*

For all that is capable of being in any way dissolved or destroyed either is corporeal and composite or has its being in a substrate: the former kind, being made up of a plurality of elements, perishes by dissolution, while the latter, being capable of existence only in something other than itself, vanishes into non-existence when severed from its substrate (Prop. 48).[21] But the soul is both incorporeal and independent of any substrate, existing in itself and reverting upon itself (Prop. 186). It is therefore indestructible and imperishable.[22]

Proposition 187 culminates Proclus' case for the soul's indestructible and imperishable nature. Proclus will proceed to interpret this result as support for a theory in which the soul undergoes an unceasing cycle of reincarnations.[23]

Ten propositions from Proclus' *Elements* have now been arranged for display, propped on velvet steps as it were. It's time to subject these propositions to a test of truth — an unfettered critique of Proclus' immortality argument.

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next Chapter 4: Reversion in the Corporeal

Chapter 3 Endnotes

[1] The Iraqi encyclopedist al-Nadim listed Proclus' *Elements of Theology* in his bibliographical dictionary *The Fihrist*, A.D. 987. See Majid Fakhry, *A History of Islamic Philosophy* (New York: Columbia University Press, 1970) 40. Apparently Proclus' original text had been translated and was in circulation among Arab scholars by that time. (This inference is not certain: no complete Arabic translation from that era has yet been found.) See also: Encyclopaedia Britannica articles on *Proclus* and *Arab thought*.
[2] Proclus was himself a capable mathematician. See, for example, his commentary on Euclid's *Elements*, as in: Proclus, *Proclus: A Commentary on the First Book of Euclid's Elements*, trans. Glenn R. Morrow (Princeton: Princeton University Press, 1970).
[3] Proclus may have written the *Elements of Theology* as a continuation of his *Elements of Physics*. See E. R. Dodds, trans.,

intro., and commentary, *The Elements of Theology*, by Proclus, 2nd ed. (Oxford: Clarendon Press, 1963) xvii-xviii. Proclus' style follows that of mathematical synthesis (deduction), and also Platonic hypothesis. See Dodds 1963, xi, note 4.
[4] For examples of logical weaknesses, see Dodds 1963, xi-xiii.
[5] All quotations from Dodds 1963.
[6] Dodds 35, Prop. 31. " *All that proceeds from any principle reverts in respect of its being upon that from which it proceeds."*
[7] Dodds 37.
[8] Dodds 19-21.
[9] Dodds 17-19.
[10] This implies another syllogism, whose conclusion Proclus does not draw. Premising Props. 17 and 15, Proclus could conclude that self-moving bodies are also incorporeal. Proclus does not, however, compose the syllogism.
[11] Dodds 19.
[12] Dodds 37, Prop. 34. " *Everything whose nature it is to revert reverts upon that from which it derived the procession of its own substance."*
[13] Dodds 45.
[14] Dodds 47.
[15] Dodds 49, Prop. 48. " *All that is not perpetual either is composite or has its subsistence in another."*
[16] Dodds 47, Prop. 47. " *All that is self-constituted is without parts and simple."*
[17] Dodds 43, Prop. 41. " *All that has its existence in another is produced entirely from another; but all that exists in itself is self-constituted."*
[18] Dodds 49.
[19] Dodds 77-79, Prop. 44 . *"All that is capable in its activity of reversion upon itself is also reverted upon itself in respect of its existence."*
[20] Dodds 163.
[21] Dodds 49, Prop. 48. " *All that is not perpetual either is composite or has its subsistence in another."*
[22] Dodds 163.
[23] Dodds 181, Prop. 206. *"Every particular soul can descend into temporal process and ascend from process to Being an infinite number of times."*

Chapter 4
Reversion in the Corporeal

Proclus makes an elegant argument for the soul's indestructible and imperishable nature. His orderly conclusions build upon each other in a logical manner. So *has* Proclus demonstrated the immortality of the soul? This depends upon what we judge to be a satisfactory "demonstration." What does it really mean, to say that a metaphysical argument demonstrates something?

One meaning of "demonstrate" is to "show by reasoning." That much Proclus has accomplished: most of his reasoning is sound in the *Elements*.[1]

"Demonstrate" has a second, stronger meaning: to "show how something works." Proclus alludes to this second meaning in the *Elements*: "The task of science is the recognition of causes, and only when we recognize the causes of things do we say that we know them."[2] Causes, Proclus insists, are not isolated, but ordered within a structured hierarchy of causation. Quoting his description of cyclic activity: "There are greater circuits and lesser, in that some revert upon their immediate priors, others upon the superior causes, even to the beginning of all things."[3]

(Proclus' hierarchy of causes enchanted medieval scholars. The book's popular abridgment acquired a title [*Book of Causes*] that suited scholarly interest.)

So Proclus acknowledges the need to pursue causes towards their source, as the way of knowing things as they really are — knowing how they work. And this is a sound principle. A hierarchy of causes certainly affects physical bodies; as, for example, in the motion of a car. The proximate, direct cause of motion is merely the rotation of its wheels. This rotation has in turn a cause: the force exerted through the pistons. And that force likewise has a cause, in the combustion of gasoline. Our understanding proceeds onward through the hierarchy of known causes. As we learn the several causes of the car's motion, we improve our understanding of the car.

Turning now to the ten propositions quoted previously, we see that they state several types of causation. The first two propositions touch upon physical, corporeal causes, which Proclus mentions in Propositions 33 and 17.[4] His examination of causes continues in Proposition 15, wherein Proclus makes a sharp distinction between corporeal and incorporeal causes. Thereafter the remaining propositions elaborate incorporeal causes exclusively.[5]

Table 4.1 arranges Proclus' causes by proposition, with the general nature of each cause summarized at right.

Table 4.1
Ten selected propositions from Proclus' *Elements of Theology*

Proposition	Cause	Nature
33	cyclic motion	corporeal
17	self-motion	both corporeal and incorporeal
15	self-reversion	incorporeal
16	self-reversion	separable from corporeal
43	self-reversion	self-constituted
46	self-constitution	imperishable
49	self-constitution	perpetual
83	self-knowledge	all self-reversive and self-constituted natures
186	soul	all self-knowing natures; hence incorporeal, separable
187	soul	all natures of Prop. 186;[6] hence indestructible, imperishable

Reading the table row-by-row, from the top down, we can see how Proclus has built his case.

The success of Proclus' argument for immortality is tied to the success he has enjoyed in puzzling out the hierarchy of corporeal and incorporeal causes at work in the human body. Proclus' corporeal causes rise no higher than simple self-motion, and not even that rudimentary degree of dynamism is guaranteed to be entirely corporeal.[7] Above self-motion the incorporeal hierarchy of causes takes control, producing all greater human qualities through means independent of the corporeal body.

This is the division of causes which Proclus maintains. It makes sense, when viewed through the eyes of a Neoplatonist. However, modern readers may find that this division of causes raises some questions. Do corporeal causes truly reach their zenith at self-motion? Or does self-motion engender higher levels of causation within the human body? And if so, how far might corporeal causation within the body progress towards the soul?

Answers to these questions might very well disentangle the knot of Proclus' argument — if only to spool his Neoplatonism in, and then out again, as thread for a metaphysical panoply of modern cut. To that end a review of relevant facts will be worthwhile.

The review begins at what Proclus thought the most potent of corporeal causes: self-motion. Proclus does not detail the living functions he thought to be self-motivated, so it's hard to guess just which self-motions he imagined the body capable of executing. Perhaps the flow of blood through the circulatory system appeared to him as a self-moving stream. Or he may have been impressed by the autonomous motion of muscular reflexes. But this is speculation — he may not have pondered these functions at all. The *Elements* focus on mental functions, mentioning the human body only as a participating repository of the soul.[8] So examples of bodily self-motion are not to be found in Proclus' text.

We might have better luck if we look to Proclus' next higher cause, self-reversion.

> *"Everything originally self-moving is capable of reversion upon itself."* [9]

Proposition 17 delves into the *reversive* activity of self-motion. Apparently Proclus is speaking here of reversion in all types of

bodies, biological and other; but this is uncertain because nowhere does Proclus define the literal meaning of "reversion."[10] The proposition does at least give us some working definitions of self-reversion, as expressed through self-motion:

> "...motive activity is directed upon itself..."
> "...mover and moved exist simultaneously as one thing..."
> "...one and the same thing moves and is moved..."

Proclus' definitions are slippery fish. In Proposition 17 the catch slides *en masse* towards the prosaic end of the boat. These reversions are closer to mere "recursion" than to the spiritual cycles Proclus describes elsewhere — recursion being understood first as a "mechanically operated cyclic motion."

If we allow ourselves this simplification we can gain entry into Proclus' argument. Recursion, unlike reversion, has technical definitions. Mathematical, computational and biological examples of recursion exist. So a study of recursion would raise this critique upon a scaffolding of fact.

Recursion has an additional advantage in being an ancient concept. As the mathematician Robin Gandy reminds us, "The use of recursion in computation is at least as old as Euclid, though the word is recent."[11] So its properties have been known for a long time. Those factual properties would be germane to Proclus' argument, where they could be shown to free powers in the body more causative than mere self-motion. And so these are the powers to target with a selective history of recursive systems, which follows.

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next Chapter 5: Mathematical Recursion

Chapter 4 Endnotes

[1] Again, for examples of logical weakness, see Dodds 1963, xi-xiii.
[2] Dodds 13.
[3] Dodds 37.
[4] Proclus' differentiation of corporeal and incorporeal causations is anything but clear-cut. For such clarification as may be possible, see Lucas Siorvanes, *Proclus: Neo-Platonic Philosophy and Science* (Edinburgh: Edinburgh University Press, 1996) 86-110; A. C. Lloyd, *The Anatomy of Neoplatonism* (Oxford: Clarendon Press, 1990) 98-135.

Proclus deposits Nature at the lowest stratum of causation; yet even natural objects have both corporeal and incorporeal aspects in his scheme. (Here Proclus is following Aristotle's example.) The matter comprising physical bodies Proclus considers to be inert; it is instead the "enmattered form" (*physis*) which gives that matter its useful properties. A body's *physis*, while technically incorporeal, is nonetheless inseparable from its matter; so *physis* is the most "tangible" sort of incorporeality to be found in Proclus' universe.

See Siorvanes 136-37.
[5] Or they would, if Proclus had numbered his propositions more to this critic's liking. As it happens, his numbering scheme throws up a few exceptions to my tidy rule. An example: Props. 25 through 39 develop the principles of procession and reversion. For Proclus, these broad principles undergird both corporeal and incorporeal existence. (Cyclic activity, described therein in Prop. 33, reads as one of the more corporeal aspects.)
[6] Prop. 187 calls upon Prop. 186 as an authoritative axiom. The properties listed in Prop. 187 are properties which have been derived in the build-up towards Prop. 186.
[7] See *Chapter 3, note 10* for the syllogism in question. Proclus' pronouncements on self-motion are rather problematic. In Prop. 14 Proclus states that some existents are "intrinsically moved." (Unfortunately, he does not provide a list of these existents.) In Prop. 20 he specifically denies self-motive powers to the human body, stating that "self-movement is contrary to its nature." Yet, "[w]hen soul is present, the body is in some sense self-moved..." The cloudy phrase, "in some sense," is a miniature of Proclus' greater difficulty with the concept of self-motion. Dodds 201-08 provides some helpful commentary on Props. 14-20. See also note 8, below, concerning the soul's life-giving relation to the body.
[8] Dodds 165. Quoting from Prop. 188: "For that into which soul enters necessarily lives, and when a body is deprived of soul it is thereupon left lifeless...." Siorvanes details Proclus' "subtle bodies" and "soul vehicles" in Siorvanes 131-33.
[9] Dodds 19-21.
[10] Proclus may not have wanted us to assign a literal meaning to "reversion." Quoting Lloyd 124, 126-27:

> "It is difficult, perhaps impossible, to find a consistent theory of reversion in Neoplatonism....
>
> [T]he term translated 'reversion' — *epistrophe* — is doubly ambiguous. First, we find it used sometimes with its strict meaning of 'being turned towards' something, in other words to refer to an inclination, sometimes with a much fuller meaning of 'returning' or 'having returned' to it; and there are times when the reader is unsure which is meant...."

Proclus describes reversion via abstract analogies — a method common among Neoplatonic philosophers. See Siorvanes 105-09.
[11] For a short sketch of the development of the mathematical term "recursion," see Robin Gandy, "The Confluence of Ideas in 1936," *The Universal Turing Machine — A Half-Century Survey*, ed. Rolf Herken (Oxford: Oxford University Press, 1988) 72-73.

Chapter 5
Mathematical Recursion

Mathematical recursion is the theoretical rootstock of applied computation. Recursion has grown from antiquity's bud into a stout, corkscrewed trunk — fruitful in application, of course. Brief examples will slice open the corkscrewed trunk at points of interest.

Exponentiation provides our first example: it's a quick mathematical recursion. I'll follow with mechanical and biological examples which penetrate Proclus' metaphysics (and a great many others).

But starting near the root, with exponentiation. How is it done? Oftentimes we use an intuitive method. If we want to calculate the exponent, 2^3, "off the cuff," we might calculate it this way:

> $2 \times 2 = 4$,
> and $4 \times 2 = 8$.
> That's three multiplications of the number two.
> Therefore: $2^3 = 8$.

Here we've used an intuitive, informal definition of exponentiation. This definition is not recursive. A recursive definition calculates the exponent in a different way. Such a definition has two parts: a base clause and a recursion clause.[1] A recursive definition of exponentiation takes this form:

> Base clause: $a^0 = 1$
>
> Recursion clause: $a^{j+1} = a^j \times a$

[Note that the recursion clause refers to itself, in the sense that higher terms ($j+1$) are defined with reference to lower terms (j). For this reason the clause can be invoked repeatedly during calculation. (It can *recur* many times.) This behavior is shown below.]

The definition is concise — but how to apply it? We have no rule. A mathematician must exercise judgment in interpreting the definition, before using it to calculate an actual exponent. We might interpret the recursive definition of exponentiation so as to calculate 2^3 this way:

> Looking at the recursion clause, we see that
> $2^3 = 2^2 \times 2$.
> Likewise, $2^2 = 2^1 \times 2$.

And $2^1 = 2^0 \times 2$.
But $2^0 = 1$, according to the base clause.
So now we can build up the result from that base clause starting point.
$2^1 = 1 \times 2 = 2$.
Making $2^2 = 2 \times 2 = 4$.
Making $2^3 = 4 \times 2 = 8$.
So $2^3 = 8$.

The definition doesn't say, explicitly, that it must be used in just this way. Again, it's the human mathematician who provides the interpretation, and then the driving force, to perform the math. The mathematician is the motive "cause," after Proclus.

Can recursive definitions be modified so as to acquire self-motive power? Well, a more modern form of recursion is found in the recursive *function*. A recursive function, like a recursive definition, also has a base clause. The difference is that rather than having a recursion *clause*, it has a recursion *formula*. Also there is a strict *rule* for use of the formula.

Here is exponentiation with a recursive function:[2]

Base clause: $k_m(0) = 1$

Recursion formula: $k_m(n') = k_m(n) \times m$

[The variable **m** stands for the base term to be exponentiated. (In this example, it is "2".) The variable **n** stands for an exponent in the natural number sequence **0, 1, 2, 3, ...** The prime symbol (**'**) means "plus 1." So the natural number sequence is formally stated as **0, 0', 0'', 0''', ...** Hence the use of **n** and **n'** in the formula.]

The rule for use of the formula is simple: we apply the formula repeatedly until the base clause appears; then we substitute the base clause value to produce a result.

The calculation of 2^3 now proceeds entirely by rote:

$2^3 = k_2(3)$
$= k_2(2) \times 2$
$= k_2(1) \times 2 \times 2$
$= k_2(0) \times 2 \times 2 \times 2$
$= 1 \times 2 \times 2 \times 2$
$= 8$

This last calculation seems more "mechanical," when compared against the other two techniques. It is indeed more mechanical, in the sense that there is no ambiguity in the calculation. The rule is exact. Its execution can be driven by a machine, free of human supervision. A computer can execute the recursive function for exponentiation autonomously and thereby mechanically calculate any exponent.

By this technique recursion has acquired self-motive power. Computers execute recursive functions every day. (The web browser displaying this very page is itself an amalgam of recursive

functions.)[3]

Is there an upper limit to what recursive functions can compute? This limit, should it exist, would be relevant to the critique. Any computational limit on recursive functions would set a corresponding limit on the powers of recursion in corporeal bodies, including the human body. This limit would restrict the range in which "corporeal causes" could operate — a win for Proclus. Some mathematical proofs speak to this point.

To begin with, we note that our exponentiation function is an example drawn from that class of recursive functions called "partial recursive functions."[4] An important property of any partial recursive function is that its value can be obtained by a finite number of steps. Hence its value can be computed in a finite amount of time. Or saying it another way, its value can be "effectively" computed.

Partial recursive functions have been proved equivalent to those functions computable on abstract Turing machines.[5] This proof applies to all digital computers, as they are logically equivalent to Turing machines in their operation.[6] So digital computers can compute all partial recursive functions.

Alonzo Church and Alan Turing took this proved result a step farther by proposing two stronger, and similar, theses. They proposed:

> Church's Thesis (**C**): Any function the value of which can be effectively computed is partial recursive.[7]
>
> Turing's Thesis (**T**): A function is 'effective' just in case it can be computed by a Turing machine.[8]

These two theses are interchangeable, and are sometimes spoken of jointly as the "Church-Turing Thesis,"[9] which I'll abbreviate as **CT**. If correct, **CT** would prove directly that no upper limit exists on the computational power of recursive functions as implemented on digital computers.

Has **CT** been proved? Here it would be appropriate to let mathematicians speak for themselves, voicing their professional opinions on the proposed proofs and refutations of **CT**:

> *From the Encyclopaedia of Mathematics:*
>
> ...The classes of functions computable on Turing machines and the partial recursive functions... are identical. In the view of most mathematicians of our time, this class of functions may serve as the class of intuitively computable functions and is identified with it...[10]
>
> *Robert Rosen:*
>
> ...For a variety of reasons, there is cause to believe

> that Church's Thesis fails as a physical proposition. Nevertheless, ...to state and analyze the Thesis in material terms touches on some of the deepest and most basic aspects of theoretical science.[11]
>
> *Michael Arbib:*
> The most important candidate for the notion of *effectively computable function* will be that of a function *computable by a Turing machine*. As researchers developed other theories of computation, they have found again and again that each computable function they specify can also be computed by a Turing machine. This has led to the conviction that the notion of *Turing-computable* (and its equivalents) is indeed an adequate formalization of our intuitive notion of effectively computable.[12]
>
> *Stuart Shanker:*
> ...The very controversy which continues to surround CT is proof of the enduring strength of that framework, and the problems obdurately tied to it....[13]
>
> *R. J. Nelson:*
> Although Church's Thesis (CT) has been central to the theory of effective decidability for fifty years, the question of its epistemological status is still an open one. My own view, which is prompted by a naturalistic attitude toward such questions in mathematics as elsewhere, is that the thesis is an empirical statement of cognitive science, which is open to confirmation, amendment, or discard, and which, on the current evidence, appears to be true....[14]

The opinions are diverse because **CT** is not really a mathematical theorem. The *converse* of **C** and **T** have been proved mathematically true, but **CT** itself argues for something rather more philosophical; namely, the true nature of computation. As an empirical fact, **CT** has been applied successfully to all known classes of computable functions. So it remains a useful "working theory" of computability.

On balance, the quotations above seem to weigh in favor of **CT**, and against Proclus; but they also suggest that the ultimate validation of **CT** will be experimental. The experiments of most interest, and of greatest relevance to Proclus' argument, are those which have the human body as their subject of study.

In the next chapter we will study a prime example of recursive computation in the human body.

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next Chapter 6: Episodic Memory

Chapter 5 Endnotes

[1] Defined after Browski, E. J. and J. M. Borwein, eds., *Dictionary of Mathematics*, s. v. "Recursive Definition" (London: Collins, 1989). See also: Encyclopaedia Britannica article on *recursive definitions*.
[2] Defined after Judson Chambers Webb, *Mechanism, Mentalism, and Metamathematics* (Dordrecht: D. Reidel Publishing, 1980) 51.
[3] For an overview of computable functions, see I. A. Lavrov and A. D. Taimanov, "Computable Function," *Encyclopaedia of Mathematics* (Dordrecht: Kluwer Academic Publishers, 1980). For a full definition of primitive recursive functions, see Stephen C. Kleene, *Introduction to Metamathematics* (Princeton: D. Van Nostrand, 1952) 217-20.
[4] Lavrov and Taimanov, "Computable Function" 286-87.
[5] Kleene gives a formal statement of equivalence. See Kleene, *Introduction to Metamathematics* 363-76, Theorems XXVIII-XXX.
[6] A good overview of Turing's analysis can be found in Stephen C. Kleene, "Turing's Analysis of Computability, and Major Applications of It," *The Universal Turing Machine: A Half-Century Survey* 3-54.
[7] Lavrov and Taimanov, "Computable Function" 287.
[8] Webb 8.
[9] For a good development of the joint Church-Turing Thesis, see Stephen C. Kleene, *Mathematical Logic*, New York: John Wiley & Sons, 1967) 232-47.
[10] Lavrov and Taimanov, "Computable Function" 287.
[11] Robert Rosen, "Effective Processes and Natural Law," *The Universal Turing Machine: A Half-Century Survey* 534.
[12] Michael A. Arbib, *Brains, Machines and Mathematics*, 2nd ed. (New York: Springer-Verlag, 1987).
[13] S. G. Shanker, "Wittgenstein versus Turing on the Nature of Church's Thesis," *Notre Dame Journal of Formal Logic* 28.4 (1987): 643.
[14] R. J. Nelson, "Church's Thesis and Cognitive Science," *Notre Dame Journal of Formal Logic* 28.4 (1987): 581-82.

Chapter 6
Episodic Memory

The Church-Turing Thesis, abbreviated here as **CT**, applies recursive functions to common computing problems. Most of these problems are solved by "serial computers," which execute instructions in a linear sequence, one by one. **CT** also applies to computers which execute instructions in *parallel*, performing many computations concurrently. John Shepherdson[1] has proved the applicability of **CT** to parallel computers.[2]

Some parallel computer designs are inspired by the microscopic architecture of neural structures in the brain. Parallel computers known as "neural nets" are built so as to mimic these structures. Since we're chasing **CT** into the human body, it will be expedient to restrict pursuit of **CT** applications to neural nets alone.

In 1943 Warren McCulloch and Walter Pitts[3] designed a simple neural net which embodied only five physical rules.[4] They demonstrated that this simplistic neural net could perform all Turing machine computations. In 1995 Hava Siegelmann and Eduardo Sontag proved a more powerful conjecture, showing that all Turing machines can be simulated by neural nets of finite size.[5]

Recently neural nets have been refined so as to simulate the electrical "spiking" behavior common to real neurons. The spiking model places additional biological constraints on neural nets,[6] making modern versions more realistic than the early 40s model of McCulloch and Pitts. Like those early neural nets, spiking neural nets can also simulate all Turing machines effectively. In addition, Wolfgang Maas[7] has demonstrated that spiking neural nets can simulate other classes of machines, including finite automatons[8] and random access memory devices.[9] And very recently (1997) Maas[10] has shown that spiking neural nets can achieve computational performance far superior to that of McCulloch-Pitts neural nets.[11]

These results must be encouraging for theoreticians, but they remain very much theoretical. The models are inspired by neural anatomy; however, very few simulate anatomic structures in detail. More relevant results would be those which map to *particular* recursive structures in the human brain. If these structures could be shown to exhibit powers transcending mere self-motion (preferably rising towards the psychological realm) the results would be of value to the current critique. We will see below that a brain structure essential to the function of *memory* does exhibit such powers.

One machine which Maas has modeled on spiking neural nets is a kind of "random access memory."[12] Neural net memory structures can be highly recursive, and this suggests that bodily memory structures might also contain recursive components. As it happens, one such recursive memory structure *is* well known. It is located within the hippocampus, an organ situated at the crossroads of sensory pathways in the brain.

The hippocampus is not an easy structure to visualize. For this reason several anatomical images will be presented among the paragraphs to follow. The images are ordered so as to guide the reader's eye down to the hippocampus, and to expose the recursive structure within.

Fig. 6.1
Limbic system[13]

This cutaway view displays some of the brain's deep limbic system structures, as seen through the temporal lobe from a viewpoint above the left temple. The two lobes of the hippocampal formation lie below the centrally-located thalamus. Distant brain areas connect to the hippocampus through two fiber bundles visible in the illustration: the cingulate gyrus and the fornix. The cingulate gyrus contains most of the hippocampus' afferent (input) fibers. The fornix contains most of the efferent (output) fibers.

Fig. 6.2
Hippocampal formation[14]

Figure 6.1 is inset within Figure 6.2, at upper left. Figure 6.2 isolates the hippocampal formation (shaded in inset).

This cutaway reveals the folded tissues of the hippocampus. The dentate gyrus is the interior fold. The cornu ammonis is the exterior fold. The cornu ammonis is not labeled in Figure 6.2, but is marked in another cutaway view, Figure 6.3, below.

Fig. 6.3
The dentate gyrus is labeled "DG." The cornu ammonis is labeled "CA."[15]

This exterior fold, the cornu ammonis, is the main site of memory processing in the hippocampus. An overview of its supposed function will follow these figures.

Fig. 6.4
Photograph of exposed hippocampus[16]

In Figure 6.4 the hippocampus is rotated 180 degrees relative to Figure 6.3. The bar at lower right is 6.5 mm, for scale.

The hippocampus is common to many animals. Most hippocampal experiments have been performed on rats. Subsequent diagrams are of rat hippocampal regions, all of which have close analogues in the human hippocampus.

Fig. 6.5
Rat hippocampus[17]

In Figure 6.5 the cornu ammonis is again labeled "CA." Two regions are marked: "CA1" and "CA3." Also, the dentate gyrus, at bottom, is once again labeled "DG." Major nerve pathways through these structures are illustrated by individual neurons. Arrows indicate the general flow of information.

Fig. 6.6
CA1 and CA3 regions are inverted in humans, relative to rats.[18]

Fig. 6.7
Schematic of connections and information flow[19]

Figure 6.7 magnifies Figure 6.5 with a more detailed schematic of connections and information flow in the hippocampus. Note the looping structure marked as "Recurrent collateral" in the CA3 region at left. Recurrent collaterals occur where nerve output fibers (axons) circle back upon the nerve input fibers (dendrites) of neighboring cell bodies. Collaterals are the synaptic connections between axons and dendrites. The recurrent collateral in Figure 6.7 is of special interest: it is a known example of a recursive structure in the brain. We can trace the flow of information through the hippocampus, marking the recursion where it occurs:

In Figure 6.7 information flows through the perforant path (1) to the dentate gyrus and the CA3 region. The dentate gyrus also projects information through the mossy fibers (2) to the CA3 region. Recurrent collaterals cycle inputs within the CA3 region. (*This* is the recursion.) Thereafter the CA3 region projects through the Schaeffer collateral (3) to the CA1 region. The CA1 region projects to the subiculum (4) and on to other cortical areas.

The recursion in region CA3 figures more prominently in Edmund Rolls' network schematic, Figure 6.8:

Fig. 6.8
Hippocampal network schematic[20]

In Figure 6.8 the block diagram at left shows the overall information flow between regions. The symbolic diagram at right highlights recurrent collaterals ("rc") of the CA3 region, which stand out by virtue of their distinctive looping structure.

The diagrams in Figure 6.8 clarify Figure 6.7. They showcase the hippocampus' recursive information flow. Afferent (input) connections are shown as solid lines. Efferent (output) connections are shown as dashed lines. At right, the more detailed symbolic diagram shows dendrites as thick lines, and axons as thin. "rc" indicates that recurrent axons loop their collaterals back onto dendrites within the CA3 region — the site of recursion.

The hippocampus is known to form "episodic memories": memories of episodes, or events.[21] The sensations impinging on the brain at the time of an event are associated together, by the hippocampus, into that one event memory. When that event is recalled through the hippocampus, those sensations emerge as a unit to reconstruct the event in the imagination.

The role of the hippocampus in storing and recalling events has been a subject of investigation since the 1950s.[22] More recently the CA3 region has been singled out for especially intense study. The CA3 region is the portion of the hippocampus which contains a high number of recurrent collaterals, as noted in Figures 6.7 and 6.8. As a group, these "coiled" neurons produce outputs which contribute to their own inputs. And under the right conditions recurrent collaterals can propagate nerve impulses in self-sustaining loops. This does seem to occur in the CA3 region. It's a biological form of recursion, with computational properties essential to the formation of episodic memories.

The computational properties of greatest interest are those of an "autoassociator." This device is just a neural net which has been completely permeated by its recurrent collaterals.

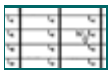

Fig. 6.9
An autoassociator of the type theorized for the CA3 region[23]

Figure 6.9 diagrams an abstract autoassociator. The sequence of changes which are thought to occur during episodic memory formation in the CA3 region can be read from the diagram in this way:[24]

External input sensations (e_i) excite dendrites (thick lines) to produce simultaneous electrical activation (h_i) on a group of neurons. In turn, those activated neurons' cell bodies (triangles) fire outputs (r_i). The recurrent collaterals (r'_j) of these outputs strengthen synaptic connections (w_{ij}) on just the excited dendrites in the group. This cycle continues for the duration of the external input. After a few cycles the memory pattern is stored, as a single remembered event, in the strengthened connections.

Edmund Rolls and Alessandro Treves have modeled the neural net thought to exist within the hippocampus.[25] Here are some of their experimental results:

- The simulated hippocampus was able to store all presented

event memory patterns.[26]
- It recalled those memories reliably when prompted with a small "cue" memory stimulus. Memory recall was perfect when the cue contained as little as 40% of each pattern.[27]
- Recall failed completely when the recurrent collaterals of the CA3 region were disabled.[28]
- The number of event memories which the simulated hippocampus could store was proportional to the number of recurrent collateral synapses per CA3 cell.[29]
- The estimated number of storable event memories (36,000 for the rat)[30] is consistent with the clinical theory that the CA3 region stores memories for a brief time only. (It is thought that the hippocampus transfers older memories to the neocortex as newer ones are acquired.)[31]

Rolls characterizes the results:

> The immediate interest of a simulation like this is, of course, that it works. A network with the connectivity and general structure of a specific brain area, the hippocampus, presented with inputs which produce a similar sparseness of activity to that found there, using a learning algorithm which is related to one which is known to operate in this area, and given the same limited opportunity to learn a large number of memories (one presentation per pattern) can perform a function similar to that which the area appears to perform in the brain. We must, surely, feel that progress is being made in understanding how the hippocampus works as part of the brain's system for memory formation.[32]

Other recent experiments support these findings.[33],[34] So we can infer with some confidence that the body relies heavily upon recursion when storing and recalling memories of events.

This result, and the results discussed previously, must now be laid out alongside Proclus' propositions so that we may conclude this rambling critique.

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next Chapter 7: Mortality

Chapter 6 Endnotes

[1] John C. Shepherdson, "Mechanisms for Computing Over Arbitrary Structures," *The Universal Turing Machine: A Half-Century Survey* 581-601.
[2] Shepherdson 597. Quoting:

> "For every mechanism satisfying [Gandy's four 'Principles of Mechanisms'] there is a parallel Turing machine which is equivalent to it on all interpretations

on which it is determinate."

[3] McCulloch and Pitt's original 1943 article, "A Logical Calculus of the Ideas Immanent in Nervous Activity," is reprinted in Warren S. McCulloch, *Embodiments of Mind* (Cambridge, Massachusetts: The MIT Press, 1965) 19-39.
[4] McCulloch 22. See also *Chapter 17, note 42*.
[5] Hava T. Siegelmann and Eduardo D. Sontag, "On the Computational Power of Neural Nets," *Journal of Computer and System Sciences*, 50:1 (1995): 132-50.
[6] The "spiking" behavior is codified by complex threshold and response functions. See also *Chapter 17, note 42*.
[7] Wolfgang Maas, "Lower Bounds for the Computational Power of Networks of Spiking Neurons," *Neural Computation* 8:1 (1996): 1-40.
[8] Finite automaton (finite state machine): "an abstract machine consisting of a set of states (including the initial state), a set of input events, a set of output events, and a state transition function. The function takes the current state and an input event and returns the new set of output events and the next state. Some states may be designated as 'terminal states'. The state machine can also be viewed as a function which maps an ordered sequence of input events into a corresponding sequence of (sets of) output events." Source: *Free On-line Dictionary of Computing*.
[9] Random access memory: "the most common computer memory which can be used by programs to perform necessary tasks while the computer is on; an integrated circuit memory chip allows information to be stored or accessed in any order and all storage locations are equally accessible." Source: *WordNet 1.6*.
[10] Wolfgang Maas, "Networks of Spiking Neurons: The Third Generation of Neural Network Models," *Neural Networks* 10:9 (1997): 1659-71.
[11] The particular example chosen used a single spiking neuron to perform a computation which would require hundreds of McCulloch-Pitts neurons.
[12] Maas, "Lower Bounds for the Computational Power of Networks of Spiking Neurons," 30 -31.
[13] Walter J. Hendelman, *Student's Atlas of Neuroanatomy* (Philadelphia: W. B. Saunders, 1994) 181.
[14] Hendelman 189.
[15] Peter McLeod, Kim Plunkett, and Edmund T. Rolls, *Introduction to Connectionist Modelling of Cognitive Processes* (Oxford: Oxford University Press, 1998) 279.
[16] Henri M. Duvernoy, *The Human Hippocampus*, 2nd ed. (New York: Springer, 1997)15.
[17] Juaquin M . Fuster, *Memory in the Cerebral Cortex: An Empirical Approach to Neural Networks in the Human and Nonhuman Primate* (Cambridge, Massachusetts: The MIT Press, 1995) 26.
[18] Duvernoy 19.
[19] McLeod, Plunkett, and Rolls 282. Quoting the original caption:

"A schematic representation of connections within the hippocampus. Input comes through the perforant path

> (1) which synapses with the dendrites of the dentate granule cells and also with the apical dendrites of the CA3 pyramidal cells. The dentate granule cells project via the mossy fibres (2) to the CA3 pyramidal cells. The recurrent collateral system of the CA3 cells is indicated by the single axon labelled Recurrent collateral. The CA3 pyramidal cells project via the Schaeffer collateral (3) to the CA1 pyramidal cells, which in turn have connections (4) via the subiculum back to other cortical areas."

[20] McLeod, Plunkett, and Rolls 284. Quoting the original caption:

> "Forward connections (solid lines) from areas of cerebral association neocortex via the parahippocampal gyrus and perihinal cortex, and the entorhinal cortex, to the hippocampus. Backprojections (dashed lines) via the parahippocampal gyrus to the neocortex. There is great convergence in the forward connections down to the single network in the CA3 pyramidal cells and great divergence again in the backprojections. Left: block diagram. Right: more detailed representation of some of the principal excitatory neurons in the pathways. [triangle] represents pyramidal cell bodies; [circle] represents dentate granule cells. The thick lines above the cell bodies represent the dendrites; the thinner lines with arrow heads the axons. Abbreviations: DG: dentate granule cells. mf: mossy fibres. PHG: parahippocampal gyrus. pp: perforant path. rc: recurrent collateral of the CA3 hippocampal pyramidal cells."

[21] For an introductory overview of the principles of neural memory formation, and the role of the hippocampus in the acquisition of episodic memories, see Fuster 23-46. For photographs of long-term memory structures, see *a dissection of memory structures in the sheep brain.*
[22] For a very readable history of twentieth-century memory research, see Brenda Milner, Larry R. Squire, and Eric R. Kandel, "Cognitive Neuroscience and the Study of Memory," *Neuron* 20:3 (1998): 445-68.
[23] Edmund T. Rolls and Alessandro Treves, *Neural Networks and Brain Function* (Oxford: Oxford University Press, 1998) 43.
[24] A good introduction to autoassociators can be found in McLeod, Plunkett, and Rolls 72-95.
[25] Rolls and Treves 95-135. A summary of that analysis is presented as part of an introductory course on neural net theory in McLeod, Plunkett and Rolls 279-92.
[26] McLeod, Plunkett and Rolls 289.
[27] McLeod, Plunkett and Rolls 289.
[28] McLeod, Plunkett and Rolls 290.
[29] Rolls and Treves 113.
[30] Rolls and Treves 113.
[31] Rolls and Treves 122-29. For biochemical details, see Ivan Izquierdo and Jorge H. Medina, "Memory Formation: The Sequence

of Biochemical Events in the Hippocampus and Its Connection to Activity in Other Brain Structures," *Neurobiology of Learning and Memory*, 68:3 (1997): 285-316. For a very recent (2000) proposed linkage of hippocampal and cortical memory systems, see Edmund T. Rolls, "Hippocampo-Cortical and Cortico-Cortical Backprojections," *Hippocampus*, 10:4 (2000): 380-88.

[32] McLeod, Plunkett and Rolls 289-90.

[33] Some supplementary theories on overall hippocampal function can be found in L. R. Squire, "Memory and the Hippocampus: A Synthesis From Findings With Rats, Monkeys, and Humans," *Psychological Review* 99:2 (1992): 195-231; James L. McClelland and Nigel H. Goddard, "Considerations Arising From a Complementary Learning Systems Perspective on Hippocampus and Neocortex," *Hippocampus* 6:6 (1996): 654-65; Mark Moll and Risto Miikkulainen, "Convergence-Zone Episodic Memory: Analysis and Simulations," *Neural Networks* 10:6 (1997): 1017-36; Richard Granger, et al., "Distinct Memory Circuits Composing the Hippocampal Region," *Hippocampus* 6:6 (1996): 567-78.

[34] Some theories on the hippocampus' role in storage and retrieval (including dreamtime retrieval) of temporal *sequences* of episodic memories can be found in William B. Levy, "A Sequence Predicting CA3 Is a Flexible Associator That Learns and Uses Context to Solve Hippocampal-Like Tasks." *Hippocampus* 6:6 (1996): 579; D. A. August and William B. Levy, "Spontaneous Replay of Temporally Compressed Sequences by a Hippocampal Network Model," *Computational Neuroscience: Trends in Research, 1997*, ed. James M. Bower (New York: Plenum Press, 1997) 231-36; Yu-Lin Qin et al.. "Memory in Hippocampal-Neocortical Ensembles," *Philosophical Transactions of the Royal Society of London: Series B* 352:1360 (1997): 1525-33; J. L. Kavanau, "Memory, Sleep and the Evolution of Mechanisms of Synaptic Efficacy Maintenance," *Neuroscience* 79:1 (1997): 7-44.

Chapter 7
Mortality

The summary of Proclus' ten selected propositions, first presented as Table 4.1, is printed again as Table 7.1 below:

Table 7.1
Ten selected propositions from Proclus' *Elements of Theology*

Proposition	Cause	Nature
33	cyclic motion	corporeal
17	self-motion	both corporeal and incorporeal
15	self-reversion	incorporeal
16	self-reversion	separable from corporeal
43	self-reversion	self-constituted
46	self-constitution	imperishable
49	self-constitution	perpetual
83	self-knowledge	all self-reversive and self-constituted natures
186	soul	all self-knowing natures; hence incorporeal, separable
187	soul	all natures of Prop. 186;[1] hence indestructible, imperishable

The table fairly condenses Proclus' immortality argument. Results from Chapters 5 and 6 may work some changes on this table. Any changes we'll mark on an updated version to follow.

Let's look again at Propositions 17, 15 and 16 (taking them in the same order as before):

> Prop. 17: *Everything originally self-moving is capable of reversion upon itself.*[2]

Proposition 17 states that for the self-moving body, "one and the same thing moves and is moved." Are we to infer that self-motion is corporeal, or incorporeal? Proclus' statement is unclear on this point.[3] But we, possessing better knowledge, can make a more certain statement. If we recall the distinction made between a recursive *definition* and a recursive *function* in *Chapter 5* we can see how the recursive function correlates more precisely with self-motion. A recursive definition must be interpreted by a mathematician, who acts as its cause and motive force. The recursive function, however, can be applied mechanically by a computing device. The self-motion which results is invisible inside electronic computers, but the gnashing gears of an electrically-powered mechanical calculator display quite vividly the modern reality of self-motion in corporeal bodies.

By such examples we can remove ambiguity from Proposition 17. We can say now that self-motion is wholly corporeal, and

present even within the rigid confines of a machine.

Moving to the next proposition:

> Prop. 15: *All that is capable of reverting upon itself is incorporeal*.[4]

Proposition 15 defines self-reversion as "the case in which the reverted subject and that upon which it has reverted become identical." This, Proclus maintains, is an incorporeal act; just because "a divisible substance cannot be conjoined with the whole of itself."

Strictly speaking, Proclus' statement is true. But Proclus' definition of conjunction neglects the role of *time*. And time does have a role to play, because corporeal bodies cannot act *instantaneously* to accomplish any task whatsoever. They cannot be moved instantaneously. Neither can they move themselves, nor revert upon themselves, nor conjoin themselves, nor disjoin from themselves, nor in any other way *change* without the freedom to do so *in time*. Granted time, these actions become possible.

Let's consider the hippocampal autoassociator described in *Chapter 6*. The autoassociator operates over time because the neurons which comprise it function at a finite speed. It stores and retrieves memory patterns via the neurons' recurrent collaterals. And these collaterals are recurrent just because they feed loops of axonal spikes back to their sources; inputs priming outputs, outputs cycled back as inputs again.

Where in the midst of these recursions can we say an active memory really "begins"? No one certain point answers. Practically speaking, the question is not meaningful. The memory is conjoined with itself. While the memory is active, the reverted subject and that upon which it reverts have become identical.

This sort of corporeal recursion is, by Proclus' corrected definition, a form of self-reversion. And so Proposition 15 falls: self-reversion, like self-motion, can be wholly corporeal.

Moving to the third proposition of immediate interest:

> Prop. 16: *All that is capable of reverting upon itself has an existence separable from all body*.[5]

Proposition 16 asserts that the self-reversive "has an existence separable from all body." This, because self-reversion is "independent of the body and not conducted through it or with its co-operation...."[6]

It is too easy to remark that spiking neural nets "conduct" their electrical spikes by the principle which Proclus verbalized, yet did not know. But irrespective of this remark, we note also that Proposition 16 cites the invalidated *Proposition 15* as an authoritative axiom. That authority being now invalidated, Proposition 16 must also be invalidated. In the living brain self-reversion would appear to be inseparable from the corporeal.

Table 7.2 summarizes all the changes derived above. Strikeouts have been placed over Proclus' modified or invalidated deductions:

Table 7.2

Changes to the first four of the selected propositions

Proposition	Cause	Nature
33	cyclic motion	corporeal
17	self-motion	~~both corporeal and incorporeal~~ corporeal
15	self-reversion	~~incorporeal~~ corporeal
16	self-reversion	~~separable from corporeal~~ inseparable from corporeal
43	self-reversion	
46	self-constitution	
49	self-constitution	
83	self-knowledge	
186	soul	
187	soul	

Table 7.2 shows the changes which preceding arguments have effected. The first four propositions have been marked, their causes all now falling to corporeal nature.

Proclus is clearly under siege. Yet six propositions are still unmarked in Table 7.2, their natures being as yet undecided. The final six propositions build in part upon the four now captured, but they rise higher than the basic facts brought to bear so far in this critique. So nothing should be said of the final six propositions until some greater argument ascends to their level. Another perspective on memory can advance the critique.

Saint Basil cast memory in civic form as "the cabinet of imagination, the treasury of reason, the registry of conscience, and the council chamber of thought."[7] Imagination, reason, conscience, thought itself — to St. Basil, memory was essential to the execution of all these psychologies. To be sure, it is difficult to perform mental tasks without memory's aid. If we linger now to consider St. Basil's listed psychological functions, one by one, this point may sharpen itself.

We might begin by considering the vitality which memory infuses into the imagination. It's hard to imagine, say, a tropical reef — if we've never held a brittle plate of fan coral, nor watched a sting ray's perfect glide, nor heard the sizzle of reef head feeding, nor felt the warmth of sun in shallow water, nor gulped brine. Such events are indispensable to a rich imagination of reef. Forget them and the imagined reef fades to a lifeless pastel.

As for reason: Can a judge reason a case of jurisprudence wisely if deprived of his libraries of law and barred from the use of precedent? No judge so constrained would attempt the task. His memory of legal precedent is the guide his reason follows to a sound judgment. Were he to judge while in ignorance of precedent he would risk rashness.

As for conscience: Can conscience speak to us if we remember nothing of the bad acts of which we are guilty? Repress all memory of those acts and conscience is muted.

The meaningful weight of our thoughts is emptied if the history of life is forgotten.

Through St. Basil's apt metaphors the vital importance of

memory becomes clear. It is no exaggeration to say that the soul, were it deprived of all memory, would be then incapable of knowing any thing; incapable even of knowing itself.[8]

This truth will press against the final six propositions left undecided in Table 7.2. Returning now to Proposition 16:

> Prop. 16: *All that is capable of reverting upon itself has an existence separable from all body.*

This proposition we know already to be invalid. The hippocampal autoassociator demonstrates that self-reversion can be wholly corporeal.

We read again from the proposition: "[I]f there were any body whatsoever from which [self-reversion] was inseparable, [self-reversion] could have no activity separable from the body...."[9] That assertion links to the claim of Proposition 83: "All that is capable of self-knowledge is capable of every form of self-reversion."[10]

Now we can complete the syllogisms implicit in these quotations. Episodic memory, being as we've seen both corporeal and self-reversive, is inseparable from the body. It follows that self-knowledge, being the memory with self as both subject and object, must likewise be inseparable from the body. Memory's corporeality makes self-knowledge a hostage to the body's corporeal limitations.

This result turns a cold light on the last of the ten selected propositions, Proposition 187:

> Prop. 187. *Every soul is indestructible and imperishable*.
>
> For all that is capable of being in any way dissolved or destroyed either is corporeal and composite or has its being in a substrate: the former kind, being made up of a plurality of elements, perishes by dissolution, while the latter, being capable of existence only in something other than itself, vanishes into non-existence when severed from its substrate (Prop. 48).[11] But the soul is both incorporeal and independent of any substrate, existing in itself and reverting upon itself (Prop. 186).[12] It is therefore indestructible and imperishable.[13]

The soul would appear to be intimately dependent upon self-knowledge and the greater store of memory. But they, being as we've seen composites which are inseparable from the corporeal body, must be "dissolved or destroyed" when the body ceases function. We are led to conclude, contra Proclus, that at death the soul is destroyed along with its requisite parts: it "perishes by dissolution," or else "vanishes into non-existence."

This is a dour conclusion. It is also not new. Scientific knowledge

leaves us with little reason to doubt this conclusion today, but even in the classical and medieval worlds complete mortality broke through occasionally as a minority opinion. The works of Plato, Aristotle and al-Farabi provide famous examples.[14] Also, we've seen above how the logic within Proclus' own Propositions 16, 83 and 187 does itself spool down to complete mortality once we've assigned corporeal natures to the causes in Propositions 17, 15 and 16.

Of course, we are still free to spin arguments for immortality if we wish to do so. But a modern argument for immortality should, I think, honor the tradition of systematic philosophy which Proclus' work exemplified. The conflicted immortality arguments set forth by William James and Albert Shalom (to choose two capable philosophers) make plain the difficulty of approaching Proclus' classical standard.[15]

Modern immortality arguments will need to address physio-computational evidence directly; so as to refute it, or else to show its irrelevance to the problem. Abundant evidence now supports the Church-Turing Thesis and its recent application to hippocampal learning. To my knowledge no philosopher has as yet found a way to accommodate this body of evidence within a rational immortality conjecture.

Perhaps such conjectures are forthcoming. But for now the evidence gives us good reason to ponder instead the case for complete mortality. And not only to ponder it, but to actively probe it with temperate questions, e.g.:

- What are the limits of complete mortality?
- Can anything be known of complete mortality's metaphysical "substratum"?
- Does that metaphysics in some way point "beyond" complete mortality?

Such questions bring to mind the heated correspondence between al-Kirmani and al-Akhram, back at Dar al-Hikma. We will revisit that precedent, but not yet.

If we are to examine the metaphysical questions surrounding complete mortality, we will need to work for a time within an entirely modern conceptual framework. Classical frameworks are incomplete. They enshrine time-tested concepts, such as Causation, Generation, and Soul. But other, more modern concepts are missing from the matrix. For example, neither Hellenic nor medieval philosophers conceived "personal identity" in the way we do today. And we will see that personal identity does factor into the preliminary answers which are soon to emerge.

These answers I will gather beneath a rubric — a title I've affixed to the header of every essay page. I call this philosophy "Metaphysics by Default." I'll explain the meaning of that title directly.

But thinking back to Chapter 2, we bring to mind again the library of

Dar al-Hikma. We have envisioned in our mind's eye the little padlock on the door of the Greek sage's cabinet. And in our mind's eye we've taken a crowbar to that padlock, ripping it off to retrieve Proclus' *Elements* from within.

The crowbar imagery is readily appreciated. What one man locks, another man can unlock. (Sometimes it takes a little elbow grease.) And I'll sound a note of caution here, because it is also second nature to coerce metaphysical belief when our understanding fails to free it. Or if we do understand, we are sorely tempted to discount those arguments which are sound, but which seem somehow unpleasant or unrewarding. In short, we're tempted to force the lock.

But we must be patient with ourselves, for here we are interrogating our natural limits — never an easy task. In our mind's eye the barrier we'd breach now is no mere cabinet door — no man-made obstruction — but a hardened ebony wall marking the extremity and end of life. It is life's natural barrier, impervious to artifice.

To my way of looking at it, this wall has an inlaid double lock. A snake's eyes stare at us from deep within the pitch — two keyholes awaiting two keys. We may yet be tempted to force this lock: by invoking a creed, or some dissemblance. But this lock, being natural, cannot be so forced. The keys must be natural truths if they are to fit the lock and open the ebony wall.

We have one key already in complete mortality. That truth is not cultural, or relative. It is not contingent upon a conditioned state of mind. It is instead a natural truth, as required. If we value the case for complete mortality we hold the first key firmly in hand. Now we can go after the second key.

---

next Chapter 8: Personal Identity

see also Chapter 7 Supplement: Classical Mortality Arguments

Chapter 7 Endnotes

[1] Prop. 187 calls upon Prop. 186 as an authoritative axiom. The properties listed in Prop. 187 recall the properties which have already been stated in building to Prop. 186.
[2] Dodds 19.
[3] For other pronouncements concerning self-motion, see *Chapter 4, note 7.*
[4] Dodds 17.
[5] Dodds 19.
[6] Dodds 19.
[7] James Wood, ed., *Nuttall Dictionary of Quotations*, new edition (London: Frederick Warne, 1931) 273.
[8] Clinical studies of medical subject H. M. detail a famous real-world example of perpetual memory loss. For a description of H. M.'s memory deficiency see Milner, Squire, and Kandel 447-53.
[9] Dodds 19.

[10] Dodds 77.
[11] Dodds 49. Prop. 48. "*All that is not perpetual either is composite or has its subsistence in another.*"
[12] Dodds 163.
[13] Dodds 163.
[14] *Supplement to Chapter 7: Classical Mortality Arguments.* This supplement provides introductory quotations from the works of Plato, Aristotle and al-Farabi.
[15] For James' argument, see William James, *Human Immortality* (Boston: Houghton Mifflin, 1898). For a critique of James' argument, see Ernest G. Braham, *Personality and Immortality in Post-Kantian Thought* (London: George Allen & Unwin, 1926) 163-69.

For Shalom's argument, see Albert Shalom, *The Body/Mind Conceptual Framework & The Problem Of Personal Identity* (Atlantic Highlands: Humanities Press International, 1985) 471-86, Chapter XX. A potential contradiction in Shalom's argument emerges when we contrast the spirit of Chapter XX with the matter of Chapter XVIII. It is especially difficult to reconcile Shalom's immortality conjecture with his assertion on page 431:

> "[T]he physical living body... must somehow be the inherent source of whatever is intangible in the human person...."

Shalom's "internalization and deployment" psychology is reminiscent of Proclus' "procession and reversion" scheme. Both philosophers have built immortality arguments around introspective (and untestable) definitions of psychological processes.

E-mail the author.
E-mail the webmaster.

Chapter 7 Supplement
Classical Mortality Arguments

This supplement to Chapter 7 presents quotations from three venerable arguments for complete mortality. These arguments are found in the works of Plato, Aristotle and al-Farabi.

In *Phaedo* Plato has Simmias put the question to Socrates, whether soul and body might be likened to harmony and the lyre. Should that analogy hold true, complete mortality would be the soul's fate:

> [M]ight not a person use the same argument about harmony and the lyre — might he not say that harmony is a thing invisible, incorporeal, fair, divine, abiding in the lyre which is harmonized, but that the lyre and the strings are matter and material, composite, earthy, and akin to mortality... For I suspect, Socrates, that the notion of the soul which we are all of us inclined to entertain, would also be yours, and that you too would conceive the body to be strung up, and held together, by the elements of hot and cold, wet and dry, and the like, and that the soul is the harmony or due proportionate admixture of them. And, if this is true, the inference clearly is, that when the strings of the body are unduly loosened or overstrained through disorder or other injury, then the soul, though most divine, like other harmonies of music or of works of art, of course perishes at once....[1]

This argument against immortality troubles Socrates and his friends more than any other. In the end, Socrates rejoins the argument by appealing to past-life recollection as a demonstration of the soul's existence prior to the body. He goes on to cite the soul's propensity for internal conflict as a further counter-example to the harmony metaphor employed by Simmias.[2]

Aristotle also considered the harmony metaphor to be insufficient as an explanatory theory of the soul's function.[3] He proposed a more sophisticated materialistic argument, which had the effect of binding the soul even more tightly to the living body:

> Suppose that what is literally an 'organ', like an axe,

> were a *natural* body, its 'essential whatness', would have been its essence, and so its soul; if this disappeared from it, it would have ceased to be an axe, except in name....[4]
>
> Next, apply this doctrine in the case of the 'parts' of the living body. Suppose that the eye were an animal — sight would have been its soul, for sight is the substance or essence of the eye which corresponds to the formula, the eye being merely the matter of seeing; when seeing is removed the eye is no longer an eye, except in name — it is no more a real eye than the eye of a statue or of a painted figure....[5]
>
> [A]s the pupil plus the power of sight constitutes the eye, so the soul plus the body constitutes the animal.
>
> From this it indubitably follows that the soul is inseparable from its body, or at any rate that certain parts of it are (if it has parts)....[6]

The Persian philosopher al-Farabi pondered these arguments some 1,300 years after they were first written down. Al-Farabi's distance from classical Greece granted him perspective: he could weigh the classical works against a stack of more "modern" Hellenistic and medieval texts — texts which by-and-large favored incorporeality and immortality. The Andalusian philosopher Averroes records al-Farabi's judgment:

> "In the book on the *Nicomachean [Ethics]* Alfarabi appears to have denied that conjunction with the incorporeal intelligences can take place. He stated that such was also the opinion of Alexander. And [he held] that the end for man should not be regarded as anything other than theoretical perfection...."[7]

Herbert Davidson notes that al-Farabi's line of reasoning may have paralleled Aristotle's own:

> ...Averroes reports Alfarabi's grounds [for his skeptical conclusion] to have been that "the generated-destructible cannot become eternal." An Aristotelian rule laid down that anything generated must undergo destruction and cannot continue to exist forever, and Alfarabi — as Averroes transmits or reconstructs his reasoning — concluded that inasmuch as the human intellect comes into existence, it inevitably undergoes destruction.[8]

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next Chapter 8: Personal Identity

Chapter 7 Supplement — Endnotes

[1] Plato, "Phaedo" 226-27. *Available online.*
[2] Plato, "Phaedo" 231-39. *Available online.*
[3] Aristotle, "De Anima," 546-47. Book I, Chapter 4: 407b 28 - 408a 18. *Available online.*
[4] Aristotle, "De Anima," 556. Book II, Chapter 1: 412b 12 - 412b 15. *Available online.*
[5] Aristotle, "De Anima," 556. Book II, Chapter 1: 412b 19 - 412b 23. *Available online.*
[6] Aristotle, "De Anima," 556. Book II, Chapter 1: 413a 2 - 413a 4. *Available online.*
[7] Herbert A. Davidson, *Alfarabi, Avicenna, and Averroes, on Intellect* (New York: Oxford University Press, 1992) 71-72.
[8] Davidson 72.

Chapter 8
Personal Identity

What is "personal identity"? We know from intuitive self-awareness that personal identity exists. It's a fact of conscious life, as common as the word, "I." But how to define it?

Philosophers of the ancient world provide little guidance, and modern philosophers have only framed definitions in the form of a problem. Harold Noonan, in his survey of the subject, states this problem in terms of "logically necessary and sufficient conditions":

> The problem of personal identity over time is the problem of giving an account of the logically necessary and sufficient conditions for a person identified at one time being the same person as a person identified at another.[1]

That's one definition. Noonan's use of the adverb "logically" may exaggerate the logician's limited role. *The Oxford Companion to Philosophy* states the problem a bit more generally:

> The problem is to say in an informative way what the necessary and sufficient conditions are....[2]

Everyone maintains personal identity; it persists irrespective of our individual traits. Personal identity is the "common denominator" of soul: where personal identity persists, a soul will surely be found. So if we are to improve our knowledge of the soul's overall function and nature, it's very likely we'll need to tackle the problem of personal identity first.

The implication of "problem definitions" is that our *best* definition of personal identity would be one which captures its necessary and sufficient conditions, and in a manner which is most "informative." This suggests a plan for the chapter. We'll focus on each of the conditions which modern philosophers consider necessary for the maintenance of personal identity. Once we've narrowed each condition down to some more distinct criterion, we'll follow the example of Chapter 6 and hunt for that criterion's corresponding corporeal function. Wherever a corporeal function can be found, that function strengthens the argument for complete mortality developed in Chapter 7. And more than that — it also unearths the second metaphysical key, which shall remain nameless for now.

We might expect this study of personal identity to be a lengthy task. But as it turns out, only three "Great Criteria" of personal identity are actually known; so we're working down a short list.

Moreover the critique of Proclus' *Elements*, finished in Chapter 7, has given us a time-saving shortcut; as we'll see below.

First Criterion: Memory

In the previous chapter we considered the importance of *memory* to the conscious mind. It is "the cabinet of imagination, the treasury of reason, the registry of conscience, and the council chamber of thought," to use St. Basil's metaphors.

Memory's value to the thinking mind has never been controversial. What *has* at times been controversial is the value of memory with respect to personal identity. John Locke started this argument all by himself, back in 1694. Here's his groundbreaking assertion, from *An Essay Concerning Human Understanding*:

> For since consciousness always accompanies thinking, and 'tis that, that makes every one to be, what he calls *self*; and thereby distinguishes himself from all other thinking things, in this alone consists *personal Identity*, *i.e.* the sameness of a rational Being: And as far as this consciousness can be extended backwards to any past Action or Thought, so far reaches the Identity of that *Person*....[3]

John Perry clarifies the final sentence of Locke's assertion:

> Locke must mean something like this: "Any experience I can remember being reflectively aware of, is mine, *i.e.*, one that happened to me." Thus the distinction between knowing of present experiences by our five external senses and knowing of them by our sixth inner sense is carried over into memory; all and only experiences I can remember having been aware of in this latter way were mine.[4]

Taken literally, Locke's statement demands too much. It requires that our minds remember everything that has ever happened to us, forgetting nothing along the way. Of course, we cannot remember *everything*. Acknowledging this fact, Anthony Quinton[5] and H. Paul Grice[6] have modified Locke's theory to accommodate forgetfulness. More recently, Perry[7] has worked to remove circularity from Grice's version of the theory. Otherwise this line of reasoning hasn't changed much since Locke's day.

Quoting Sydney Shoemaker, a prominent critic of this "memory theory":

> It is, I should like to say, part of the concept of a person that persons are capable of making memory statements about their own pasts. Since it is a conceptual truth that

> memory statements are generally true, it is a conceptual truth that persons are capable of knowing their own pasts in a special way, a way that does not involve the use of criteria of personal identity, and it is a conceptual truth (or a logical fact) that the memory claims that a person makes can be used by others as grounds for statements about the past history of that person. This, I think, is the kernel of truth that is embodied in the view that personal identity can be defined in terms of memory.[8]

Locke's memory theory has withstood three hundred years of criticism pretty well. Memory would seem to be a necessary condition of personal identity.

Having found a necessary condition, we should like to narrow that condition down to some more distinct corporeal criterion, if possible. But philosophers have not always been clear in stating just which *type* of memory is necessary for personal identity, and this makes the task a bit more involved. There are, actually, several known types.[9] If we work down the hierarchy of these memory types, we can find the one most clearly essential to personal identity. This will be our criterial candidate for "Lockean memory" — that type of memory essential to personal identity.

So, starting at the top of the hierarchy:

At the highest level, memories divide into short-term and long-term types. The memory required by personal identity must be retained over the span of a lifetime. Hence Lockean memory is *long-term.*

Long-term memories can be either implicit or explicit. Implicit memories are skills and habits: memories with no "truth value." Explicit memories have truth value, and can be proved true or false. When we recall an experience from life, our recall may be accurate or not. By comparing our recall with factual history we can determine the memory's truthfulness. So Lockean memory is not just long-term, but *long-term explicit*.

Finally, explicit memories are of two types: facts and events. Memories of facts are unrelated to one another. For example: I may recall a photographic image of a deer, and also an unrelated photo of a tree with a patch of stripped bark. The two factual memories are disconnected, separate. Memories of events "associate" such isolated data. Continuing the example: While walking through the forest, I see a buck deer rubbing his antlers against a tree in order to remove the antlers' itchy velvet. In future I will associate the two prior images, those of a deer and a stripped tree, together in this novel event. Presentation of either image will bring the associated event to mind.

An autobiographical memory — a memory of a unique, personal experience — associates sensations together in the record of that experience. That record constitutes a remembered event. Therefore Lockean memory is not just long-term explicit, but specifically it is the memory of *long-term explicit events.*

A taxonomy of memory types is highlighted so as to trace this deduction:

Fig. 8.1
A taxonomy of memory types[10]

The colored junctures trace the deduction of long-term explicit event memory.

Here we have narrowed Lockean memory down to one specific type: that of long-term explicit events. (Truth be told, it's a deduction now common, even popular.)[11] And this is where our critique of Proclus' *Elements* provides a shortcut:

We saw in Chapter 6 that memories of events (episodic memories) are stored in the neocortex, and retrieved from the neocortex, through the autoassociative function of the hippocampus. Autoassociation binds recursion to the living, corporeal body.

Now we can make use of this knowledge again. We simply note that the function which binds recursion to the body also binds Lockean memory to the body.

This takes care of the memory criterion.

First Conclusion: The memory criterion of personal identity has a corporeal basis.

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next Section 2 of 4

Chapter 8, Section 1 Endnotes

[1] Harold W. Noonan, *Personal Identity* (London: Routledge, 1989) 2.
[2] Paul F. Snowdon, "Personal Identity," *Oxford Companion to Philosophy* (Oxford: Oxford University Press, 1995) 654-55. *Related texts online.*
[3] John Locke, *An Essay Concerning Human Understanding*, ed. Peter H. Nidditch (Oxford: Clarendon Press, 1979) 335, Chapter 27, Section 9. This quotation is taken from the chapter entitled "Of Identity and Diversity." That chapter was an addition to the second edition of the essay, published in 1694.
[4] John Perry, "The Problem of Personal Identity," *Personal Identity*, ed. John Perry (Berkeley: University of California Press, 1975) 14-15. *Related texts online.*
[5] Anthony Quinton, "The Soul," *Personal Identity* 53-72.
[6] H. Paul Grice, "Personal Identity," *Personal Identity* 73-95.
[7] John Perry, "Personal Identity, Memory, and the Problem of Circularity," *Personal Identity* 135-55.
[8] Sydney Shoemaker, "Personal Identity and Memory," *Personal Identity* 133-34.
[9] A good historical review of the study of mammalian memory can

be found in Milner, Squire, and Kandel 445-68.
[10] Milner, Squire, and Kandel 451.
[11] See, for example, Rocco Gennaro's recent (1996) version of the "episodic memory argument" in Rocco Gennaro, *Consciousness and self-consciousness* (Amsterdam: John Benjamins Publishing Company, 1996) 182-200. Gennaro builds an interdisciplinary argument wherein he equates consciousness quite explicitly with the ability to fashion episodic memories (long-term explicit event memories).

Chapter 8
Personal Identity

continued, Section 2 of 4

Second Criterion: Continuity

Continuity may well be another necessary condition of personal identity. Generally speaking, continuity is the property of being unbroken, or whole, over time. Solid inanimate objects exhibit this property because they retain the same atoms in the same relative positions over time. With living things, continuity becomes more complex. Locke starts his *Essay* with a definition of continuity in vegetable life:

> We must therefore consider wherein an oak differs from a mass of matter, and that seems to me to be in this, that the one is only the cohesion of particles of matter any how united, the other such a disposition of them as constitutes the parts of an oak; and such an organization of those parts as is fit to receive and distribute nourishment, so as to continue and frame the wood, bark, and leaves, etc., of an oak, in which consists the vegetable life. That being then one plant which has such an organization of parts in one coherent body, partaking of one common life, it continues to be the same plant as long as it partakes of the same life, though that life be communicated to new particles of matter vitally united to the living plant....[12]

So, by Locke, a plant may replace individual particles without violating its identity. Only the greater living structure must persist over time.

This truth of vegetable continuity would seem to be a truth of animal and human continuity as well. Harold Noonan develops the idea in his survey of personal identity philosophy. He speaks here of "bodily identity," but continuity of the human body over time is implied:

> The most natural theory of personal identity, which would be almost anyone's first thought, is that personal identity is constituted by bodily identity: *P*2 at time *t*2 is the same person as *P*1 at time *t*1 if and only if *P*2 has the same body as *P*1 had.... According to this view personal identity is essentially no different from the

> identity of material objects in general. An artefact, like a ship, or a living thing, like an oak tree or a horse, persists through time. Its persistence does not consist in its retention of the same matter — for artefacts can be repaired and patched up and living things are necessarily involved in a constant exchange of matter with their environment — but in its retention of the same form as its matter undergoes gradual replacement....[13]

Sydney Shoemaker[14] and Derek Parfit[15] refine this position, concluding that the brain is the only organ of the human body for which continuity is necessary. Noonan distills the essence of their theories:

> "*P*2 at time *t*2 will be the same person as *P*1 at time *t*1 just in case *P*2 at *t*2 has the same *brain* [emphasis added] as *P*1 at *t*1."[16]

Shoemaker and Parfit have made some assumptions about brain function, but the assumptions are reasonable. This essay has already presented evidence of brain function which justifies their claims.

Continuity would appear to be a protean property of material objects, one expressed in several modes by inanimates, plants, animals and human beings.

Second Conclusion: The continuity criterion of personal identity has a corporeal basis.

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next Section 3 of 4

Chapter 8, Section 2 Endnotes

[12] Locke 330-31, Chapter 27, Section 4.
[13] Noonan 3.
[14] Sydney Shoemaker, *Self-knowledge and Self-identity* (Ithaca: Cornell University Press, 1963) 22-25.
[15] Derek Parfit, *Reasons and Persons* (Oxford: Clarendon Press, 1984) 253.
[16] Noonan 5.

Chapter 8
Personal Identity

continued, Section 3 of 4

Third Criterion: Subjectivity

Subjectivity is the quicksilvered criterion, the most elusive of the three Great Criteria of personal identity.

The philosopher Albert Shalom, writing in the mid-80s, could grant corporeal bases for memory and continuity — but not for subjectivity. In his view subjectivity is fundamentally different:

> There seems... to be no alternative but to regard the continuity of body or, according to more recent writings, the biographical or autobiographical continuity of experiences, as the only basis on which one can refer to an individual's "identity"....
>
> But when we are dealing with subjectivities, in particular that of the human entity, the situation is not quite so simple. It is through our own awareness of ourselves that this simple model is most clearly seen as inadequate. ...[T]he constant ability of an "I" to be aware of "itself" throughout all bodily changes and throughout all the changes of subjective experience, is a problem which simply cannot be dealt with in terms of that framework.[17]
>
> [The] central difficulty... of all theories which try to derive an adequate theory of the person from the body/mind framework [is that] there is no explanation of how neural activity can give rise to subjective processes at all. It follows that all such theories can be no more than variations on the inexplicable emergence of subjectivity from an initial fertilized ovum considered as a purely physicochemical entity.[18]

That was a mid-80s perspective. For a mid-90s perspective, we can turn to another accomplished philosopher, David Papineau. Papineau makes a novel comparison. He likens the twentieth-century study of consciousness — subjectivity in its fullness — to the nineteenth-century study of life:

> It may seem to some readers that a physicalist theory of consciousness will come close to denying the existence

of consciousness. But that would be a mistake. It doesn't deny consciousness, just a certain conception of consciousness.

It denies that consciousness is some kind of extra inner light, some further non-physical property which exists over and above any physicalistically specifiable property. But this is quite consistent with holding that consciousness is a real property which distinguishes some kinds of systems from others. This combination of views requires only that we accept that consciousness is identical with some property which is specifiable in a physicalistically acceptable way.

An analogy may be helpful here. In the nineteenth century there was a heated theoretical debate about the essence of *life*. The participants had a satisfactory enough working notion of life: they agreed about which kinds of behaviour and physical organization are characteristic of life, and in consequence were clear enough about where in practice the line should be drawn. Everything from humans to microbes is alive, while planets and pebbles are dead. (Perhaps there were some borderline cases; but the penumbra of vagueness was not wide.)

Still, despite this wide degree of agreement on the nature of life, nineteenth-century thinkers took there to be a further question. *Why* are these systems alive? What mysterious power animates them? And why is this power present in certain cases, such as trees and oysters, and not in others, like volcanoes and clouds?

These questions have disappeared from active debate. Biology textbooks sometimes begin with a few perfunctory paragraphs about the distinguishing characteristics of their subject matter. But the nature of life is no longer a topic of serious theoretical controversy. Everybody now agrees that the difference between living and non-living systems is simply having a certain kind of physical organization (roughly, we would now say, the kind of physical organization which fosters survival and reproduction.)

The explanation for this nineteenth-century debate, and its subsequent disappearance, was that it was premised on the notion that living systems were animated by the presence of a special substance, a vital spirit, or *elan vital*, which was postulated to account for those features of living systems, such as generation and development, which were thought to be beyond physical explanation. And of course, if you do believe in such a vital spirit, then you will want to know about its nature, and why it arises in certain circumstances and not others.

However, nobody nowadays believes in vital spirits any more, not least because it is now generally accepted that the characteristic features of living systems can in principle all be accounted for in physical terms. In

> consequence, it no longer makes sense to puzzle about *why* living systems are alive. To be alive is just to be a physical system of a certain general kind. There isn't any extra property present in living systems, over and above their physical features, which distinguishes them from non-living systems. So we have stopped asking questions which presuppose such an extra property.
>
> I recommend that we do the same with consciousness....
>
> ...We should reject the theory that consciousness involves an extra inner light in addition to facts of physical organization. But we can reject this theory without rejecting consciousness. Even if consciousness is just a kind of abstract physical organization, the difference between being conscious and not being conscious can still be perfectly real.[19]

Papineau predicts positive results from physicalist studies of consciousness. Two very recent (1997) studies are especially relevant to this essay, in that they point the way towards a corporeal subjectivity criterion. The studies isolate subjective mechanisms within their functional models of conscious brain systems. This functional approach may well address Shalom's concern, and vindicate Papineau's faith in wrinkled clay. We'll review the studies below.

Bernard Baars has developed a "Global Workspace" model of consciousness, as described in a joint article by James Newman, Bernard Baars and Sung-Bae Cho, entitled, "A Neural Global Workspace Model for Conscious Attention."[20] The researchers characterize attention as a "global integration and dissemination system... which controls the allocation of the processing resources of the central nervous system."[21]

Their system model places great importance on the thalamus.[22] The thalamus is a deep-seated limbic structure. Like the hippocampus, it also intercepts transmissions along the brain's sensory pathways. But the thalamus is not an organ of memory like the hippocampus — instead, the thalamus is known to be a regulator of "attentional states," or states of alertness.[23]

Fig. 8.2
Central location of thalamus

The thalamus has connections to and from many regions of the neocortex.[24]

For Newman, Baars and Cho, the thalamus performs attentional functions as part of the Global Workspace model. The Global Workspace is a competitive neural net system wherein independent neural output units compete with each other to see which unit can produce the largest response to each environmental stimulus input. The output unit with the largest response wins the competition. It

proceeds to categorize the stimulus, classifying it as a distinct feature of the external environment.

In the thalamus, this competition is thought to "gate" attention. Gating blocks off unimportant sensations before they can reach the neocortex; freeing the cortex to act upon just those features of its environment which are novel, or else important to survival.[25]

Fig. 8.3
Thalamocortical connections

Some long-distance connections between the thalamus and the neocortex[26]

The thalamus alerts the neocortex to these important environmental features. In Figure 8.3 the thalamus is the dark ovoid at the center of the inset image. The larger, main image displays thalamic fiber bundles — they run from the thalamus to other brain regions (which reciprocate with fibers of their own). Note the thickness of the fiber bundles. Like high-voltage power lines, these fibers transmit thalamic alerts with swift and abundant force.[27]

Fig. 8.4
"Wagon wheel" diagram

A "wagon wheel" diagram of central nervous system attention and conscious perception. "Th" is the thalamus; "g_c" is a closed attention gate; and "g_o" is an open attention gate.

In this diagram a visual stimulus has opened an attention gate to the primary visual cortex (V1).[28]

In Figure 8.4 a "wagon wheel" diagram of the Global Workspace places the thalamus at visual center. Newman, Baars and Cho speak of it as the "hub" of their model. Thick fiber "spokes" anchor it to all points on the rim of cortex. In Baars' model the thalamus maintains gated attentional connections to all regions of the central nervous system.

The Global Workspace model outlines a neural mechanism of attention. And this is highly relevant to the subjectivity criterion; because when the mind "pays attention" to some object, it maintains a distinction between itself and that object. The distinction between self and object can also be stated as the distinction between self and not-self, which is perhaps a more general definition of subjectivity. Through this "verbal overlay" we can see more clearly the model's relevance to the subjectivity criterion.

Newman, Baars and Cho summarize the most important properties of their model:

> [W]e have introduced a collection of neuroscience and [neural net] models for attention and binding, resource allocation, and second-order gating, which share important features and parallels with a neural Global

> Workspace System for conscious attention.... While the [neural net] models we have presented only implement partial aspects of the [Global Workspace] system, and even our Wagon Wheel model largely neglects the influences of memory and affective systems upon the stream of consciousness, the outlines of a general framework for understanding conscious processes should be discernable.... This is certainly great progress, given the virtual *terra incognita* consciousness has been for most of the history of science.[29]

John G. Taylor builds upon this Global Workspace model. In "Neural Networks for Consciousness"[30] Taylor presents a complementary neural net model. His model distinguishes discrete stages in the emergence of consciousness.

Taylor begins his exposition by listing several features of consciousness which any detailed model (neural net or other) must mimic. Taylor categorizes these low-level features of consciousness, as in Table 8.1. Here, "spatial features" place the location of mental activity; "temporal features" delimit the timing of mental activity; and "emergent features" specify the ways in which mental activity emerges as conscious awareness, or "phenomenal experience."

Table 8.1
Criterial features of phenomenal experience (PE)[31]

Feature Types	Features
Spatial features	Localized representations in localized modules
	Modules well-coupled together
	Modules well-coupled to higher-level modules
Temporal features	Temporal continuation of activity
	Time required to achieve PE activation
	No gap between different PE activations
Emergent features	One-way creation of PE activation
	PE created at highest level of hierarchy
	Rapid emergence once begun
	No ability to probe lower levels supporting PE but below PE creation level

These features of conscious life have been extracted from a mountain of psychological studies. Taylor is careful to work within the real-world limitations which they impose upon the modeler.

To model the emergence of consciousness at its lowest level, Taylor begins with a two-stage neural net model of cortical processing. The two stages correspond with the two lowest levels of mental activity: the first stage is pre-conscious, an "unattended condition"; the stage above it is "passive awareness" (awareness without attention). The third and highest stage, the "attended condition," Taylor models separately.[32]

The images below map Taylor's three stages to three distinct regions of cortical activity. Figure 8.5 is the predictive theory. Figure 8.6, the experimental result.

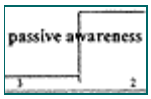

Fig. 8.5
Levels of activation in modules of the three-stage model, and their corresponding levels of awareness.[33]

Fig. 8.6
Images of brain activity (dark areas) corresponding to the three levels of conscious activation.

"A" shows the unattended condition. "B" shows passive awareness, minus the unattended condition. "C" shows the attended condition, minus passive awareness and the unattended condition.[34]

The result agrees with prediction: each stage of awareness activates additional cortical regions. To see better why this is the case, we can highlight a broad correspondence between Taylor's three stages of awareness and three sectors of Baars' "wagon wheel" attentional model. Figure 8.7 illustrates with color-coded sectors. Note that passive awareness (yellow) charges out of the thalamus' attention gates. When a gate opens, additional cortical regions are activated.

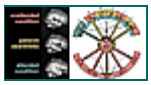

Fig. 8.7
Correspondence between three stages of awareness and three sectors of the "wagon wheel" attentional model.[35]

This broader correspondence, which is as much anatomical as theoretical, bolsters Taylor's argument. In Taylor's model, attentional systems gate thoughts between these discrete stages of awareness.[36] As it happens, Taylor's attentional systems are similar to the thalamic system theorized by Newman, Baars and Cho (as above). There is in fact some overlap between the proposed systems, in and around the thalamus.[37]

Taylor provides clinical results in support of his model, along with details of the model's continuum neural field theory.[38] That mathematical theory defines recursive "bubbles" of persistent cortical activity: bubbles set in motion by the thalamus. These recursive bubbles separate stage-two thoughts (passive awareness) from stage-one thoughts (the unattended condition).[39]

For Taylor, this second-stage recursive separation is the principal requirement of awareness:

> In the model, the lower first stage involves modules tranforming inputs into various codes. It is only at the second level that further modules are activated in a manner which brings about the emergence of phenomenal awareness.[40]

Awareness, even passive awareness, entails subjectivity — it's the conscious subject, after all, who is aware. This ubiquitous correlation indicates that the *transition* from the unattended condition up to passive awareness marks the emergence of subjectivity. (It's a popular idea: many philosophers are now willing to entertain just this sort of deduction.)[41]

The deduction can be stated more dramatically. We can say that Taylor's *third* stage of consciousness — the "attended condition" — is *not necessary* for subjectivity. I should clarify this more dramatic statement:

The attended condition engages the brain's frontal lobes for sustained concentration, and for planning and reasoning tasks which pertain to the object of attended concern. Such effort is a hallmark of the human experience, but adult humans sustain the attended condition only intermittently. Moreover, this level of consciousness is entirely absent in young children. Taylor explains:

> [T]he late onset of prefrontal myelination [axon sheathing] would prevent much use being made of such frontal sites in the first few years of life, a period in which there is extensive coding of words and objects in posterior sites.[42]

Taylor goes on to cite studies of adults who have maintained conscious life despite damage to the frontal lobes.[43] These case studies provide additional support to the idea that third-stage thoughts can be distinguished from, and are largely independent of, basic subjectivity.

The implication of Taylor's work is that subjectivity emerges within the second stage of mental activity — not the third. Passive awareness would appear to be sufficient.

Newman, Baars and Cho reach a similar conclusion. They deduce that the frontal lobes perform an "executive function" over the limbic system.[44] The researchers take pains to point out the fact that this executive function is *not* indispensable to consciousness — thalamic competition is judged the more fundamental manifestation of conscious life:

> Note that an executive system is not an *essential* requirement for consciousness. That this is not the case is illustrated by the literature on extensive damage to the frontal lobes of the brain.... In terms of the [Global Workspace] model we have presented, it is not executive attentional processes, but the selective binding of coalitions of active cortical modules via a thalamocortical competition which is the *sine qua non* for the generation of a coherent stream of conscious representations.[45]

And finally, a picture worth a thousand words: Figure 8.8 shows the thalamus at work.

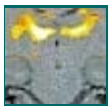

Fig. 8.8
Thalamus imaged while in the process of stimulating the cortex to attention.[46]

This extraordinary set of images comes from an experiment in which five adults were monitored as they focused attention upon a visual target. These images are a record of activity within each subject's thalamus (blue rectangle).

Subjects attended to the target under three different mental conditions: high, medium and low arousal. Performance during the state of low arousal (morning sleep deprivation) ignited the greatest activity in the thalamus. This activity maps to color pixels, which predominate in the "low arousal" images at left.

The investigators speculate that this record of heightened activity captures the thalamus as it is "working harder" to force a drowsy cortex up into an attentive state.[47] The thalamus, it seems, is here compelling the cortex to "wake up and pay attention."

Remarkable images — and photographic evidence in support of theories which implicate the thalamus in subjective awareness.

So thalamus is king. Taken all in all, the thalamic attentional system would appear to be of utmost importance to the emergence of subjectivity.

Third Conclusion: The subjectivity criterion of personal identity has a corporeal basis.

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Chapter 8, Section 3 Endnotes

[17] Shalom 449.
[18] Shalom 366.
[19] David Papineau, *Philosophical Naturalism* (Oxford: Blackwell Publishers, 1993) 121-23.
[20] James Newman, Bernard J. Baars, and Sung-Bae Cho, "A Neural Global Workspace Model for Conscious Attention," *Neural Networks* 10:7 (1997): 1195-1206. The article is reproduced within the *next section*.
[21] Newman, Baars, and Cho 1195.
[22] See especially Newman, Baars, and Cho 1197-99, Section 2.

[23] See Marvalee H. Wake, ed., *Hyman's Comparative Vertebrate Anatomy*, 3rd ed. (Chicago: University of Chicago Press, 1992) 681. Quoting:

> "The fifth division of the dorsal thalamus is composed of the *intralaminar* nuclei. The neurons of this group are scattered along the margins of the other thalamic nuclei and constitute an extensive *arousal system* to the telencephalon. These neurons receive projections from all of the ascending sensory pathways..., and they project to the outer layer of the isocortex.
>
> Such neurons appear to form an alerting or biasing mechanism for the isocortex. They probably do not convey information on where or what is happening in an animal's world, but rather convey that something new or different is happening that 'needs' to be analyzed."

[24] Francis Crick, *The Astonishing Hypothesis* (New York: Charles Scribner's Sons, 1994) 84.
[25] For a good introduction to competitive neural networks, see McLeod, Plunkett, and Rolls 127-38, Chapter 6.
[26] Hendelman 199.
[27] Thick axons are fastest. Thalamocortical fiber bundles are thick enough to be visible to the unaided eye: the lobotomy procedure severs them. For neuro-computational details of their alerting function, see Anthony Zador, "Thalamocortical Synapses: Sparse but Stentorian," *Neuron* 23:2 (1999): 198-200.
[28] Newman, Baars, and Cho 1199. Quoting the original caption:

> "'Wagon wheel' model of CNS systems contributing to global attention and conscious perception. A1, primary auditory area; BG, basal ganglia; g_c, 'closed' nRt gate; g_o, 'open' nRt gate; MRF, midbrain reticular formation; nRt, nucleus reticularis thalami; PFC, prefrontal cortex; S1, primary somatosensory area; Th, ventral thalamus; V1, primary visual cortex (from Newman et al., 1997)."

[29] Newman, Baars, and Cho 1205.
[30] John G. Taylor, "Neural Networks for Consciousness," *Neural Networks* 10:7 (1997): 1207-25. The article is reproduced within the *next section*.
[31] John G. Taylor, "Neural Networks for Consciousness" 1209.
[32] John G. Taylor, "Neural Networks for Consciousness" 1221-22.
[33] John G. Taylor, "Neural Networks for Consciousness" 1212.
[34] John G. Taylor, *The Race for Consciousness* (Cambridge, Massachusetts: A Bradford Book, MIT Press, 1999) 270. Quoting the original caption:

> "Surface-projected schematic representation of mean activated areas of cortex (a) during inattention to an auditorily presented stream of syllables due to attention to a visual signal presented to both eyes. (b) The additional cortical area brought on stream when subjects passively listen to the syllables (no visual distractor).

> (c) Additional cortical area when attention is focused on the syllables."

[35] The correspondence is this author's interpretation. Note especially that the juxtaposed images do not represent attentional events of the same sensory modality. The wagon wheel drawing illustrates a visual stimulus, whereas the brain images record an auditory stimulus. For the researchers' original captions, refer to notes 28 and 34 of this section.
[36] John G. Taylor, "Neural Networks for Consciousness" 1209-11, 1221-22.
[37] Taylor's model of the "thalamus-NRT-cortex complex" is cited by Newman et al. See Newman, Baars, and Cho 1198.
[38] John G. Taylor, "Neural Networks for Consciousness" 1211-21.
[39] In light of prior arguments, it is perhaps unsurprising to find that Taylor's hypothesized neural net architecture is massively recursive. See especially John G. Taylor, "Neural Networks for Consciousness" 1210, Figure 4; also reproduced within the *next section*. Taylor provides a supplementary exposition on recursion in the nucleus reticularis thalami (the layer of neurons surrounding the thalamus proper) in John G. Taylor, *The Race for Consciousness* 149-56.
[40] John G. Taylor, "Neural Networks for Consciousness" 1207. (Quoted from the abstract.)
[41] For example, David Chalmers, a prominent and popular philosopher of mind, has recently (1996) made a strong case for something very similar: namely, the correlation between consciousness and awareness. See David J. Chalmers, *The Conscious Mind* (New York: Oxford University Press, 1996) 213-46; Chapter 6. Quoting from page 243:

> "It is very plausible that some kind of awareness is *necessary* for consciousness. Certainly all the instances of consciousness that I know about are accompanied by awareness. There seems to be little reason to believe in any instances of consciousness *without* the accompanying functional processes. If there are any, we have no evidence for them, not even indirect evidence, and we could not in principle. It therefore is reasonable to suppose on the grounds of parsimony that wherever there is consciousness, there is awareness."

[42] John G. Taylor, "Neural Networks for Consciousness" 1221.
[43] John G. Taylor, "Neural Networks for Consciousness" 1221.
[44] Newman, Baars, and Cho 1201.
[45] Newman, Baars, and Cho 1202.
[46] C. M. Portas, G. Rees, A. M. Howseman, O. Josephs, R. Turner, and C. D. Frith, "A Specific Role for the Thalamus in Mediating the Interaction of Attention and Arousal in Humans," *The Journal of Neuroscience* 18:21 (1998): 8982.
[47] Portas et al. 8987.

E-mail the author.
E-mail the webmaster.

Chapter 8
Personal Identity

continued, Section 4 of 4

Many details of Baars' and Taylor's studies are beyond my competency. I should refrain from paraphrasing the studies further. But at this point readers may yet hold the opinion that the two consciousness theories I've cited are in reality just groundless hypotheses, or else insubstantial "games." Certainly, were this the case, the third conclusion of this chapter (the corporeal basis of subjectivity) would be premature.

My thin paraphrase of the science is insufficient to convince anyone otherwise. Lacking other means of persuasion, I have elected to reproduce the researchers' printed articles in full. The articles can speak for themselves.

Here is the article by Newman, Baars and Cho: (also bound in Adobe *PDF* format, here:)

Fig. 8.9
"A Neural Global Workspace Model for Conscious Attention"[48]

Pages:
1195 1196 1197 1198 1199
1200 1201 1202 1203 1204
1205 1206

And here is the article by John G. Taylor: (also bound in Adobe *PDF* format, here:)

Fig. 8.10
"Neural Networks for Consciousness"[49]

Pages:
1207 1208 1209 1210 1211

1212 1213 1214 1215 1216
1217 1218 1219 1220 1221
1222 1223 1224 1225

The subject matter of the articles is difficult, but the clarity of the prose is such that readers unfamiliar with the subjects can still work through to the articles' important results. Also, the cited references lead us out to a burgeoning orchard of evidence. Readers unimpressed by the articles themselves would do well to sample the surrounding evidence before moving on.

But the time is already ripe for moving on. The cumulative weight of evidence bends us to the conclusion that subjectivity does indeed have a corporeal basis.[50]

In review:

In this chapter we have examined the three Great Criteria of personal identity — memory, continuity and subjectivity — and found each to have a corporeal basis. These results indicate that personal identity is, as a whole, corporeal.

We note in passing that philosophers have proposed a few other conditions of personal identity.[51] Most of these conditions are variations on the three themes of this chapter; hence subject to the same corporeal limitations. So we can proceed without visiting the alternative definitions.

At this point it might be helpful to arrange the criteria into some "temporal sequence of emergence," or "order of creation." The ordering is not critical, so this argument will be brief. Literally, "1-2-3."

Both subjectivity and memory require bodily continuity for their function. The neurons that comprise the working brain must be kept in a healthy state, continuously, for the duration of life. Damage to the neurons — any break in their continuity — has a deleterious effect. For example, a deficiency of potassium impairs nervous transmissions and is experienced as confusion. So it is almost certain that the onset of continuity must in some way precede the onset of subjectivity and memory during the emergence of consciousness.

As for subjectivity and memory: subjectivity may be more robust than memory. The subjective experience can sustain itself in the event of widespread damage to frontal lobes, as we've noted in *Section 3* of this chapter. More to the point, infants are seen to exhibit subjective awareness during the period of memory failure known as "infantile amnesia;"[52] and adults also maintain subjectivity when injury leaves them unable to acquire long-term memories.[53] This suggests that the brain can maintain a minimal subjectivity even when a long-term memory system is absent. So

perhaps subjectivity in some way precedes memory during the emergence of consciousness.

At birth, the possible order of emergence for personal identity criteria would therefore be:

1. continuity
2. subjectivity
3. memory

The order of destruction at death is more speculative, but conceivably it might be:

1. memory
2. subjectivity
3. continuity

We can imagine how the ordering might stage destruction of personal identity at death; first, by effacing long-term memories as the surface layers of neocortex shut down; then, as stillness penetrates the limbic system deeper within, disbanding subjectivity. At the end, cell death throughout the brain would break the functional continuity of the nervous system, withdrawing any possibility that the physical structure could reinstate its lost personal identity.

Complete mortality would seem therefore to nullify personal identity at death. Where necessary conditions are lacking, personal identity cannot exist.

The argument for complete mortality, engaged back in Chapter 7, has now been extended to encircle personal identity. To be sure, complete mortality is as disagreeable now as it was when first broached. A quick study of personal identity has done nothing to fashion mortality more to our liking.

Neither has this chapter offered up any metaphysical gifts. The corporeal basis of personal identity would seem to constitute a cul-de-sac for metaphysical philosophy; just because corporeality, by itself, leads nowhere. It is a metaphysical dead end.

Or so it may appear. What the negative judgment overlooks is the fact that this chapter has instead produced the *second key* to our metaphysical lock. The first key we recall as being the natural truth of complete mortality. And now we have our second key, which is just the *corporeal basis of personal identity*. This second natural truth complements the first, and it is equally important to the thesis.

Now both keys are in hand. We can open the lock and breach the ebony wall.

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next Chapter 9: Existential Passage

Chapter 8, Section 4 Endnotes

[48] Newman, Baars, and Cho 1195-1206.
[49] John G. Taylor, "Neural Networks for Consciousness" 1207-25.
[50] Some scientific texts exploring conscious life:

- *A collection of cognitive science resources, organized by Neil A. Busis, M.D.*
- *A collection of neuroscience images, organized by Neil A. Busis, M.D.*
- *An illustrated neuroscience tutorial, created by Diana Molavi for medical students at the Washington University School of Medicine.*
- *Images of limbic system anatomy, provided by the Virtual Hospital, University of Iowa HealthCare.*
- *Papers on consciousness, organized by David Chalmers.*
- *Papers on personal identity, organized by David Chalmers.*
- *Papers on artificial intelligence, organized by David Chalmers.*
- *Symposium on David LaBerge's "Triangular Circuit Of Attention."*
- *Bernard Baars: "In the Theatre of Consciousness."*
- *Bruce Mangan's commentary on Baars' contrastive analysis of conscious processes.*
- *James Newman: "Thalamocortical Foundations of Conscious Experience."*
- *"Conscious Mattie" — intelligent agent software based upon Baars' Global Workspace theory.*
- *John G. Taylor: "Constructing the Relational Mind."*
- *David Papineau: "Mind the Gap."*

[51] I should note that subjectivity lies at the core of intentionality. Some philosophers consider intentionality to be a criterion of personal identity — where an "intentional stance" is understood (after Brentano) as "the direction of the mind on an object." Here we see that the distinction between self and object is a requirement of intentionality. It follows that subjectivity is really the more fundamental criterion. (This observation is unoriginal. See, for example, Gennaro 107: "[I]ntentional states (conscious or not) are irreducibly subjective.")

For historical reviews and contemporary explorations of the proposed criteria of personal identity, see Perry, *Personal Identity*; Noonan, *Personal Identity*. For an insightful critique of several proposed criteria, see Shalom, *The Body/Mind Conceptual Framework & The Problem of Personal Identity*. See also, *papers on personal identity, organized by David Chalmers.*
[52] Fuster 212-13.
[53] Clinical studies of medical subject H. M. detail a famous real-world example of perpetual memory loss. For a description of H. M.'s memory deficiency see Milner, Squire, and Kandel 447-53.

Chapter 9
Existential Passage

Now we're drawing close to the metaphysical lock. The material of this chapter will walk us right to it.

An extended quotation from William James' *Principles of Psychology* introduces the concept of the "stream of thought." James will preface this germinal and perennially popular[1] concept with a treatment of "time-gaps"; first treating time-gaps which are not perceived during the conscious daylight hours, and then dealing with time-gaps which are dimly perceived upon waking from sleep. James' recognition of time-gaps, and the mind's ability to maintain continuity in spite of them, long ago raised this treatise to the status of a landmark in the history of psychology.

As we advance into this chapter we will orient ourselves continually by James' trusted landmark.

Here is the stream of thought, as first argued in William James' 1890 masterwork, the *Principles of Psychology*:

> *...Within Each Personal Consciousness, Thought is Sensibly Continuous*
>
> I can only define 'continuous' as that which is without breach, crack, or division. ...The only breaches that can well be conceived to occur within the limits of a single mind would either be *interruptions*, time-gaps during which the consciousness went out altogether to come into existence again at a later moment; or they would be breaks in the *quality*, or content, of the thought, so abrupt that the segment that followed had no connection whatever with the one that went before. The proposition that within each personal consciousness thought feels continuous, means two things:
>
> 1. That even where there is a time-gap the consciousness after it feels as if it belonged together with the consciousness before it, as another part of the same self;
>
> 2. That the changes from one moment to another in the quality of the consciousness are never absolutely abrupt.

[In an earlier chapter] we saw that such time-gaps existed, and that they might be more numerous than is usually supposed. If the consciousness is not aware of them, it cannot feel them as interruptions. In the unconsciousness produced by nitrous oxide and other anaesthetics, in that of epilepsy and fainting, the broken edges of the sentient life may meet and merge over the gap, much as the feelings of space of the opposite margins of the 'blind spot' meet and merge over that objective interruption to the sensitiveness of the eye. Such consciousness as this, whatever it be for the onlooking psychologist, is for itself unbroken. It *feels* unbroken; a waking day of it is sensibly a unit as long as that day lasts, in the sense in which the hours themselves are units, as having all their parts next to each other, with no intrusive alien substance between. To expect the consciousness to feel the interruptions of its objective continuity as gaps, would be like expecting the eye to feel a gap of silence because it does not hear, or the ear to feel a gap of darkness because it does not see. So much for the gaps that are unfelt.

With the felt gaps the case is different. On waking from sleep, we usually know that we have been unconscious, and we often have an accurate judgment of how long. The judgment here is certainly an inference from sensible signs, and its ease is due to long practice in the particular field. The result of it, however, is that the consciousness is, *for itself*, not what it was in the former case, but interrupted and continuous, in the mere time-sense of the words. But in the other sense of continuity, the sense of the parts being inwardly connected and belonging together because they are parts of a common whole, the consciousness remains sensibly continuous and one. What now is the common whole? The natural name for it is *myself*, *I*, or *me*.

When Paul and Peter wake up in the same bed, and recognize that they have been asleep, each one of them mentally reaches back and makes connection with but *one* of the two streams of thought which were broken by the sleeping hours. As the current of an electrode buried in the ground unerringly finds its way to its own similarly buried mate, across no matter how much intervening earth; so Peter's present instantly finds out Peter's past, and never by mistake knits itself on to that of Paul. Paul's thought in turn is as little liable to go astray. The past thought of Peter is appropriated by the present Peter alone.... He *remembers* his own states, whilst he only *conceives* Paul's. Remembrance is like direct feeling; its object is suffused with a warmth and intimacy to which no object of mere conception ever attains. ...[W]hatever past feelings appear with those qualities must be admitted to receive the greeting of the present mental state, to be owned by it, and accepted as belonging together with it in a common self. This

> community of self is what the time-gap cannot break in twain, and is why a present thought, although not ignorant of the time-gap, can still regard itself as continuous with certain chosen portions of the past.
>
> Consciousness, then, does not appear to itself chopped up in bits. Such words as 'chain' or 'train' do not describe it fitly as it presents itself in the first instance. It is nothing jointed; it flows. A 'river' or a 'stream' are the metaphors by which it is most naturally described. *In talking of it hereafter, let us call it the stream of thought, of consciousness, or of subjective life*.[2]

James illustrates with the waking of Peter and Paul a faculty of the living body which is so much taken for granted as to be almost beneath comment. This faculty is just the brain's ability to maintain a stream of thought perpetually, through all the vicissitudes of life.

James speaks of thoughts as "broken by the sleeping hours." Now, in the interest of accuracy we should note that modern measurements have shown brain activity to continue unbroken during sleep. Neural currents never halt entirely: in sleep they only continue in a mode of passive somatosensory awareness less capable than waking thought.[3] I interject this fact with supporting endnote as a small caveat. James' illustration still has value for us, even with this correction affixed.

Recovering now from the caveat: we read in James' text his *awe* of the mind's ability to overcome conscious disruptions; not only the common disruption of sleep, but also the time-gaps induced by anesthesia, epilepsy and fainting. All these it overcomes by "knitting" present and past thoughts back into a sensibly continuous whole.

That whole, it should be reiterated, is only a *subjective* whole. If I might elaborate on James' celebrated treatise:

James understood that the time-gaps which afflict our minds mark off intervals of time whose reality is independent of our imperfect perception of those intervals. Sleep, anesthesia, fainting and so forth — these disruptions only cause the mind to "lose track of time." The duration of the time "lost" can be measured *objectively*, with clocks. But the unconscious mind is ignorant of this objective view, having access to no clock other than the *subjective*, or internal one. When a man "gets his clock cleaned," as they say, he may be unaware of the interval of time which passes as he staggers through a time-gap. Regardless of the extent of the disruption, from his subjective vantage the stream of thought presents itself as entirely continuous and whole.

The stream of thought perceives itself as continuous and whole just because the mind is never more than dimly aware of subconscious and unconscious states. Its lapsing oversight is a consequence of physiologic limitation, rather than any active power — *Table 8.1* [4] has confirmed this inference at a phenomenal level. So the perceived wholeness across time-gaps is only a faculty of inactivity. James' treatise invokes analogous physiologic limitations by way of an explanation:

> To expect the consciousness to feel the interruptions... as gaps, would be like expecting the eye to feel a gap of silence because it does not hear, or the ear to feel a gap of darkness because it does not see.[5]

James' Peter-and-Paul illustration stresses the reliability of this faculty. I'd like to revisit James' illustration and adapt it to the needs of the present thesis.

As James drew them, Peter and Paul "forgot themselves" as they slumbered. When they awoke, they remembered themselves by quickly restoring their distinctive psychological states (and, by inference, their personal identities).

But what could we say of Paul were he to suffer a stroke as he slept, losing some memories as a consequence of epileptic brain damage? Would the injured Paul wake to the same fullness of self as the uninjured Peter? Probably he would not. Remembrance in Paul would be weakened, and therefore he would not know himself so fully as Peter would. Some events of Paul's past would no longer exist within his consciousness; or, to use James' preferred phrase, within his "community of self."

Of course, Peter might thereupon choose to help Paul re-learn those memories which injury had erased. He could re-educate Paul in the stories of lost events. But even after re-education, Paul would not, we may think, feel a strong attachment to events now known only through stories. Paul's regained memories would not have that "warmth and intimacy" which they had enjoyed before, when they were undoubtedly his own. (Sadly, this hypothetical state is only a common element of the deep impairments known from clinical study to be attendant parietal lobe injury.)[6]

But going further: what if Paul's stroke should prove even *more* severe? What if it were to *entirely* destroy the tissues of long-term memory during a coma blackout, and leave him unable to recall his past upon waking? In this extreme case his power of remembrance would be helpless to "reconnect" his past: he would wake as an amnesiac. Upon waking he would have to discover himself anew, as a new man. And if Peter were to relate some stories from Paul's past which seemed to the new man unpleasant or embarrassing, this new man might even be inclined to *separate* himself from Paul by changing his appearance and behavior, or by taking a new name. I'll refer to this transformed man as "New Paul," in contrast with "Old Paul," who would be no more.

Looking to New Paul's future we can see that the only memories which will hold a warmth and intimacy for him will be those memories recorded through personal experience *after* waking. These new memories will be part and parcel with his new personal identity.

Even so, we might wonder if our Old Paul yet requires something of the new: some psychological debt to be paid, or vow to be kept. Let's consider the question from an observer's perspective. We, being outside observers, can still remember the man whom the new Paul has forgotten. We know that the old Paul

has passed imperceptibly into the new. Our *objective* vantage allows us to see that this passage has happened. And perhaps this inclines us to think that the new Paul must be obliged to rebuild himself in the image of the old Paul. This, in tribute to the life that has been lost.

But this opinion would likely be mistaken. The *subjective* experience of New Paul would be no different from Adam's, really. He would arrive on the scene ignorant of all that exists, not unlike the proverbial First Man. Since this New Paul would be, for all intents and purposes, a new man, he would not be under any special obligation to the old Paul. Old Paul would be to him no more kindred than any other stranger.

By this reasoning we may decide, correctly I think, to grant independence to the new Paul. The body New Paul inhabits should now be his own, even though it had been Old Paul's before. Likewise, all properties and other assets should transfer free of obligation. With these tools the new Paul can build a new life.

Perhaps out of courtesy Peter should give this new Paul the option of living without knowledge of the old.

We'll open a broader perspective on personal identity by contemplating another, simpler story. I'll present this new story, and then I'll return to compare it against our story of Old and New Paul. The comparison will be instructive, I think.

As a fresh "thought experiment" I'd like to conjure up an Aegean idyll. The stage for the idyll will be a land set apart from the rest of Creation: it is a quiet meadow. The meadow is bordered by hills at left and a grove at right; just so:

Fig. 9.1

I'll place some conditions on the life in this little universe. The land provides life to plants alone, and to no animals or persons at all. It is a vegetative cosmos — with one exception: a small house will now open onto the meadow. It is home to a noble Greek couple: the veteran Nicos and his wife, Casta. I'll add their house in Figure 9.2.

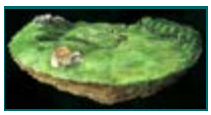

Fig. 9.2

Here the two live in calm isolation. They enjoy life as vegetarians, and in peace. For many years they carry on thus, living without the company of other persons or animals, for their cosmos contains no other inhabitants.

In time Nicos succumbs to old age and passes away in his sleep. Casta performs the rituals in his honor, and being still healthy she lives on in solitude. This solitude ends nine months later, when Casta gives birth to Nicos' son, Thanos, whom she had conceived shortly before Nicos' death. Casta will raise Thanos within their

idyllic meadow home.

The Aegean idyll has now told a spare story of three lives involved in a death and a birth. The illustration below abstracts those lives into timelines of existence. Each thick white line symbolizes the temporal extent of a life in the idyll. Time flows from left to right. We see again that Nicos passes away before the birth of Thanos, and that Casta lives throughout the full duration of the story.

Fig. 9.3
Timelines for Nicos, Casta and Thanos

We will come across this illustration again, later in the essay. For now, we can note that the idyll's text and imagery present only *visible* facts of the idyllic cosmos. The story has not yet spoken to the subjective, interior, reality of the characters. And this will be the next task: to sketch some essentials of the subjective experiences of their lives.

The sketch will incorporate James' ideas, and also the deductions we still hold as our metaphysical keys. Again, those keys are *complete mortality* and the *corporeal basis of personal identity*.

So, peering first into the life of Nicos:

His is a robust soul. By day he enjoys the full powers of mind: an unbroken stream of thought, subjective awareness, remembrance of a noble life's events, and so forth. Each night heavy slumber deprives him for a time of these mental faculties and intersperses dim time-gaps into his rest. Morning follows night, and the waking Nicos remembers himself by reaching back into his store of memory, re-acquainting his mind with familiar thoughts and sensations. A sweet breeze off the meadow stirs thoughts of wife and home, and he awakes.

This is the daily cycle of Nicos' conscious experience. It continues without subjective disruption for the duration of his life.

And then, on the appointed night, Nicos passes away in his sleep. What can be said of his subjective experience on this night? We can imagine the outline of it. The night begins like every previous night, with a heavy slumber. And in that slumber Nicos lives through dim time-gaps. But this night one time-gap does not end with a restoration of consciousness. Instead the dimly-felt, subconscious time-gap of sleep descends to an unfelt, unconscious level. There it continues, unfelt, unperceived, into the hour of his life's cessation; wherein he dies.

As Nicos is understood to be completely mortal, death entirely unravels his personal identity. It empties his store of memory and halts the inertial whirl of subjectivity. At the very end his continuous mesh of neural structures crumbles, making the loss irreversible.

All three criteria of personal identity have now failed him.

Objectively we see that his body is no longer animate. We say that Nicos no longer lives.

But to say that Nicos "no longer lives" is to state a purely objective, external view of his death. Nicos' subjective, internal view would at this time be entirely ignorant of the view without. By the understanding we have developed in previous chapters we can say with good reason that Nicos' subjective view must be quite different from the objective view — our modern understanding of personal identity requires this distinction. The two different views, subjective and objective, do not overlap; and this fact compels us to consider Nicos' subjective view as a "thing-in-itself," knowable only on its *own* terms.

So, imagining Nicos' viewpoint alone, we ignore the outward appearance of the matter and focus on the purely subjective experience which Nicos should be expected to encounter. What can we say of the moment when personal identity finally fails him? At that moment Nicos' subjective experience is suspended — *in toto* — by the functional disruption of death. This suspension is still understood most readily as an unfelt time-gap. Nicos' subjective experience of death is thereby reduced to an elemental, which is just this:

Subjectively, Nicos' unfelt time-gap *continues*, indefinitely.

No other subjective experience would be consistent with James' stream-of-thought psychology. Nor would another experience square with the conditions of complete mortality and personal identity.

This particular time-gap is unusual in that it is open-ended. Nicos' inanimate body cannot restore subjectivity to Nicos in future; as a result, it cannot end the time-gap which Nicos' death has initiated.

Hereafter I will refer to this special type of unfelt time-gap as a "mortal amnesia": it is the forgetfulness of existence we can associate with failure of the criteria of personal identity. By prior reasoning this amnesia is irreversible. Having encountered mortal amnesia, Nicos afterwards lacks the means of perceiving any aspect of his condition, or of recovering in future any of the memories which death has destroyed.

This is the deepest, most engulfing time-gap which Nicos can encounter; for here no subconscious or unconscious thoughts can persist to facilitate his recovery. Mortal amnesia casts Nicos into a state of timeless imperception that is indistinguishable from the thoughtless existence we ascribe to inanimate matter — which, indeed, Nicos has now become.

Looking now to Thanos:

Nine months after the death of Nicos, Thanos emerges into the Aegean idyll. Thanos' birth is the first to grace their cosmos since the loss of Nicos.

The newborn encounters his first experience of life: light, noise, and a hard rush of air into new lungs. His personal identity is still a blank slate. In these first moments of life his only knowledge is an innate, instinctive understanding of life's basic needs. But that knowledge is common to all living creatures — Thanos' *unique* memory of life will come in future, as the stream of thought deposits its silt of memories in his forming mind.

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next Section 2 of 3

Chapter 9, Section 1 Endnotes

[1] James' concept is more popularly known by its lengthier equivalent, the "stream of consciousness." The concept's enduring popularity is reflected in its common usage. Newman, Baars and Cho provide a salient example on page 1202 of their *cited article*, wherein the authors refer to consciousness as a "coherent stream of conscious representations." For a recent (1992) multi-disciplinary defense of James' 1890 stream-of-thought treatise, see Owen Flanagan, *Consciousness Reconsidered* (Cambridge, Massachusetts: The MIT Press) 153-75, Chapter 8. For a concise evaluation of the *Principles of Psychology*, see Robert Wozniak's *online introduction*.

[2] William James, "The Stream of Thought," *The Writings of William James*, ed. John J. McDermott (Chicago: University of Chicago Press, 1977) 31-33.

[3] Passive awareness of the somatosensory system persists even in deepest sleep, which is why a midnight thumbprick, or a distress of internal organs, will register in the slumbering brain and elicit groggy response. The unbroken neural currents of somatosensory awareness link *postcentral gyrus* and *thalamus* especially tightly, without interruption, day and night. Articles exploring the neural basis of sleep have been collected by Jerome M. Siegel, and are *available online*. Functional differences between the waking and sleeping brain are detailed in a good *neuroscience tutorial*, courtesy of Diana Molavi. For an overview of memory-related activity during sleep, see Fuster 284-88. For a simulation of memory recall during sleep, see Bin Shen and Bruce L. McNaughton, "Modeling the Spontaneous Reactivation of Experience-Specific Hippocampal Cell Assemblies During Sleep," *Hippocampus* 6:6 (1996): 685-92.

[4] The confirmation is most explicit in the listing of emergent features. When mental function drops from the highest emergent level of the hierarchy, phenomenal experience invariably lapses.

[5] James, *The Writings of William James* 32.

[6] A lucid case study of parietal lobe injury can be found in A. R. Luria, *The Man With a Shattered World: The History of a Brain*

Wound (New York: Basic Books, 1972).

Chapter 9
Existential Passage

continued, Section 2 of 3

Let's bring to mind again our extended version of the story of Peter and Paul. In that final version Old Paul loses all memory during sleep, due to a stroke. He wakes amnesiac as a new man; as New Paul.

Now we can compare this story with the Aegean idyll. Specifically, we will compare the subjective conditions of Old Paul and New Paul to those of the deceased Nicos and the living Thanos.

First, comparing Thanos to the new Paul: how does Thanos' subjective condition compare with New Paul's?

- The infant Thanos is amnesiac, in that he remembers no past. The same is true of New Paul.
- Thanos is gifted with a body and subjective awareness that are new to him. The same is true of New Paul.

We can see that Thanos and the new Paul experience the same subjective conditions at the start of their respective lives.

Now, comparing Nicos to the old Paul: how does Nicos' subjective condition compare with Old Paul's?

- Nicos has lost all memory during sleep, irretrievably. The same is true of Old Paul.
- Nicos encounters an unfelt time-gap following the loss of memory. The same is true of Old Paul.
- Nicos' subjective awareness is suspended in the time-gap. The same is true of Old Paul.

We can see that Nicos and the old Paul experience the same subjective conditions at the end of their respective lives.

Perhaps the ontology of the "two Pauls" is more tractable than that

of Nicos and Thanos. We do not fail to grasp that the new, waking Paul is a continuation of the old, forgotten Paul. The new Paul cannot know this, as his subjective vantage restricts his view to the stream of thought continuous with his new memories of self. But from our objective vantage we see enough to understand that the old Paul has passed through an instantaneous amnesia to the new.

The passage is simply an unfelt time-gap. The time-gap has begun with Old Paul's injury, and it has ended with New Paul's recovery. Consequently, the amnesiac New Paul lives unknowingly as a continuation of the life of Old Paul.

The same conditions afflict Nicos and Thanos. Here the details of Nicos' subjective condition correspond with those of Old Paul. His mortal amnesia is just as irreversible as the amnesia which the old Paul has suffered during his injurious sleep. Similarly, Thanos' birth corresponds with New Paul's awakening in all its subjective details. His infantile amnesia[7] is as complete as New Paul's own amnesia.

The underlying time-gap conditions also correspond. Nicos' death — a cessation of subjectivity — is the beginning of an unfelt time-gap; and Thanos' birth — subjectivity's restoration — is the very condition whereby any unfelt time-gap ends.

What can we infer from these similarities?

The direct inference: Nicos' supposedly interminable time-gap has actually reached its end with Thanos' birth. Nicos has passed, imperceptibly, to Thanos; and the amnesiac new man who is Thanos lives unknowingly as a continuation of the life of his father Nicos.

I'll record this transmigration by marking it on the timeline illustration in red.

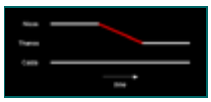

Fig. 9.4
Transmigration of Nicos to Thanos

Keys spin. Tumblers drop. And the ebony wall dissolves to smoke, curling away on a zephyr.

We have reached this essay's first novel result. The result may surprise some readers, and in some quarters it may be unwelcome. Even so, readers who've followed the argument thus far can grant that the transmigration is neither a spurious assertion nor a gratuitous conjecture. We find it instead to be a direct application of this essay's theory to those specific conditions which have been written into the Aegean idyll. As such it makes sense.

This result — Nicos' passage to Thanos — is our point of departure into Metaphysics by Default. What can we see of the metaphysics now, at the outset? We return to its metaphor. In our mind's eye the ebony wall is gone. Where it once stood now runs the river Lethe; the river whose clear waters, once drunk, cause forgetfulness of the past. We stand on the river's near bank, at the end of this life. The river's far bank is birth into the next. In the spirit of the metaphor we can say that Nicos has dipped into the river, emerging at the far bank as Thanos.

Which is all very archetypal and literary — but here I should restate the idea plainly, lest metaphors obscure my meaning. The literal truth of the passage mechanism is that the passage is understood as nothing more than an unfelt time-gap. It's a purely *subjective* event — a natural relocation of the awareness of existence.

This passage mechanism is a modern novelty. But there is more to Metaphysics by Default than the passage mechanism itself. There is precedent to consider, as well as a distinctive set of properties unique to this new metaphysics. If I might set the passage mechanism within a pedagogic structure (allowing myself imagery once again), I'd like to think of it as a philosopher's first "stepping stone" across the river Lethe. There will be four more stepping stones strewn out beyond the first: we should take each in turn. When we've tested all five stepping stones Metaphysics by Default will extend beneath us as a completed philosophical path across the river.

I will invoke this philosophical simile periodically as we progress through the remainder of the essay, working through chapters as across stepping stones. But the first step on a path is always the hardest. We need to be more certain of this first step. Once we've secured it we can move on. What is to be done?

First off, we should consider some objections to the transmigration philosophy. Any number of objections are possible at this early stage of development, but with an eye towards relevance I'll focus on those objections I think readers are most likely to encounter hereafter. I will present and answer just three potential objections within the confines of this chapter.

My philosophical macrame may yet grow tedious. To relieve the tedium I will wrap up this chapter's argument with a final metaphor, a narrative. This concluding narrative will release the passage mechanism to its more proper visual setting, which is inherently fluid and boundless. I hope the narrative suggests to the reader a thoroughly naturalistic vision of passage. This vision can justify the mechanism at a level of high intuition, intuition which tedious argument informs but cannot by itself attain.

Now on to the three potential objections, and replies to same.

In this chapter we have compared the conditions of existence encountered by the participants of two different stories. Thanos and New Paul were shown to experience equivalent subjective conditions. And Nicos and Old Paul were also shown to experience equivalent subjective conditions. These equivalences made the passage of Nicos to Thanos tenable.

There *are* some differences between the two stories. The argument de-emphasized them, but they cannot be ignored. Let's call up the characters again and see how they differ:

The most notable difference may be found in the premise that Old Paul and New Paul share the same, common body, whereas

Nicos and Thanos do not. Nicos and Thanos are entirely unique individuals: they have separate bodies. In the idyll this difference is a given — but would this difference present difficulties in the real world? Might it, in some way yet unstated, block passage? Many readers may find inside these questions some fragments of an objection to the new philosophy, so the objection deserves consideration:

To begin with, we know that the bodies of Nicos and Thanos must be different. The objective reality of this difference is beyond dispute, but its relevance to the passage event is not. Let's think back to James' original story, wherein Peter and Paul awake and "reach back" to their respective streams of thought. As James surmises the process:

> When Paul and Peter wake up in the same bed, and recognize that they have been asleep, each one of them mentally reaches back and makes connection with but *one* of the two streams of thought which were broken by the sleeping hours. As the current of an electrode buried in the ground unerringly finds its way to its own similarly buried mate, across no matter how much intervening earth; so Peter's present instantly finds out Peter's past, and never by mistake knits itself on to that of Paul. Paul's thought in turn is as little liable to go astray.[8]

As I've noted *earlier in this chapter*, James' understanding of the physiology of sleep is not entirely correct. Thought continues during sleep, if only in a mode of *passive somatosensory awareness*. The stream of thought is not broken or halted by sleep, contrary to James' conjecture. His introduction of the electrode metaphor only confuses matters. As no "break" actually exists to be mended, the electrode metaphor is devoid of explanatory value.

So what is actually happening to Peter? We're closer to the truth if we say that Peter wakes *as Peter* because his stream of thought has persisted all through the night. As it happens, that stream of thought has remained all night within his own body — specifically, within the neural structures which remain active during sleep. These structures are inclusive of the cortical episodic memory structures essential to self-knowledge. Consequently Peter wakes, as himself, in his own, familiar body.

Likewise with Paul, who also wakes to his own body.

This is the most direct explanation of the gentlemen's "unerring" ability to wake to their correct bodies.

So true breaks, or unfelt time-gaps, are easier said than done; hence the need for Old and New Paul.

As I have modified James' story, Old Paul suffers a stroke during the night. The injury destroys his long-term memories, and he wakes amnesiac, as New Paul. But why exactly do we think that Old Paul *must* pass imperceptibly into the new? The stream of thought concept helps us here again:

We may suppose in this case that Old Paul's stream of thought has been disrupted momentarily — *in toto* — by the stroke. We take it to be an extreme situation, one in which a *complete* break in thought can be hypothesized to occur during life. The break throws Old Paul into a deep, utterly unfelt time-gap until the damaged brain can restore its swirl of neural current. When the restoration is finished he can awake. He wakes as the amnesiac New Paul.

In this story Old Paul's stream of thought has halted momentarily within his body. Shortly thereafter New Paul's stream of thought has commenced within that *same* body. Subjectively, an unfelt time-gap begins when Old Paul's stream of thought halts, and it ends when New Paul's stream of thought commences. These two terminals[9] of the unfelt time-gap (its beginning and ending coordinates) define the time-gap uniquely. Between the terminals lies a period of inactivity: a full cessation of thought.

In this story both terminals are found down inside the single body of "all-Paul." Since both terminals are located within that one body, we conclude that the thoughts of Old Paul must merge across the time-gap into the thoughts of New Paul. Any other conclusion would contradict our common understanding of the psychological events described.

The story of Nicos and Thanos matches the story of Old and New Paul in its temporal, functional, subjective details. The only significant difference is that the time-gap fashioned by Old and New Paul had its terminals inside a *single* body, whereas the time-gap fashioned by Nicos and Thanos has its terminals inside two *different* bodies.

Focusing on this new time-gap:

Nicos' stream of thought halts — permanently — inside his own body. Hence Nicos' body is the location of the beginning terminus of his unfelt time-gap. The only *ending* terminus available thereafter is the one located in *Thanos'* body. We find it there because Thanos' stream of thought commences inside Thanos' body, rather than Nicos'.

Now, we have no reason to deny Nicos access to that ending terminus. Indeed, James' stream-of-thought paradigm offers the insensate Nicos no alternative to Thanos' terminus — it is Nicos' only subjective option after death.

We should not expect Nicos to resist Thanos' terminus from within death's unfelt time-gap. Such an expectation would be, as James unintentionally suggests, like "expecting the eye to feel a gap of silence," or "the ear to feel a gap of darkness." These are impossibilities: an organ of perception cannot escape its essential function. Likewise, an unfelt time-gap cannot escape the terminals which define it. Whenever two terminals delimit a period of complete inactivity, they define an unfelt time-gap — one which would seem to operate without regard for irrelevant particulars, such as the *name* assigned to the subjective function at either terminus.

Of course, each particular body *is* unique, hence named. Subjectivity, however, is a *universal*: a ubiquitous and purposeful neuropsychological state. (This understanding is supported by the functional knowledge I've cited in the *previous chapter*.) Subjectivity comes to fruition always by common means and with common traits, as any universal must.

In daily life subjectivity's universality is entrained continuously within the particulars of an individual: subjective awareness brings to mind the individual's unique thoughts, such as the events of episodic memory. Each subjective time-gap is felt by the individual, and each pertains to the unique individual only — in daily life.

Now *in extremis* — at subjective terminals demarking the beginning or end of complete inactivity — the individual's unique particulars are inaccessible. At death the requisite neural continuity is disbanding; at birth, banding together. At these extreme terminals individual uniqueness cannot pertain: the thalamocortical subjective state is at such transitional moments isolated from, say, the hippocampus and its unique content of memory. Subjectivity *in extremis* lacks the continuity and content of individuation.

Yet the terminals remain, and although extreme terminals may be thought effectively indistinguishable in their universal subjective aspect, each terminus does retain one distinction: its unique spatio-temporal coordinates. Each terminus still exists, uniquely in space and time. Only *individuation* is lost here; a loss rendering infeasible the individual's felt time-gap. The terminal pair does still satisfy the temporal and functional conditions of an *unfelt* time-gap. Given that individuation is lost, this pairing would be an unfelt and *divided* time-gap. (Divided in the sense of antonym to the individuated case.)

So. Old and New Paul have jointly defined one divided, unfelt time-gap. Nicos and Thanos have defined another. Under the postulated conditions Thanos' ending terminus presents itself as an adequate match for Nicos' beginning terminus.

We can conclude that the ending terminus of Nicos' time-gap will be located within Thanos' body. Consequently, Nicos' thoughts can be expected to merge imperceptibly across the time-gap into those of Thanos. As was the case with Old and New Paul, any other conclusion would contradict a straightforward reading of the psychological events described.

This reasoning answers the first objection. The answer is minimally sufficient as it stands, but the stream-of-thought reasoning will be strengthened by the reply to a second objection. This reply will tap the concept of personal identity in order to build a more encompassing argument.

A second and similar objection concerns the slippery transfer of thought between lives.

The "transfer" of Nicos' thoughts (and, by inference, personal identity) to Thanos seems in a way *too easy*. If we grant that a subjective passage from Nicos to Thanos is possible, it remains to be demonstrated that Nicos' passage to Thanos is the *only one* possible. Why should Nicos not pass to Casta, for example? Or to some person who might walk into their idyllic cosmos some hundreds of years hence? This objection asks for a justification of the claim that Thanos, in particular, *must* receive the passage.

We can build a reply to this objection by making use of a prior result, in which we found that personal identity is fashioned out of the three Great Criteria exclusively: emerging through the bodily

dynamics of continuity, subjectivity, memory — and nothing else. Insofar as personal identity appears to be wholly dependent upon those corporeal criteria for its being, it must follow those criteria where they lead. If the three criteria operate within a particular body, personal identity adheres faithfully to that body: it has no choice but to do so. If the three criteria should fail in one body and emerge anew at a later time in another, the experience of personal identity would then have no choice but to transition from one body to the other. This is only a consequence of the supposed primacy of the three criteria.

In the Aegean idyll Thanos is the first and only person to begin life after Nicos' death. It is for this reason that Nicos is thought to pass specifically to Thanos: not because of the filial relation, which is irrelevant, but only because Thanos is the *first*. As reasoned previously, Thanos' terminus adequately satisfies the temporal and functional requirements for an ending to Nicos' unfelt time-gap. More generally we might say now that Thanos' new personal identity criteria are naturally sufficient to continue the old personal identity criteria of Nicos. Thanos' birth, the first restoration of subjectivity, is also the first restoration of personal identity. Said either way, the meaning is much the same:[10] Thanos' appearance as the *first* newborn after Nicos' death is the temporal condition which must be met if Thanos is to be the recipient.

Being first, Thanos is naturally positioned to receive the passage.

It is important to state again that no incorporeal substance is posited as transferring between Nicos and Thanos. Any suggestion of incorporeality would be duplicitous at this point, in light of what has been said heretofore. So incorporeal transfers are not to be inferred.

Much the same restriction must be placed on physical transfers. Thanos is Nicos' posthumous son, but this filial link is not relevant to the metaphysical event. Nicos' spermatic seed conveys no memory of Nicos' life to the newborn. We still assume Nicos' memories to have been lost irretrievably at death. No "thing" is imagined to have transferred any memory, or personality, or soul, or any psychic entity whatsoever from Nicos to Thanos.

The passage is understood as unfelt time-gap, with nothing superadded — rather, and critically, with individuation *subtracted*. All that has "passed" is a shift of perceived existential "moment" — a natural relocation of the awareness of existence. It is in this sense an "existential passage" which Nicos encounters, and I will refer to it as existential passage in subsequent chapters of this essay.

Perhaps it would be helpful to contemplate awareness again:

Living minds exhibit subjective awareness of existence. This awareness is attained by thalamocortical mechanisms such as those sketched in *Chapter 8*. We'd invite confusion were we to assert that Nicos' awareness could in any way persist apart from his living body. Such an assertion would not make sense, given what is known

about the phenomenon of awareness. As life generates awareness, that awareness exists only where life makes it be. Likewise the individuation attendant awareness. And so if, following Nicos' death, awareness should first come into being again with Thanos, it is metaphysically parsimonious to infer that Nicos would then *be* where Thanos *is* — an amnesiac, relocated.

Contrary assertions do invite confusion. How after all could awareness or individuation persist apart from the living body? How could awareness or individuation command the ontologic issue at those times when they do not exist? I think they cannot. No, such assertions, when made explicit, seem always to confuse themselves. To clear the confusion one must posit additional, unjustified metaphysical entities or assumptions: an unavoidable "multiplication beyond necessity," subject to Occam's Razor. The parsimonious reasoning of existential passage fares better on this score.

Awareness folds into personal identity as subjectivity. Considering now personal identity after Thanos' birth: any person born into the idyll *after Thanos' birth* must be denied the possibility of receiving Nicos' existential passage. Nicos would by that time have passed already to Thanos. From the time of passage onward Thanos would maintain the continuity, subjectivity and memory which guarantee that the resumed personal identity stays with him, defining him, for life.

This last point also explains why Nicos' wife Casta is not thought to participate in the passage. Displaying the timelines again:

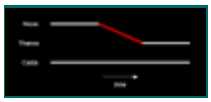

Fig. 9.5
Transmigration of Nicos to Thanos

We see again in Figure 9.5 that Casta has lived throughout the story. She has maintained her own personal identity — before, during, and after the existential passage of Nicos to Thanos. Being thus continuously individuated and self-contained, Casta cannot receive a passage which requires, by the nature of passage terminus, that the recipient *lack* such continuity and individuation. A recipient must be new to the world; new in the sense that the criteria of personal identity find in the recipient a ready apparatus which has not cohered continuously before.

This reasoning is reply to the second objection.

A third objection can be raised, and this objection is unlike the previous two. It is built along the lines of a skeptical argument, and it asks:

> How can we know that the three criteria of personal identity, as stated, are the *only* three which exist? What assurance do we have that others will not appear in

future to cast doubt upon existential passage?

This objection raises the possibility that some additional criteria may be involved in personal identity; criteria which, should they exist, might invalidate the original deduction that Nicos passes to Thanos.

Of course, any criteria found to be even partially corporeal add their weight to the case for existential passage. Moreover, a historical review of the concept of personal identity[11] assures us that the three Great Criteria from Chapter 8 cover the subject as it is known today. But even so, the skeptical argument cannot be rebutted with complete certainty, simply because our knowledge of abstract concepts will always be less certain than our knowledge of concrete tangibles. Perhaps in this context it would be helpful to imagine some of the changes which our knowledge of a tangible object might undergo, over the course of civilized time.

Consider a stone:

Some three thousand years ago a gray metallic stone enters the civilized world as a farmer's talisman. In time that talisman finds use as a tradesman's magnetic lodestone. Later on, a naturalist recognizes it as a meteorite. And thereafter a geologist determines that the meteorite is actually a Martian soil sample.

Here our understanding of a stone has matured, transmuting the stone with each twist and turn of thought along the way. And who is to say that our understanding will not continue to mature, someday transmuting that stone yet again? We cannot rule out the possibility. By this example we see just how provisional our knowledge can be, even for a concrete tangible such as a stone.

Abstractions suffer more frequent transmutations than tangible objects. That metallic stone may have undergone four transmutations at the hands of man, over the course of, say, three thousand years; but how many times has the abstraction known as "democracy" transmuted in just the past three *hundred* years? There have been many experiments and amendments: republic, slave state, theocracy, commune, military-industrial complex, the fourth estate, electronic town hall — the list of named changes goes on and on.

This history of change supports the skeptic's objection. It suggests that the obsolescence of personal identity, as an abstraction, is somehow inevitable; and this skepticism discourages us from thinking seriously about the metaphysics implicit in personal identity.

But the skeptical argument claims too much authority for itself. It predicts changes in a future which no one has yet seen. As few predictions of change come true, we should take with a grain of salt the skeptic's prediction that our concept of personal identity will change markedly at some future time. Not knowing the future, skeptics should refrain from disparaging what is known today.

And there is another weakness to consider, in that the skeptical argument gives too little credit to people who've labored under concepts now outdated. As illustration we can imagine the metallic stone again. Changes in human understanding have transmuted that stone over time. So, should we reprimand the ignorant farmer for

handling it as a mysterious curiosity? No, we should not. The farmer's sense of wonder has led him to notice and enshrine that stone. The tradesman who inherits it from him can thank that farmer for his effort, as can the naturalist and the geologist, on down the line. Each person has made an individual effort, and the sum total of these efforts has preserved a small sample of Martian soil on Earth across millennia.

We should measure philosophies by a similar rule. Each philosopher who has investigated the phenomenon of personal identity has done so within the concepts possible for his or her time. And if we read philosophical (and now, factual) texts in historical order we can see how philosophers' combined efforts have slowly improved our understanding of personal identity beyond the indistinct notions we've entertained from the ancient past.

Moreover, the end-result of these efforts can be more enduring than skeptics would suggest. Personal identity, as an abstraction, has evolved only slowly and with little drama over the past three hundred years. In contrast, we recall that the abstract idea of *democracy* has evolved quite dramatically in that same timeframe, acquiring many new and even contradictory meanings along the way. Personal identity weathered the storms of intellectual fashion with far less damage — a credit to its sturdy physiologic basis, I expect.

John Locke wrote his treatise on the role of memory in personal identity back in 1694. After three hundred years we might naively expect his argument to have been superseded by now. But instead philosophers have only modified it so as to delineate memory types and accommodate special conditions of weakened memory. The central pillar of Locke's argument stands today, buttressed by generations of philosophers who've chosen to reinforce what they inherited.

I hope this view of philosophy can embolden us to reject the skeptical argument, and to persist in fording these metaphysical headwaters — testing our way across, step-by-step, stone-by-stone. Persons looking back from the Olympian future should not excoriate us for undertaking the exploration, provided that we are not harsh ourselves in judging the imperfect maps left behind by our own predecessors.

This concludes the third of three objections, and replies to same.

These point-and-counterpoint arguments have been necessary. They may also have become tedious, as foretold. I'll relieve the tedium somewhat by delivering the awaited "narrative metaphor" for existential passage. I hope the metaphor can appeal directly to intuition and thereby surpass the careful mincing to which I've subjected the patient reader.

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next Section 3 of 3

Chapter 9, Section 2 Endnotes

[7] Fuster 212-13.
[8] James 32.
[9] Here I'm using the word "terminus" in the sense of an "end-point on a transportation line." Unfortunately the plural can also have an unintended meaning, as the "connective points on an electrical circuit." This second meaning should not be inferred, as it brings to mind James' flawed electrode metaphor.
[10] Should Thanos have been born *before* Nicos' death, he would not have received any passage whatsoever; for the same reasons. He would have been "born without a metaphysical past," so to speak. This idea will be developed fully in Chapter 14.
[11] For historical reviews and contemporary explorations of the proposed criteria of personal identity, see *Chapter 8, note 51*.

Chapter 9
Existential Passage

continued, Section 3 of 3

The narrative metaphor:[12]

> Our tour group has rented an outboard for a day of Pacific sightseeing. We putter along the coast, contented. We clear a promontory, and two islands come into view. The islands are much alike: each a shining ring of sand surmounted by palm thicket. A mile of ocean ripples between them.
>
> We dock on the westward island to take our lunch in palmshaded view of its counterpart. A resident greets us and we share lunch with him as he educates us in the fauna of local seas. Then he surprises us. He declares that these two islands are "invisibly connected." They are not two islands at all, he says, but only one.
>
> We wonder if he isn't having a bit of fun with us. After all, the islands are marked on our tourist map as separate geographical entities: no bridge or reef links them. His statement seems incredible. We protest, but he stands by his claim. "Spend the night here," he says. "You'll see for yourselves."
>
> It's a friendly invitation. We take him up on it. Beers and cards are produced, and we practice card tricks in his living room as day rolls into night.
>
> The moon ascends, and our host packs up the cards. "Now, to the invisible connection."
>
> We follow him to the beach, pausing together when the sand softens underfoot. We search the night horizon for the second island, and for the alleged "connection."
>
> When our eyes come to terms with the moonlight, we locate the second island. We see no great change in its appearance. And then we see that our host has pulled off a clever card trick. For while we mastered Vegas shuffling techniques, a spring tide ebb stole in — draining the intervening waters entirely. At this moment the two islands are no longer separated by a mile of shallow ocean. Dry land connects them as one.

The narrative metaphor expresses something of that pre-verbal intuition which has sparked the phrase "existential passage." What

is pre-verbal cannot of course be expressed adequately in words, especially here, at the limit of subjective being. Subject-verb syntax cannot express the subject *in transition*. We can however give some meaningful interpretation to the metaphor.

We can interpret the two islands as representing two personal identities, such as those of Nicos and Thanos. Those identities are distinct throughout the duration of their lives. We have reason to mark them down on the "map of life" as separate islands of being.

But islands are entirely dependent upon the ocean for their existence. When a deep spring tide ebb drains the ocean between them, the islands which were formerly separate merge into one. They remain as one until the ocean returns to divide them. This all occurs effortlessly, by default.

Nicos is likewise dependent on the criteria of personal identity for his (seemingly) independent being. When the criteria fail him at death, he loses his independence; and *by default* he merges across an unfelt time-gap into whichever personal identity next assembles into being.[13]

Now, a note concerning repetition:

Some verbal constructions have been of necessity repeated within this chapter. Repetition can trick us into admitting words with a too-easy familiarity, even if the concepts which those words represent remain mysterious in their details. And I shouldn't want to lull the reader into any such false habituation. If I cannot eradicate the offending pattern altogether, I can correct the deficiency almost as well by alerting the reader to it.

Here is an example: In several passages I have reiterated that Thanos "receives" Nicos' "personal identity" through "existential passage." We should resist the pull of that repetition by bracing to the fact that the words in quotation marks are *not* incantations. They cannot drive the passage event by wordplay. That would be tantamount to "forcing the lock."

The definitions, phrasings and logical inferences of this essay are nothing more than glosses on nature's corpus. *Nature* must drive the passage event, and nature — pervasive, generative, mysterious nature — is capable. Reliable, too; even the very standard of reliability. Where nature assembles necessary and sufficient conditions for a phenomenon, we trust nature to deliver the phenomenon.

That trust applies to essay conditions, as everywhere. Existential passage is plausible only if it is understood to transpire by means as natural and reliable as the ebb and flow of tide.

My interpretation of the tidal metaphor drops a phrase to plumb my thoughts on existential passage. I've spoken of the tide as acting "effortlessly, by default." The phrase, "*by default*," has seemed to me apt enough to deserve permanent attachment to this philosophy. This is why "Metaphysics by Default" is now the chosen name.

"By default" — what pigments of meaning can that phrase brush

across the metaphysics?

One meaning draws from the popular vernacular. When we make a "default assumption" about some subject we are assuming what is most common or most likely true about that subject. This is how we treat subjects which are uncontroversial: subjects which are established and trustworthy in our minds.

The academic knowledge which I have cited in chapters past is mere textbook material. It has been peer-reviewed and discussed in earnest — in some cases over a span of hundreds of years. By this method corporeal existence, delimited by complete mortality and personal identity, has risen to the level of a default assumption in our time. A metaphysics which relies upon corporeal existence can lay honest claim to the title "Metaphysics by Default." The wind is at its back.

In contrast, a metaphysics which would attempt to *contravene* corporeal existence would find itself today bucking a strong headwind. The defense of such a metaphysics would have to address a number of issues, including those raised in this essay. A few hypothetical examples can push some issues to the forefront:

For example: An immortality metaphysics might posit that our memory of life can survive the grave. Now, to support that position the argument would need to demonstrate some means whereby our memories could be recalled sans neocortex and hippocampus. Otherwise the argument would be seen to ignore evidence which speaks against it.

Or perhaps an immortality metaphysics might posit that the corporeal body cannot produce some vital psychological state. To support that position the argument would need to define this psychological state clearly, then make clear the impossibility of any corporeal production, and then propose some incorporeal means of attainment. (This was Proclus' approach.)

Or possibly an immortality metaphysics might deny the putative individuality of each personal identity, blurring living individuals into an undifferentiated One. To support such a trans-personal identity hypothesis, the argument would need to provide evidence of a functional linkage between living minds; or else expose some crippling deficiency in the individualistic criteria of personal identity.

Well, these would all be herculean labors. We can see just how it is that immortality raises so many intractable problems for the modern philosopher.[14]

Metaphysics by Default circumvents these problems. This new transmigration philosophy ventures no immortality conjecture. Instead it uses two natural keys — found in mortality and personal identity — to open a metaphysical lock; deducing a type of transmigration that is not encumbered by the many hard problems of immortality.

Within the philosophy's modern and widely-accepted conceptual framework existential passage occurs naturally, even "by default."

One other application of the word "default" suggests itself. Quoting Cicero:

> Nature is the one who has granted us the loan of our lives, without setting any schedule for repayment. What has one to complain of if she calls in the loan when she will?[15]

Cicero portrays nature as an unpredictable loan shark. She has tossed this loan of life to us unrequested. We lack the means of satisfying nature's usurious demands, and so we simply hold onto the loan until such time as nature will call it in. When that time comes we will do as all have done before us. We will default upon the loan.

This meaning of "default" does also color the philosophy. It is a classical brushstroke which should not be omitted from the finished work. I add it here in order to complete that singular effect which the title "Metaphysics by Default" should rightly convey.

This concludes the preliminary definitions and arguments for Metaphysics by Default. At this point the mechanism of existential passage is secured: understandable and defensible, it's a concept deserving sober thought.

Previously I've spoken of existential passage as a first stepping stone along the philosopher's metaphysical path, and so it is. We have now tested existential passage and determined, I think, that it will support us. We can step onto it and prepare for the next step. Our second stepping stone will be the historical precedent promised back in Chapter 2.

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next Chapter 10: Precedent at Dar al-Hikma

Chapter 9, Section 3 Endnotes

[12] Metaphors are ambiguous, and hence open to eternal re-interpretation. So it should be noted that this author's stated interpretation of this particular metaphor is the only one intended, or even understood, by the author himself. Re-interpretation would create a different metaphor, according to the interest of the interpreter. If this author's role is somewhat analogous to that of an "island resident," it is only by virtue of long acquaintance with the philosophy.

[13] The ambiguity of metaphors should be reiterated. See note 12, above.

[14] Ernest Braham has performed a thorough analysis of some western philosophers' immortality arguments. See Braham, *The Problem of the Self and Immortality: An Estimate and Criticism of the Subject from Descartes to Kant* (London: The Epworth Press, 1925); Braham, *Personality and Immortality in Post-Kantian Thought*. For an introduction to two arguments and their refutations, see *Chapter 7, note 15*.

[15] Cicero, *Tusculan Disputations*, trans. C. D. Yonge (New York: American Book Company, n.d.). Book I, XXXIX.

E-mail the author.
E-mail the webmaster.

Chapter 10
Precedent at Dar al-Hikma

Back in Chapter 2 we began the vignette of al-Kirmani and al-Akhram, only to set it aside for consideration at a later time. Now I'd like to recall these two gentlemen and continue their interrupted history. Both men contribute to Dar al-Hikma's precedent — its harbinger of Metaphysics by Default.

Looking first at al-Kirmani's contribution:

Al-Kirmani was an orthodox Ismaili theologian. His letter of warning to al-Akhram was typical of his attempts to herd radicals back into the fold of convenient orthodoxy. As he scolded al-Akhram he bore down also upon the popular works of Abu Ya'qub al-Sijistani, a tenth-century Neoplatonic Ismaili philosopher. Al-Kirmani's concern with al-Sijistani centered on the man's notion that the soul is "forgetful," in the Neoplatonic sense.[1] Paul Walker illumines al-Sijistani's position:

> The physical world is attractive and the lower preoccupations of the soul hold its attention. Baser soul becomes enmeshed, enthralled, infatuated with the ephemeral effects in momentary pleasures and experiences. The timeless stability of intellect seems less exciting by comparison. As a result soul has a tendency to sink lower and lower, to plunge into material being and the physical world to its ultimate depths. It then becomes forgetful of its spiritual origin.
>
> [Walker comments:] Forgetting in soul implies that there was something to forget, something like a previous existence....[2]

Al-Kirmani was sensitive to a possible heresy in al-Sijistani's position. Walker adds detail to that position, and recounts al-Kirmani's investigation:

> Although al-Sijistani explicitly challenges and rejects transmigration in the extant material written by him, it is hard to confirm his exact view of this particular form of metempsychosis since the very concept of soul "forgetting" and "remembering" presupposes that is [sic] has an existence outside of the individual body to which it is temporarily attached. Without question al-Sijistani recognizes in some manner the concept of soul

> "forgetting" her own world. Does the soul therefore "remember" a previous existence? Does it "forget" its bodily life once it separates from the sensations of physical being? These are additional questions which might indicate the relationship between the soul in body and the soul once freed of body.
>
> The thirty-seventh *iqlid* of *al-Maqalid* asks the latter question in its title: "That Soul when it Separates from the Body Does Any of its Knowledge Cease or Not?" Al-Sijistani's answer is that temporal events and knowledge of them certainly do come to an end because soul once outside of body is not confined either by physical fact or temporal sequence. The discrete facts of a corporeal life no longer possess significance; they cease to exist. The implication is clear: soul no longer remembers its individual, particular existence since it now participates in true, timeless knowledge which is mind itself.
>
> Al-Kirmani noted this problem in his *Riyad* and recorded his own unease with the ideas of al-Sijistani about soul's "forgetting." The implications he sees in this doctrine lead eventually to the objectionable doctrine of transmigration, but al-Kirmani goes on to exonerate al-Sijistani....[3]

What is most noteworthy in all this is the fact that al-Kirmani associated transmigration with al-Sijistani's philosophy of the soul's "forgetfulness." He drew a connection between forgetfulness and transmigration; even though al-Sijistani did not, himself, teach transmigration.

This connection has its parallel in Metaphysics by Default. Back in Chapter 9 we saw how "mortal amnesia" leads to the concept of existential passage. It is a prerequisite of the inference. Should memory loss at the end of life be less than complete, existential passage would be effectively blocked. But a complete mortal amnesia sets up conditions for passage.

So al-Kirmani was right to isolate al-Sijistani's doctrine for careful scrutiny. Then as now, forgetfulness opens the door to transmigration.

But we should not infer that al-Kirmani was himself interested in exploring this fine point of transmigration philosophy. Just the opposite: his pronouncements on the subject were intended to be negative, prohibitory. He could bind forgetfulness to transmigration with a thread of "guilt by association," and that sufficed for the purpose of his orthodox mission.

Al-Akhram is another story. He and his supporters were keen to graft transmigration onto Muslim theology. Neoplatonic philosophy aided their cause.[4] Al-Kirmani was aware of this. He may have refused to answer al-Akhram's question on the soul's nature for fear that a detailed response might give his opponent some advantage in the debate. To be sure, al-Kirmani would have had little to gain by

acquainting al-Akhram with other philosophies supportive of transmigration, such as al-Sijistani's forgetfulness theory. That sort of intellectual matchmaking was not in al-Kirmani's charter.

Al-Akhram died a year after his debate with al-Kirmani.[5] Other leaders took al-Akhram's place in the radical movement, and they went on to canonize the movement's ideas as a formal religious philosophy. That canon has been preserved. It is now a sacred text of the Muehhideen[6] Druze community. The canon is comprised of one hundred and eleven epistles, a few of which discuss transmigration.[7] Most of the canonical transmigration ideas are Neoplatonic — but the text harbors surprises. I reprint extended quotations from Epistle 70 below, with a few notes at the end. The quotations begin with a statement we've seen before, back in Chapter 2:

> It is claimed that the soul was dropped into this world from without, without being apprised of any guilt attached to it.... I say that if this was done as an opportunity for the soul to be refined and purified then this world (earth) in God's justice should have been superior to the place of its regress and defilement.
>
> If it was dropped as retribution for some committed wrong, then this environment fits its guilt and further repentence [sic] and devotion become useless and superfluous for it has already been charged and condemned and is paying in hurt and penance and nothing can change its plight. This environment is set aside, therefore, as an abode of the unclean and cannot be a temple for worship nor a medium for rehabilitation.
>
> If the preceding hypothesis holds and the soul was dropped on earth because of slip, error and sin then the soul will be here for good. No one on earth can live free from error and sin and if error and sin brought the soul to earth the soul's multiplicity of errors and sins in this earthly life will be added reason to continue its residence hereon. The soul will not, therefore, leave this world.
>
> If they admit that the soul thrived in this world and was cleansed and became educated after it was ignorant, then this world where it flourished must be superior to that in which she stumbled, was tainted and fell.
>
> I say what Reason spells out namely: that no honest and perceptive person can but admit that the soul has advanced from ignorance to knowledge in this world despite its errors and trespasses and has no reason whatsoever to abandon it and must perforce elect to stay in it and will return to it every time....[8]
>
> The savants of old agreed that the soul reaches its highest stage of development in the midst of nature's environment. Justice and reason would indicate that the soul, joined to the body in this world's atmosphere, is ideal for the soul and more creditable and nobler than if

> it were done after it leaves the body, for, joined to the body and ruling it, it dominates the world also and reigns by virtue of its own power and authority over this order of nature. Whoever disagrees, let him come forward and show us what the soul has done independently and on its own after it has discarded its body [sic] garb.[9]
>
> The soul does not act away from and apart of the human body. If it did so, it could not talk and communicate and such act would come to naught. Shaizary's opinion that the soul withdraws unto itself at dream-time and returns to tell what it had seen gives us no new insight. It only reflects vaguely what we see in nature and in our natural lives through the senses and adds no new experience or knowledge. The congenitally blind cannot conceive of natural images in his dreams for he never had sight to be cognizant of the form of those images.[10]

Given the time and place of authorship, those were fighting words.

The Druze developed these bold metaphysical ideas with respect for Greek and Hellenistic precedents. We can see something of their Greek inspiration by comparing their opinion on dreams with that of a revered Greek authority. Their opinion, stated above, is reminiscent of Aristotle's own:

> [A]s in a liquid, if one vehemently disturbs it, sometimes no reflected image appears, while at other times one appears, indeed, but utterly distorted, so as to seem quite unlike its original; while, when once the motion has ceased, the reflected images are clear and plain; in the same manner during sleep the phantasms, or residuary movements, which are based upon the sensory impressions, become sometimes quite obliterated by the above described motion when too violent; while at other times the sights are indeed seen, but confused and weird....[11]

It would be overreaching to claim Aristotelian authority for the Druze passage concerning dreams, but the similarity reminds us of the influence which Aristotle exerted at Dar al-Hikma. We've seen in Chapter 2 that the chief Ismaili theologian, al-Kirmani, did himself prefer an Aristotelian version of soul to the Neoplatonic. And I'd like to introduce one more palace Aristotelian,[12] a contemporary of al-Kirmani[13] and al-Akhram. This Aristotelian was the scientist Abu Ali Mohammed ibn al-Hasan ibn al-Haitham, pre-eminent physicist and mathematician of the Fatimid empire.[14]

Ibn al-Haitham's *Optics* textbook provides an informed theory of perception, quite advanced for its time in attention to experimental detail. Here is T. J. De Boer's paraphrased translation of the theory. Note the importance which ibn al-Haitham places

upon the *timing* of perception, especially as it concerns the temporal operation of the nervous system.

> In the "Optics" the psychological remarks on Seeing and on Sense-Perception in general — are of special interest for us. Here he exerts himself to separate the individual Moments of the Perception, and to give prominence to the condition of Time as characterizing the whole process.
>
> Perception then is a compound process, arising out of (1) sensation, (2) comparison of several sensations or of the present sensation with the memory-image which has been gradually formed in the soul as a result of earlier sensations, and (3) recognition, in such fashion that we recognize the present percept as equivalent to the memory-image. Comparison and recognition are not activities of the Senses, which merely receive impressions passively, but they devolve upon the Understanding as the faculty of judgment. Ordinarily the whole process goes forward unconsciously or semi-consciously, and it is only through reflection that it is brought within our consciousness, and that the apparently simplex is separated into its component parts.
>
> The process of Perception is gone through very quickly. The more practice a man has in this respect, and the oftener a perception is repeated, the more firmly is the memory-image stamped upon the soul, and the more rapidly is recognition or perception effected. The cause of this is that the new sensation is supplemented by the image which is already present in the soul. One might thus be disposed to think that Perception was an instantaneous act, at least after long practice. That, however, would be erroneous, for not only is every sensation attended by a corresponding change localized in the sense-organ, which demands a certain time, but also, between the stimulation of the organ and the consciousness of the perception an interval of time must elapse, corresponding to the transmission of the stimulus for some distance along the nerves. That it needs time, for example, to perceive a colour, is proved by the rotating circle of colours, which shows us merely a mixed colour, because on account of the rapid movement we have no time to perceive the individual colours.[15]

While developing Metaphysics by Default, I have sometimes wondered whether the Fatimid philosophers at Dar al-Hikma might have guessed at existential passage before, back during the eleventh-century reign of al-Hakim. It remains a possibility. To see just how close they came we may consider, as a unit, four ideas which were popular at the palace and subject to vitriolic debate by 1017. These

four ideas were:

1. Ibn al-Haitham's theory of perception, in which all perceived sensation was understood to depend upon temporal nervous activity.
2. Al-Sijistani's theory of the soul's "forgetfulness."
3. The Druze' Aristotelian opinion that "the soul does not act away from and apart of the human body."
4. The Neoplatonic tradition of transmigration philosophy.

We can imagine a hypothetical scenario, as a historical fancy:

What if al-Hakim's reign had prospered through the eleventh century,[16] and palace scholarship continued undisturbed for a few generations? Had this happened, proponents of these four ideas might have synthesized from them a medieval version of existential passage.

The historical circumstances place restrictions on what such a philosophy could be. To begin with, the axioms of a "medieval existential passage" would need to adhere to the four incipient ideas. Also, since we're conjecturing an eleventh-century synthesis, any European Renaissance science is out-of-bounds. Finally, we must deny our fancied medieval philosophers access to any definition of personal identity, as John Locke opened that field in 1694.

Within these reasonable limits, the following synthesis may have been possible:

> *{an imagined synthesis — not a quotation}*
>
> At death, temporal nervous activity ceases. This quiescence liberates the soul; calming its excitations and releasing it from worldly preoccupations by means of a "forgetfulness of perception." Divinely afflicted, the soul is entranced within the timeless stability of intellect and is unable to perceive sensation or the flow of time. This condition persists until Universal Soul transmigrates the individual soul to another human body. Thereafter the new body's nervous system transmits perception of time and sensation to the soul again, lowering it from forgetfulness and into new life.

Such a development of Ismaili thought, had it occurred, would have drawn the radicals' transmigration mechanism closer to the existential passage of Metaphysics by Default. It would have made a good "transitional" philosophy: a link in the conceptual chain which leads from the four incipient ideas to Metaphysics by Default proper.

But I should repeat for the sake of absolute clarity: this did *not* happen. No such transitional text has ever been found, nor have we reason to expect any such text will be found. I've only presented the imagined synthesis as an exercise of the historical imagination. It's one path Ismaili philosophers could have followed, in theory, *but did not follow in actual fact.*

The ashen Hills of Books blocked their way.

That being said, I'll quote one more Middle Eastern author before moving on.

In the sixteenth century the Druze sheikh Abdul Ghaffar wrote a book of philosophy entitled *Points and Circles (Al-Nuqat wal-Dawayer)*.[17] It is respected even today by Druze authorities.[18]

In this book Sheikh Abdul Ghaffar presents a blunt argument against "past life recall," or mere "talk," as Druze elders denoted it. He emphasizes the body's supposed psychological functions, and he posits a transmigration event which occurs instantaneously over any distance. It's a philosophy which confounds expectation — by threading together all four of the metaphysical ideas which were incipient at Dar al-Hikma.

Here is the relevant passage from Abdul Ghaffar's *Points and Circles*:

> The talking Spirit cannot remember save through the physical memory. It cannot think save through the brain in the body. It cannot differentiate except through the distinguishing power resident in the body. It cannot memorize except through the memorizing organ in the body. Distances don't matter to it when it leaves (at death) one body for another, with no lapse in time in the process....
>
> The Spirit while resident in the body, participates in all its activities. When it departs, it loses all factual material it had acquired in it.
>
> The spiritual advances the higher Spirit has gained, however, are retained....
>
> And it remains true and worth repeating that 'In this earthly life, souls do not know their past.'[19]

Here, in this one passage, Abdul Ghaffar appears to have synthesized, or at least syncretized, transmigration concepts which bear a striking resemblance to mortal amnesia and existential passage. For Abdul Ghaffar, forgetfulness is complete at the end of life, and transmigration occurs instantaneously, irrespective of distance. The only notable discrepancy in Abdul Ghaffar's formulation is his appended assertion concerning "spiritual advances": a discrepancy not entirely without remedy.[20] Elsewhere Abdul Ghaffar's parsimonious deductions elicit our wonder, being as they are so suggestive of Metaphysics by Default — and so retrograde to the expansive religious traditions of his age.

Regrettably, Abdul Ghaffar quickly abandons his intriguing hint at the modern thesis, veering back into Neoplatonism in accordance with the established Druze canon.[21] To put his aversion in perspective: under Ismaili Neoplatonic schemes, Universal Soul orchestrates passage to the afterlife according to rules of justice and emanationism.[22] These rules are unrelated to any physical account of the soul's operation. They hearken back to Plotinus' hypostases,[23] which have no physical properties to speak of.

The Druze are an independent branch of the Ismaili zeitgeist. This sect has maintained its Neoplatonic transmigration tradition into the present day. To Neoplatonists like the Druze, the passage executive — Universal Soul — remains an incorporeal psychological entity (Sheikh Abdul Ghaffar's suggestive text notwithstanding). It seems never to have occurred to the Druze, or to anyone, that Universal Soul might best be understood not as an incorporeal, but as a corporeal and therefore ubiquitous psychology; *i.e.*, *subjectivity*. For this reason existential passage, being premised on corporeal psychological entities exclusively, is incompatible with Neoplatonic transmigration tradition — just because Neoplatonism, as conventionally formulated, is ever premised on incorporeal soul. So, historically, it stands to reason that this incompatibility would have prevented Muslim Neoplatonists from embracing even the "medieval" existential passage I floated in the historical fancy. That speculation, like Abdul Ghaffar's real venture, draws more attention to corporeal limits than Neoplatonists would like.

It would be heartening to learn of philosophers from the past who've ventured closer to Metaphysics by Default. It seems however that none have done so. My own review[24] of the history of philosophy has turned up no better precedent than the abortive effort at Dar al-Hikma. I'm glad at least to have been able to present that unique and surprising history. I hope it has been of some interest to the reader.

For further reading I include a few references on related subjects:

- Islamic Hellenism and Fatimid scholarship[25]
- the caliphate of al-Hakim[26]
- Fatimid Cairo[27]
- the origin of the Druze[28]

Also I've assembled some images of Dar al-Hikma and Old Cairo on a supplementary page, *here*.

Significant Addendum — August 2004

No better precedent has yet fluttered down from the history stacks, but a contemporary philosopher has recently surprised me with a paper entitled, *Death, Nothingness, and Subjectivity*. In this paper philosopher and naturalist *Thomas W. Clark* argues for a novel metaphysical concept: "generic subjective continuity". As it happens, this concept proves to be functionally identical to existential passage. More surprisingly, we find upon close examination that Mr. Clark's argument for generic subjective continuity parallels my initial argument for existential passage (*Chapter 9*) at all the critical points. Readers who've grasped my argument will find little difficulty in translating between Chapter 9 and Mr. Clark's admirable paper.

For me, this has been a development more heartening than the discovery of historical precedent. Precedent is agreement among the

dead. *This* is agreement among the living.

Mr. Clark has generously offered a summary comparison of existential passage and generic subjective continuity. I reproduce his statement below:

> In a wonderfully written monograph (a book, really), "Metaphysics By Default," Wayne Stewart presents an independently developed thesis directly parallel to my argument in "Death, Nothingness, and Subjectivity" (DNS). Without having encountered my paper, Mr. Stewart uses very much the same thought experiment to support the intuition of generic subjective continuity, what he calls "existential passage" (see in particular Chapter 9). The passage across birth and death, as he describes it, is "a shift of perceived existential 'moment,' a natural relocation of the awareness of existence." This seems very close to the idea in DNS that what we should anticipate at death is the continuing "sense of always having been present."
>
> I'm happy to report that Stewart's thesis, like mine, is entirely physicalistic, in that the basis for consciousness and subjectivity is taken to be the brain (more generally, a suitably enhanced central nervous system), so that nothing is literally carried over between subjects. Yet subjectivity continues across objective gaps between physically instantiated subjects, and this is a psychologically important fact for us.
>
> Needless to say, it was very gratifying to learn of Mr. Stewart's work, which I highly recommend to your attention.
>
> — Thomas W. Clark, August 23, 2004

This completes our recovery of the historical precedent for Metaphysics by Default — precedent now augmented by Mr. Clark's coincident paper.

(And that's not all. Recently correspondents have brought to my attention some existential-passage reasoning in the papers of three other writers: William Spaulding, David Darling and Mark Sharlow. See endnote [29] for details.)

In our mind's eye this philosophical amity can fit in place as the second of five stepping stones strewn across the river Lethe. In subsequent chapters we will uncover properties of the metaphysics which distinguish it from historical transmigration philosophies. We can imagine these distinguishing properties as the three stepping stones yet separating us from the living world that waits beyond the river.

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next Chapter 11: Passage Types

see also Chapter 10 Supplement: Images of Dar al-Hikma

Chapter 10 Endnotes

[1] Al-Sijistani's philosophy of forgetfulness appears to elaborate on Plato's own vision, a vision which was integral to Plato's transmigration philosophy. Quoting from Plato, "Phaedrus," *The Works of Plato*, trans. B. Jowett (New York: The Dial Press, n.d.) 406, 408. *Available online:*

> "[W]hen [the soul]... fails to behold the vision of truth, and through some ill-hap sinks beneath the double load of forgetfulness and vice, and her feathers fall from her and she drops to earth, then the law ordains that this soul shall in the first generation pass, not into that of any other animal, but only of man....
>
> ...[A]ll men do not easily recall the things of the other world; they may have seen them for a short time only, or they may have been unfortunate when they fell to earth, and may have lost the memory of the holy things which they saw there through some evil and corrupting association. Few there are who retain the remembrance of them sufficiently...."

[2] Paul E. Walker, *Abu Ya'qub al-Sijistani: Intellectual Missionary* (London: I.B. Tauris, 1996) 43.
[3] Paul E. Walker, *Early Philosophical Shiism* (Cambridge: Cambridge University Press, 1993) 99.
[4] For historical notes on the transmigration beliefs of some early eleventh-century Ismaili extremists, see Abu-Izzeddin 116-17. See also Bryer 52.2 (1975): 245, 247; and 53.1 (1976): 10. For translations of several eleventh-century Druze epistles concerning reincarnation, see al-Najjar 87-107.
[5] Al-Akhram was put to death after accidentally sparking a riot. The riot arose when al-Akhram tried to divinize the caliph in public. This event is only distantly related to the philosophical issues discussed in the essay. See Bryer 52:1 (1975): 63-83.
[6] The noun is "Muehhidun," which translates as "Unitarians," or "believers in absolute monotheism."
[7] Primarily Epistles 15, 57, and 66-71. A few passages from this text are translated to English in al-Najjar 106-07.
[8] from Epistle 70 of the Druze canon, by Baha' al-Din; al-Najjar 97.
[9] from Epistle 70 of the Druze canon, by Baha' al-Din; al-Najjar 99.
[10] from Epistle 70 of the Druze canon, by Baha' al-Din; al-Najjar 105-06.
[11] Aristotle, "On Dreams," *Basic Works of Aristotle*, ed. Richard McKeon (New York: Random House, 1941) 622-23, Chapter 3, 461a 14-22.
[12] T. J. De Boer, *The History of Philosophy in Islam*, trans. Edward R. Jones (New Delhi: Cosmo Publications, 1983) 150.

Quoting:

> "In [ibn al-Haitham's] view philosophy should be the basis of all the sciences. He found it in the writings of Aristotle, inasmuch as that sage had best understood how to knit sense-perception into a coherent whole with rational knowledge. With eagerness therefore he studied and illustrated Aristotle's works, for the use and profit of mankind, as well as to exercise his own intellect and provide a treasure and consolation for his old age. Of these labours, however, nothing seems to have been preserved for us."

[13] No particular correspondence between al-Kirmani and ibn al-Haitham has survived or is known to have existed. But as these men were the most famous academics at the palace, they most likely encountered each other frequently at Dar al-Hikma, and at meetings with Caliph al-Hakim.
[14] Ali 318-20.
[15] De Boer 151-52.
[16] Caliph al-Hakim disappeared in A.D. 1021 (412 A.H.) at the age of 36, under mysterious circumstances. See Assaad 182-92 for possible explanations of the disappearance.
[17] Sheikh Zeiniddin Abdul Ghaffar, *Al-Nuqat wal-Dawayer (Points and Circles)*, (Lebanon: Al-Maktabah, 1999). Reprint of original, 1557. Reprint available [in Arabic] through al-Maktabah (alMaktabah.com), P.O. Box 1998, Beirut 11, Lebanon.
[18] Verified by this author on-site among the Druze communities of Lebanon; February, 1999.
[19] Al-Najjar 106-07. Arabic quotation from Abdul Ghaffar 117-20.
[20] Metaphysics by Default does not posit a personal mechanism for retention of such advances, or any other qualities, between lives. (For a consideration of the broader difficulties of karma doctrines, see *Chapter 11, note 1*.) The concept of "spiritual advancement" is not, however, exclusively personal. It has an impersonal aspect as well. To illustrate: When an author pens some insight on the human condition, that act commits the author's personal spiritual advancement to an impersonal medium. And when a reader grasps the author's meaning, the impersonal record then enters into the reader's personal thoughts. Thus the spiritual advancement is transmitted: impersonally, but nonetheless effectively. (Of course, any noble text can prove this assertion. One volume which I feel deserves special mention is Adler and Van Doren's *Great Treasury of Western Thought.* It's an inspired compendium. The selections truly constitute a treasury of spiritual advances transmitted to us from our predecessors. I recommend the work highly.)
[21] *Points and Circles* has 38 chapters. Chapters 3, 4, 5, 10, 28, 34 and 37 are arguably Neoplatonic. Other chapters address morality, the relation of body to soul, the duality of good and evil, and divine justice.
[22] See Paul E. Walker, "The Universal Soul and the Particular Soul in Ismaili Neoplatonism," *Neoplatonism and Islamic Thought*, ed. Parviz Morewedge (Albany: State University of New York Press,

1992) 149-66.
[23] The hypostases are defined in the *Enneads* of Plotinus. See Plotinus, "Enneads," *The Essential Plotinus*, trans. Elmer O'Brien, 2nd edition (Indianapolis: Hackett Publishing, 1986) 90-105, (V, 1 [10]). *Available online.*
[24] Detailed analyses of a wide range of potential precedents can be found in Lawrence E. Sullivan, ed., *Death, Afterlife, and the Soul* (New York: MacMillan Publishing Company, 1989); E. S. P. Haynes, *The Belief in Personal Immortality*, 2nd edition, revised (London: Grand Richards, 1925); Ernest G. Braham, *The Problem of the Self and Immortality: An Estimate and Criticism of the Subject from Descartes to Kant*; Ernest G. Braham, *Personality and Immortality in Post-Kantian Thought*; Steven J. Kaplan, ed., *Concepts of Transmigration: Perspectives on Reincarnation* (Lewiston: The Edwin Mellen Press, 1995); Joseph Head and S. L. Cranston, eds., *Reincarnation in World Thought* (New York: Causeway Books, published by arrangement with the Julian Press, ca. 1967).
[25] Franz Rosenthal, *The Classical Heritage in Islam* (London: Routledge, 1994); Parviz Morewedge, ed. *Neoplatonism and Islamic Thought* (Albany: State University of New York Press, 1992); F. E. Peters, *Aristotle and the Arabs: The Aristotelian Tradition in Islam* (New York: New York University Press, 1968); De Boer, *The History of Philosophy in Islam*; Heinz Halm, *The Fatimids and their Traditions of Learning*.
[26] Assaad, *The Reign of Al-Hakim Bi Amr Allah*. It is unfortunate that many medieval histories embellish stories of the Fatimid era with secondhand references and politically-motivated slanders. Dr. Assaad's meticulous reconstruction of al-Hakim's era is an exemplary treatment of difficult source materials.
[27] Yaacov Lev, *The State and Society in Fatimid Egypt* (Leiden: E. J. Brill, 1991); Paula Sanders, *Ritual, Politics, and the City in Fatimid Cairo* (Albany: State University of New York Press, 1994).
[28] Marshall G. S. Hodgson, "Al-Darazi and Hamza in the Origin of the Druze Religion," *Journal of the American Oriental Society* 82 (1962): 5-20; Abu-Izzeddin, *The Druzes*; Bryer, 52.2 (1975): 47-83, 52.2 (1975): 239-62, and 53.1 (1976): 5-27. See also: Encyclopaedia Britannica article on the *Druze*.
[29] Each author has given independent reasoning for existential passage, or similar concept. William C. Spaulding gives his reasoning in his 1982 paper, *The Creation of I's*. Thomas W. Clark gives his reasoning in his 1994 paper, *Death, Nothingness, and Subjectivity*. David Darling gives his reasoning in his 1996 book, *Zen Physics* (Chapter 8: 'You Again'). Mark F. Sharlow gives his reasoning in his 2009 paper, *Why Science Cannot Disprove the Afterlife*. I came across Clark's paper in 2004; my thanks to the correspondents who've subsequently brought the papers of Spaulding, Darling and Sharlow to my attention.

E-mail the author.
E-mail the webmaster.

Chapter 10 Supplement
Images of Dar al-Hikma

Very little remains of the palace compound itself. Most of the palace structures, including Dar al-Hikma and Dar al-'Ilm, are long gone. This supplement presents some images of Fatimid Cairo buildings yet standing. Additional images are presented as location markers.

Fig. 10.1
Downtown Cairo[1]

Figure 10.1 pinpoints Fatimid Cairo. A rough outline of the Fatimid city wall is marked in red. (North is up, scale 1 inch : 0.4 km.)

Fig. 10.2
Map of Fatimid Cairo[2]

Figure 10.2 sketches the districts of Fatimid Cairo, with the palace compound outlined at center. The Great Road to Fustat runs north and south through the palace compound. Fatimid landmarks: Mosque of al-Hakim (top center); Mosque of al-Aqmar (upper center); al-Azhar University (lower right). (Scale approx. 1 inch : 0.4 km.)

Fig. 10.3
Perspective drawing of the Mosque of al-Hakim (A.D. 1013 / 403 A.H.)[3]

Fig. 10.4
Mosque of al-Hakim, exterior

Fig. 10.5
Mosque of al-Hakim, interior

Fig. 10.6
Mosque of al-Aqmar, exterior (A.D. 1125 / 519 A.H.)[4]

Fig. 10.7
Mosque of al-Aqmar, interior

Fig. 10.8
Al-Azhar University, interior
(A.D. 972 / 361 A.H.)[5]

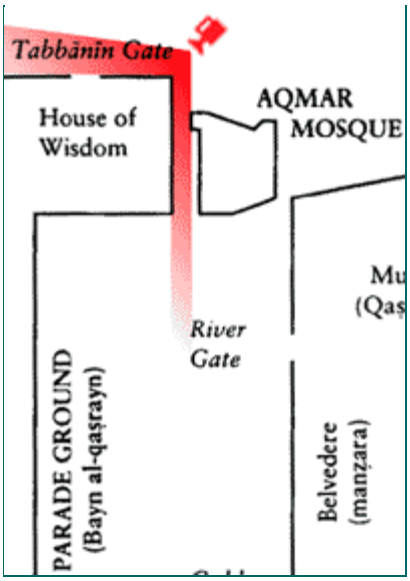
Fig. 10.9
Map of palace grounds[6]

Figure 10.9 outlines the buildings of the palace compound. The Great Road to Fustat divides east and west sides of the palace. To the southeast we find Dar al-'Ilm. To the northwest, Dar al-Hikma (labeled here as "House of Wisdom"). Note that the Mosque of al-Aqmar (top center) is the only extant structure on this map. (Scale approx. 1 inch : 0.13 km.)

Fig. 10.10
Site of Dar al-Hikma

The modern intersection shown in Figure 10.10 marks the location of the northeast corner of Dar al-Hikma. No ruins have been preserved. Neither has the Egyptian government afforded the site any manner of landmark.

Fig. 10.11
Video panorama of the site of Dar al-Hikma



A series of video images provides a panorama of the intersection shown in Figure 10.10. The approximate sweep of the panorama is marked on the map in red. The panorama begins with a southward view down the Great Road to Fustat, panning westward across the corner intersection. Click on the map in Figure 10.11 to download. (QuickTime, 4.8MB, no sound.)

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next Chapter 11: Passage Types

Chapter 10 Supplement — Endnotes

[1] Lehnert & Landrock, *Tourist Map of Cairo* (Cairo: Nubar Printing House, ca. 1973).
[2] Sanders 214.
[3] Marianne Barrucand, et al., ed., *Tresors Fatimides du Caire* (Paris: Institut du Monde Arabe, 1998) 66.
[4] Barrucand 41.
[5] Bayard Dodge, *Al-Azhar: A Millennium of Muslim Learning* (Washington, D. C.: The Middle East Institute, 1961) 25.
[6] Sanders 213.

Chapter 11
Passage Types

The Aegean idyll of Chapter 9 staged the fundamental inference of Metaphysics by Default: the existential passage of one person to another. This transmigration obeys the rules set down by complete mortality and the corporeal criteria of personal identity. It is understood best in just those terms.

Yet it may be tempting to read Metaphysics by Default as a re-interpretation of some historical transmigration tradition. This would be a mistake. The scholars of Dar al-Hikma, for example, bear no responsibility for Metaphysics by Default: that responsibility lies squarely with this author. This new philosophy does have kinship with transmigration traditions, but in most cases the kinship will prove to be remote. So we should guard against the tendency to read ancient authority into this modern idea.

In fact, some popular transmigration concepts are entirely at odds with it. We should note that *karma*, as a rule of afterlife cause-and-effect, or else as a ritual for afterlife betterment, is not a concept supported by Metaphysics by Default.[1] Neither does this philosophy accommodate the transfer of memories, personal qualities or social caste-status across the passage, as some transmigration traditions still do. Those hypotheses are incompatible with Metaphysics by Default.

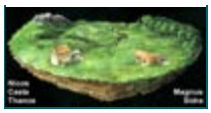
But still, the root idea of transmigration is here: one person is thought to transition to another, in meaningful sense, at some time following death. That root idea equates transmigration with a passage of numerically one deceased person to numerically one living person. It is a "one-to-one" relation. Perhaps the adjective "unitary" is appropriate for this type of passage.

In this much Metaphysics by Default has kinship with transmigration traditions. But we are by no means restricted to considering unitary passage alone. Other passage types are possible in Metaphysics by Default, and we are free to elucidate them. I will extend the idyll with this intent.

Let's consider the Aegean idyll again. We begin the story as before, with Nicos and Casta as the only inhabitants of their meadow cosmos. We know that Nicos will pass away, and that Thanos will be born at a later time.

Now let's extend this idyll by introducing another family. I'll add a second couple to the story: the Roman farmer Magnus and his wife, Sidra. They take up residence in their own home, living in tranquility much like Nicos and Casta.

Fig. 11.1



Aegean idyll with two families.
House of Nicos at left; house of Magnus at right.

From this modified start the story progresses again to the death of Nicos. And here we insert a new event: a month after the death of Nicos, Magnus also passes away. Sidra performs the rituals in Magnus' honor, and both she and Casta live on as widows. Another eight months go by, and Thanos is born.

A timeline illustrates the visible events of this modified Aegean idyll:

Fig. 11.2
Two deaths

Considering now the metaphysical events which can be expected to occur in this version of the idyll:

Nicos still passes to Thanos. Their metaphysical relation is as before. And what of Magnus? Magnus, like Nicos, has died before the birth of Thanos. Magnus, like Nicos, has slipped into the state of mortal amnesia defined in Chapter 9. When Thanos arrives, Nicos and Magnus are in the same metaphysical condition with respect to his birth. And so both men can be expected to experience existential passage to Thanos, as illustrated below.

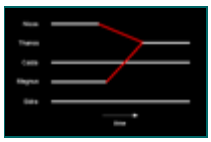


Fig. 11.3
Merged passage

This passage, of two persons into one, appears to constitute some sort of "merger." And it may seem unorthodox, even by the western world's liberal standards; for even among our younger transmigration traditions, merged transmigration is nowhere an orthodox tenet.[2] All the same, the merger does follow from the axioms of Metaphysics by Default just as readily as did the unitary passage set forth in the original Aegean idyll.

As before no "thing" transfers through the existential passage, either from Nicos to Thanos, or else from Magnus to Thanos. The existential passage remains purely subjective. And for this reason it would be incorrect to think that merged passage would in some way "crowd" Thanos, or otherwise affect him in any way. Thanos remains Thanos, regardless of who does or does not experience existential passage to him. It is more correct to say that Nicos and Magnus have experienced independent passages to the same recipient. Objectively, from without, we see the temporal and functional conditions which lead us to infer this two-to-one merger; but the participants themselves must be ignorant of the merger. The merger can only be *known* from without, as an abstraction.

It follows that two-to-one mergers hold no charmed position in the metaphysics. If a two-to-one merger is possible, a three-to-one merger is also possible. I'll modify the idyll again, so as to present

just this case. Let's look again at the timeline of the two-to-one merger:

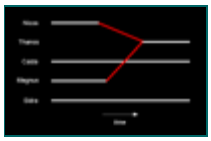


Fig. 11.4
Two-to-one merged passage

Here we see again that Nicos and Magnus die before the birth of Thanos.

Now I will modify Figure 11.4 so as to set up the three-to-one merger. Here Sidra will pass away as well, a month after Magnus' death. The timeline now looks like this:

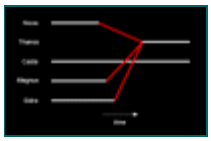


Fig. 11.5
Three-to-one merged passage

In Figure 11.5 three persons pass away before the birth of Thanos: Nicos, Magnus and Sidra. By previous reasoning all three now experience an existential passage to Thanos. The result is a three-to-one merger.

Higher-order mergers are also possible under this scheme: four-to-one, five-to-one, six-to-one, and so forth. The critical element in all these merged passages is the element of time. All who participate in a merger must have passed away *before* the single recipient of the passages is born, and *after* all other births.[3] In our last example of Figure 11.5, Nicos, Magnus and Sidra have met this condition: a three-to-one merger is the inferred result. And in general, whenever the temporal condition is satisfied by multiple participants, we can infer that a merger does occur.

Merged passage is a property of Metaphysics by Default which only appears when we study appropriate timeline examples. There are other passage types, and we will need to consider them as well. Additional examples will bring these passage types into view.

The next issue to address is a seemingly paradoxical consequence of merged passage.

Merged passages make sense within Metaphysics by Default when they are considered on a case-by-case basis. Each merger obeys the rules and seems valid. But taken as a whole, and over long periods of time, the mergers appear perhaps to violate a commonsense population condition. The apparent problem is one of population stability. By example:

The simplest existential passage is one-to-one; unitary. In unitary passage one person passes away and one person is born. The net change in population corresponding to this passage is zero: one is subtracted, and one is added. (-1 + 1 = 0) Were unitary passage the only type possible, a population subjected to existential passages would remain stable over time. Passages would entail no net loss or gain in the number of persons comprising that population.

But if we add merged passages the situation changes. In a two-to-one merged passage, two persons pass away and one person is born. It's a net loss of one person. (-2 + 1 = -1) In a three-to-one merger, three persons pass away and again one is born. It's a net loss of two persons. (-3 + 1 = -2) Likewise a four-to-one merger corresponds to a net loss of three, a five-to-one merger corresponds to a net loss of four, and so on.

Over time this net loss would appear in some way to "shrink" the population. This shrinkage is not a condition which we have heretofore placed on populations, nor is it something we see universally in populations at large. This apparent result is incongruous with reality.

But this result is *only* apparent. It stems from the choice of examples which have been used to illustrate the metaphysics so far. A different example will resolve the problem.

I'll modify the Aegean idyll again. Nicos, Casta and Thanos will remain as before. And this time Magnus and Sidra will not pass away, but will live on; sharing the idyllic meadow with Casta and Thanos. Also Magnus and Sidra will bring a child into the world: a daughter, Dacia. The timeline now looks like this:

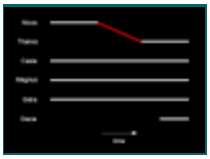


Fig. 11.6
Ex nihilo passage

In Figure 11.6 we see two events of metaphysical import. The first is Nicos' passage to Thanos. This is a unitary passage. It entails no net change in the population.

The other event is the birth of Dacia. Notice in Figure 11.6 that no passage points to Dacia's birth. Nicos has by that time already passed to Thanos, and all of the other persons continue to live. So at the time of Dacia's birth, no person satisfies the conditions requisite for an existential passage to Dacia. The result is that Dacia receives no existential passage. Of course Dacia cannot know this; but we can see, objectively, that this should be the case.

Because Dacia has not received an existential passage at birth, she is born "*ex nihilo*," from nothing, in terms of her metaphysical condition. This "*ex nihilo* passage" adds her afresh to the metaphysical count. (Speaking more precisely, we can say that the net population has increased by one, and this physical increase has been reflected passively in Dacia's *ex nihilo* passage.)

Were Sidra to bear *twins* into the idyll the population would increase by two, and two *ex nihilo* passages would be expected. Were she to bear triplets the population would increase by three, and three *ex nihilo* passages would be expected.

And so we can see that *ex nihilo* passages provide the needed counterbalance against merged passages. The population which a merged passage diminishes, an *ex nihilo* passage restores.

This version of the idyll resolves the spurious "shrinkage

problem." In the process, it has demonstrated another property of Metaphysics by Default. Although Metaphysics by Default is a transmigration philosophy, it does not posit that *every* person must be born as the transmigrated continuance of some previous life. As Figure 11.6 illustrates, under the tenets of Metaphysics by Default persons can sometimes be born without a metaphysical past — as truly *new* lives. "*Ex nihilo* passage" is the formal statement of this metaphysical condition, a condition which would seem to be common under normal circumstances.

Figure 11.6 also hints at a different, and remote, possibility. We should consider it, but only for the sake of completeness.

Focusing on Magnus and Sidra this time: I'll modify the idyll again so that Magnus and Sidra now live alone in the meadow as their cosmos' only inhabitants.

Fig. 11.7
Aegean idyll with one family, of Magnus' house

In this version of the idyll Sidra bears twins: Dacia and Beatrice. Magnus passes away before their birth, and Sidra lives on afterwards. The timeline now looks like this:

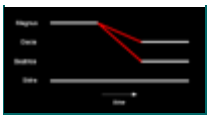
Fig. 11.8
Two births

As illustrated, Dacia and Beatrice begin life at exactly the same time. And we will assume that at all points of fetal development they have matured together, as if within a synchronized ballet.

Previously I have indicated that existential passage would be expected to occur at birth. But speaking more precisely I think we should expect it earlier, during fetal development. Limbic brain structures reach their final positions about three months into fetal development,[4] and dreams emerge (as REM sleep) by the eighth month.[5] So a fetus may perceive his or her first dreamlike thoughts and sensations at some time between the first trimester's conclusion and birth. That moment — the limbic system's first successful recursive "somersault" — may correspond with the onset of personal identity. But whenever the requisite psychological infolding does first occur, the moment should count I think as the time of existential passage. This, rather than the moment of birth itself.

Dacia and Beatrice mature in synchrony. They find themselves in the same metaphysical condition at all times during fetal development, relative to the deceased Magnus. Both are identically positioned throughout fetal development to receive — at any particular moment — Magnus' existential passage. And so we may think that both do receive it, as illustrated:

Fig. 11.9



Split passage

In Figure 11.9, Magnus has "split" his existential passage between Dacia and Beatrice. As experienced by Magnus, the moment of mortal amnesia has resolved itself as passage to Dacia — and, separately, as passage to Beatrice. I point out again: no "thing" has been split. The passage is entirely subjective, existential. As was the case with merged passage, we only ascertain the event objectively, from without. Subjectively, all the participants are ignorant of what has transpired. It is only from an objective viewpoint that we can determine that Magnus' passage has been split between Dacia and Beatrice. This is the condition we will speak of as a "split passage."

As illustrated, one person has passed through the split passage to two others. This split is one-to-two. Had Sidra born synchronized triplets, Magnus would have passed to those triplets via a one-to-three split passage. Synchronized quadruplets would have resulted in a one-to-four split passage. And so on.

Split passages will not be treated at length. They require perfect synchronization in the timings of conscious birth among the recipients. Any imperfection in that synchronization would, by prior reasoning, force the passage to that infant which emerged first; thereby eliminating the chance of a split.

Time, as an entity, seems to be a continuous thing. Or if it is in some way discrete, it must be discrete in a vanishingly fine manner. I am not competent to judge theories of time's nature,[6] or to predict whether time is ultimately continuous or discrete. But time's "fineness," if real, would make split passages unlikely. In actual living twins, developmental timings cannot approach the perfect synchronization posited in the split passage idyll of Figure 11.9. Differences in timing must emerge, and eliminate the possibility of split passage to those twins. The same would hold true of any infants, regardless of filial relationship. That is to say, any children born to the house of Magnus *and/or* the house of Nicos would need, as a group, perfect synchronization of conscious emergence in order to effect a split passage. And this could not be common.

It is possible to conceive exotic time-gap terminals whose properties would relax the requirement of perfect synchronization, but these exotics may be spurious. We can contemplate these possibilities in an endnote.[7]

In brief, then: while split passage remains a theoretical possibility, it seems unlikely in the real world. Further consideration of this passage type might be unprofitable at present.

All of the basic passage types have now been presented. We pause to collect them together, bundling them into a metaphysical grammar.

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next Chapter 12: A Metaphysical Grammar

Chapter 11 Endnotes

[1] Karma doctrines, like most afterlife philosophies, posit the preservation of personal merits and demerits beyond the grave. These moral accountings are perhaps distinguished from other, less substantial personal qualities, which the sparest karma doctrines may allow to pass away. Yet to the extent that the corporeal basis of personal identity argues against even such a spare continuance, Metaphysics by Default is prohibited from lending support to these most minimal of karma doctrines. If a subject of karma's law vanishes, that person's merits and demerits must lose their currency; like stock in a defunct business.

Karma encounters other difficulties elsewhere. One difficulty I might note here is just the *historical record*.

The problem in brief:

Let us suppose for the moment that the law of karma is real. If real, we should expect it to have left its mark on the history of human nature. What would that mark be? Well, karma rewards virtuous persons, so that their souls in some way improve from life to life. Virtue begets virtue: when meritorious traits are compounded over many generations the cumulative improvement to human nature should be very great. Modern children should therefore bless their parents with virtues far superior to those expressed by children of the ancient past. A comparison of recorded behaviors must reveal this mark of karma's progress.

And yet we find no such mark. While our own children may be paragons, all of our neighbors' children are patent pagans. Which is to say, human nature has changed very little since the dawn of recorded time.

The longstanding intransigence of human nature presents a hard problem for advocates of karma doctrines.

[2] For an introduction to a wide range of transmigration traditions, see Sullivan, *Death, Afterlife, and the Soul*, especially Chapter 16, "Transmigration," and Chapter 17, "Reincarnation." See also Kaplan, *Concepts of Transmigration: Perspectives on Reincarnation*; Head and Cranston, *Reincarnation in World Thought*.

[3] Or perhaps more precisely stated, "All of the persons who are thought to transmigrate through a merger must have passed away before that moment when the recipient of the passages first satisfies the criteria of personal identity, and after all other personal identities have assembled their own satisfactory criteria."

[4] For developmental details, see Frank H. Netter, M.D., *The Ciba Collection of Medical Illustrations: Volume 1, Nervous System: Part I, Anatomy and Physiology,* ed. Alister Brass, M.D., 3rd printing (West Caldwell, NJ: CIBA-GEIGY, 1991) 131-38.

[5] Malcolm I. Levene and Richard J. Lilford, senior eds., *Fetal and Neonatal Neurology and Neurosurgery*, 2nd edition (Edinburgh: Churchill Livingstone, 1995) 41-42, 167.

[6] For a recent debate on the nature of space and time, see Stephen Hawking and Roger Penrose, *The Nature of Space and Time* (Princeton: Princeton University Press, 1996). For a focused (and

inconclusive) presentation on the discrete/continuous issue, see: *Is Space-Time Discrete?* For Lee Smolin's lucid presentation of "loop quantum gravity", and experiments that could someday demonstrate a Planck-scale granularity of spacetime, see: *Atoms of Space and Time*, in the January 2004 issue of *Scientific American*.

[7] The passage terminals described in this chapter are "point terminals." Each metaphysical event is thought to occur at a vanishingly brief point in time, and the terminals are presented in such a way as to reinforce that supposed instantaneity. Point terminals are simple, and probably not far from nature's actual truth.

However, if nature should by some unknown means extend the temporal duration of terminals, the likelihood of split passage would thereby increase. This follows from the observation that "extended terminals" would overlap, so that these overlapped terminals would be effectively synchronized, regardless of small imperfections in timing. Increased synchronization would correspond with an increased likelihood of split passage.

Another exotic possibility which would also increase the likelihood of split passage is "permeable identity." And what is this? Well, to start with, we can say that the personal identities of Metaphysics by Default are "hermetic": sealed off from metaphysical events. When a personal identity begins its existence, it is removed from the passage equations. Under Metaphysics by Default, the living person is thought to be incapable of receiving *more* existential passages during life. And we have some reason to think that this is the case. For one thing, the stream of thought persists unbroken throughout life. Core subjectivity is conserved in the thalamocortical system, even during sleep, as per *Chapter 9, note 3*. This baseline integrity of subjective experience renders "New Pauls" unlikely. Moreover, we find that we ourselves perceive subjective experience as a deeply unified whole, as though it were hermetically sealed against the outside world; sealed perhaps even against those body parts which are not located always in close proximity to the brain. (Who does not feel naively that eyes and ears are close to the soul, and that toes are farther away?)

Well, subjective experience is primary. At some level we are entitled to accept it just as it presents itself in the first instance. If it feels hermetic, it may well be hermetic — allowing no passage events during life.

However, it is conceivable, if unlikely, that subjective experience might not be sealed so tightly as it thinks itself to be. Conceivably, personal identity could be "permeable," allowing passage events during life, even when subjective experience is functioning normally. (Of course, the passage recipient would be ignorant of any such events, just as he or she would have been ignorant of the existential passage which transpired at conscious birth.) For example: Should unfelt time-gaps be, as William James suspected, "more numerous than is usually thought," the flickering consciousness would at each inert gap be open to a metaphysical event. The Aegean idyll can be modified to present one such hypothetical scenario:

Here is the original timeline illustration, modified to show the sort of passage that would occur if personal identities were sufficiently permeable to be receptive to every death-induced

beginning terminus:

Fig. 11.10
An alternative and unlikely hypothesis: passage among permeable identities

Here Nicos passes to *Casta* at the time of his death. Under the permeable identity hypothesis, Casta is capable of receiving existential passages at any time. As a result, Nicos passes to Casta immediately upon his death. Thanos perforce encounters an *ex nihilo* passage.

Under this one-way version of the permeable identity hypothesis Nicos could now pass to any and all lives extant at the time of his death. Everyone living at that time would be a recipient of his split passage.

Applying this change to large populations, we see that the likelihood of split passage would therein skyrocket. As a result, persons would unknowingly receive existential passages throughout every minute of their lives.

But even this limited application of permeable identity seems excessive. We've no compelling reason to think that each individual identity must pass to an astronomical number of recipients. Neither do we find continual, second-by-second passage receipt a strong intuition. Yet if permeable identity were to prove real, Metaphysics by Default could accommodate it. What would change? The exposition of Chapters 9, 11 and 12 would need a rewrite; and the math of Chapters 13-16 would have to be reformulated. Other chapters would remain much as they are.

E-mail the author.
E-mail the webmaster.

Chapter 12
A Metaphysical Grammar

We have seen in previous chapters that Metaphysics by Default allows for four different types of existential passage. These types are:

- unitary — the traditional "one-to-one" passage.
- merged — two or more persons passing to a single recipient.
- *ex nihilo* — a birth which receives no passage.
- split — one person passing to two or more recipients (rare, at best).

Under Metaphysics by Default any passage must be one of these four possible types.

It may be helpful at this point to bring all of the passage types together within a single timeline illustration. This figure can serve a function similar to that performed by a language grammar. A grammar formalizes the rules of a language (its syntax) with authoritative examples of word use. Exemplary sentences are kept as simple as possible in the interest of clarity, and with the understanding that a writer will create more elaborate sentences by combining words according to the rules of the grammar.

A "metaphysical grammar" appropriate to Metaphysics by Default is printed in Figure 12.1 below:

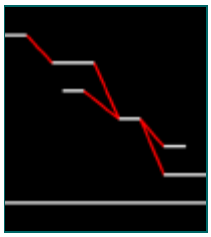

Fig. 12.1
A metaphysical grammar

By the understanding we've acquired in previous chapters we can decipher the events (and a non-event) represented in the figure.

In Figure 12.1 time is assumed as running from left to right. Four events occur, ordered temporally as (1.) to (4.). Also, the single non-event at bottom is noted as (5.). Here is the deciphered grammar:

1. a one-to-one, unitary passage.
2. an *ex nihilo* passage.
3. a two-to-one merged passage.

4. a one-to-two split passage.
5. a Methuselah, preceding and succeeding all recorded events, participating in none.

The metaphysical grammar is simple. Each passage type has been recorded only once. Moreover, the number of participants in each passage has been kept to a bare minimum.

The metaphysical grammar is also complete. Every passage type possible under Metaphysics by Default finds its example in this figure. Additionally, the "Methuselah" timeline illustrates the sole non-event condition — a longevity which surpasses all recorded events.

This metaphysical grammar derives from the root philosophy of Metaphysics by Default. Its meaning is unambiguous. No alternative interpretation of Figure 12.1 is possible within the philosophy.

Even when we consider the figure as an abstract symbol, quite apart from any school of philosophy, no alternative interpretation suggests itself. The lines, *qua* lines, sketch no representational figure; form no equation; trace no physical or social process. They are as meaningless as any random set of lines can be.

And this makes the symbol well suited for use as a metaphysical grammar. A teacher might employ the symbol as a tool of pedagogy, or else as a ready test of a student's understanding. In either case the student would recognize the symbol *just as* the metaphysical grammar, or else *not at all*. Regardless of the student's language or cultural background, misinterpretation would be unlikely.

This is a good time to pull from our pocket al-Farabi's word of encouragement, from Chapter 1:

> [As regards] those who seek the right path. When one of them rejects anything as false, he will be lifted towards a better symbol which is nearer to the truth and is not open to that objection; and if he is satisfied with it, he will be left where he is. When that better symbol is also rejected by him as false, he will be lifted to another rank, and if he is then satisfied with it, he will be left where he is.
>
> Whenever a symbol of a given standard is rejected by him as false, he will be lifted to a higher rank, but when he rejects all the symbols as false and has the strength and gift to understand the truth, he will be made to know the truth and will be placed into the class of those who take the philosophers as their authorities.
>
> If he is not yet satisfied with that and desires to acquire philosophical wisdom and has himself the

strength and gift for it, he will be made to know it.[1]

I think the metaphysical grammar fulfills some of the promise in al-Farabi's words. This unambiguous symbol maps out all of the passage types implicit in the metaphysical philosophy. If I've set a high enough standard for the philosophy, its symbol may satisfy.

If not — well, in that case al-Farabi stays upon our leisure.

In our mind's eye we have now tried the third stepping stone, which is just the enumeration of all passage types. The metaphysical grammar completes this third step. Two stepping stones now remain between our current position and the living world that waits beyond the river Lethe.

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next Chapter 13: Merger Probability

Chapter 12 Endnotes

[1] Walzer 282-83.

E-mail the author.
E-mail the webmaster.

Chapter 13
Merger Probability

In Chapter 11 I drew out the passage types implicit in the concept of existential passage. One of those types — split passage — I view unlikely, perhaps even impossible. The same is not true of merged passage.

Let's consider two similar illustrations below. Each illustration represents an inferred two-to-one merger of Nicos and Magnus to Thanos.

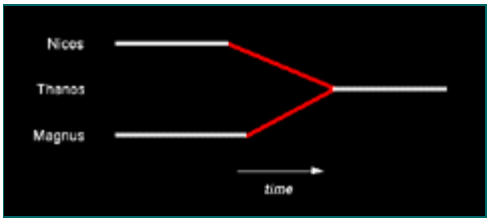


Fig. 13.1

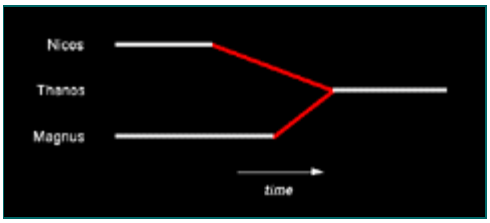


Fig. 13.2

The timelines in Figure 13.2 are altered slightly in relation to Figure 13.1. In Figure 13.2 Nicos' death has hastened somewhat, and Magnus' has tarried. The merged passage is still inferred because both Nicos and Magnus still pass away before the birth of Thanos. We can see from this example that merged passages, unlike split passages, are resilient against small changes in timing.

By the same reasoning we can deduce that one-to-one, or unitary, passages are likewise robust: they, too, are resilient against small changes in timing.

And so both unitary and merged passages would seem to be common. But how common? Would persons experience unitary passages more frequently than mergers? Or, instead, would they pass through mergers more frequently?

The question may appear intractable at first. Certainly, participants in existential passage cannot know what is happening to them. Nicos cannot know whether he participates in a unitary or merged passage. Neither can Thanos know if one, or many, or no passage participants transfer to his life. All participants must be ignorant of what transpires, as no knowledge of the event can reach their subjective viewpoints.

But it is here that an objective viewpoint again proves its value. Previously we've taken to the objective viewpoint only so that we might see the possible types of existential passage — unitary,

merged, *ex nihilo* and split. The passage types became clear as we studied timeline illustrations representing a few Aegean idylls.

Now a question has arisen which cannot be answered by such isolated sketches. Something of a systematic, global view of the metaphysics is required if we are to learn just how common each passage type would be, relative to the others. This task requires that we abstract our objective viewpoint beyond the isolated sketches — refining it into a mathematical representation of the sketched events. The mathematics will supplant the illustrative method used so far. (Unfortunately the presentation of a mathematics must needs be quite dry, and for this dryness the author apologizes. Results are summarized in Chapter 16.)

We can think of the mathematics as our fourth stepping stone along the metaphysical path.

To ground the mathematics in reality, we should begin by recalling that Metaphysics by Default leans heavily upon naturalistic argument for support. Nicos passes to Thanos only if an indifferent Nature times events to their mutual advantage. Nature is the driving force. And Nature is, as Cicero has reminded us,[1] capricious in the allotment of destinies. "Capricious" we can read prosaically as "random."

Random events are individually unpredictable. But when conditions are stable, and populations are large, many types of random events "average out." And the resulting *averages* are predictable.

As example, we might consider the measurement of temperature: in, say, a glass of water. The temperature of each water molecule is random, unknowable. But the molecules distribute their individual temperatures about some average temperature. A thermometer dropped into the glass will tell us this average temperature with certainty.

In this chapter we are only concerned with averages: the average number of experienced merged passages, divided by the average number of experienced unitary passages. This quantity is formulated as a ratio. And the ratio can be found, provided that the timings of events are random.

Three approaches to the problem are possible. All three produce much the same solution. A summary of the several mathematical results will be presented in Chapter 16.

The first approach uses informal probability rules. This solution, being informal, is not entirely certain; but this method may be the most intuitive of the three. We'll walk through an informal probability solution within this chapter.

The second approach makes use of a "Monte Carlo program." The technique is akin to gamblers' odds-making: many random events are generated, and statistics are compiled on those events in order to ascertain the odds of each event type. Monte Carlo results will be presented in the summary of Chapter 16.

The third approach applies a formal probability calculus to the problem.[2] This technique is the most rigorous of the three, and its results may be considered a formal proof. In Chapter 16 we will compare the solution obtained by this formal probability calculus against the solutions obtained by the other two techniques. The text of the formal proof, which is rather difficult, I've relegated to *Appendix A*.

To start off, let's consider the first approach. With the help of informal probability rules we can find the experienced ratio of merged versus unitary passage.

We've already posited random timings. Two more preconditions must be added if the problem is to be mathematically tractable:

1. The population must be stable, neither increasing nor decreasing noticeably over time. Of course, each death decreases the population, and each birth increases it. But we must assume that these changes in population will cancel out over time, as the population maintains itself near some equilibrium size.

2. We assume, after Chapter 11, that split passages are rare. So we will disregard split passages in formulation of the mathematical problem.

Given these preconditions the mathematical problem can be solved. We open with the figure below:

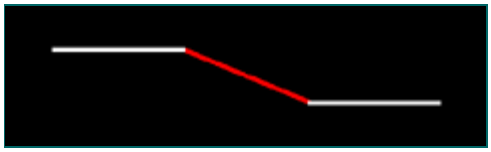


Fig. 13.3
Unitary passage

Figure 13.3 illustrates a simple existential passage. It is a unitary passage, such as that experienced by Nicos and Thanos in the original version of the Aegean idyll. This will be the starting point of the solution by informal probability rules.

We'll "freeze" the timelines in Figure 13.3. These two timelines cannot be altered. For now they represent the only two lives which can have been extant in the idyllic cosmos. If we ask, "What is the probability that a unitary passage has occurred between them?" we see that the probability is frozen at 100%. It is certain. We can also express this certainty as a decimal probability. (Decimal probabilities range between 0 and 1, and they are a little easier to work with.) Expressed in this format, the probability of a unitary passage is equal to 1. Symbolically:

$$p_1 = 1$$

Here, p_n is the relative probability of an *n*-to-one passage, where *n* is

to be understood as the number of persons "moving through" that passage. In this case, $n = 1$.

The passage occurs at the time of the conscious birth of the recipient, which is marked as time *t* in Figure 13.4 below:

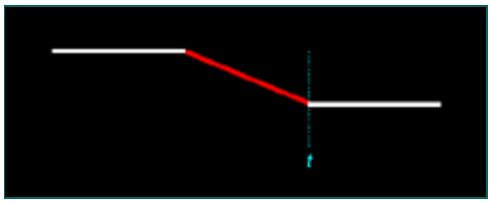


Fig. 13.4
Unitary passage at time *t*

Time *t* is critical for this one particular passage. A person who passes away before time *t* participates in the passage. A person who passes away after time *t* does not. Time *t* is the sole criterion upon which the determination depends.

Keeping in mind the supposition that these two particular timelines are "frozen," we now add a third person to the figure. This third person is a contemporary of the first — which is to say, a contemporary of that person whom we've already committed to the existential passage. The new, third life will be random in duration. This person may pass away at any time, either before or after time *t*, unpredictably. The two possible types of outcomes are illustrated in the following two figures:

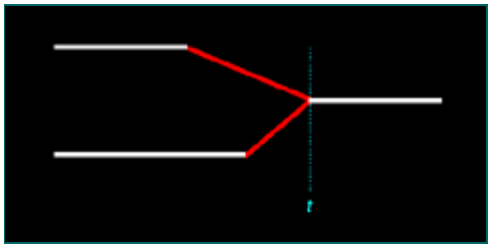


Fig. 13.5

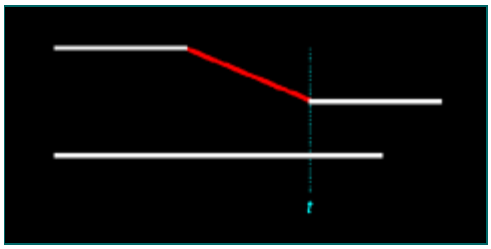


Fig. 13.6

The addition of a third person opens up the possibility of a passage type which was *not possible* in Figure 13.4. Here we have our first opportunity for a two-to-one merged passage. As it happens, the first two-to-one merger is found in Figure 13.5. Merger occurs only in Figure 13.5; it does not occur in Figure 13.6. Since each of the two possible outcomes is equally likely, the probability of a two-to-one merger is here 1/2, or 0.5. Symbolically:

$$p_2 = 0.5$$

We can create another set of figures to determine the probability of a three-to-one merger. To do this we'll add a fourth person. Again, this additional person may pass away at any time, either before or

after time *t*. Four types of outcomes are now possible:

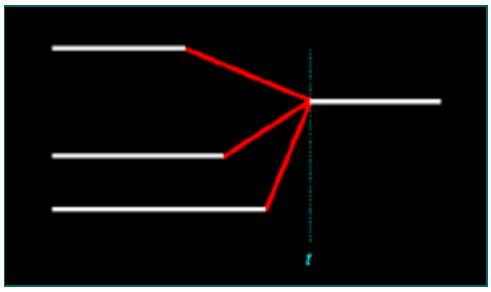


Fig. 13.7

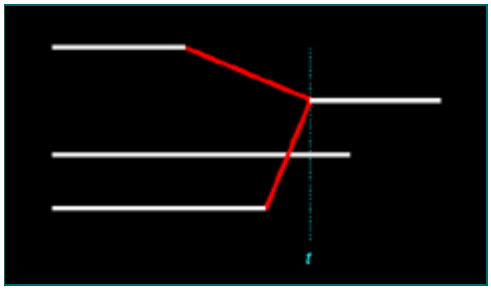


Fig. 13.8

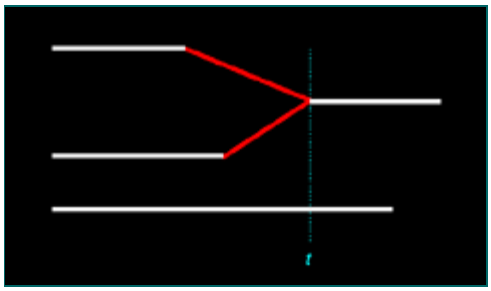


Fig. 13.9

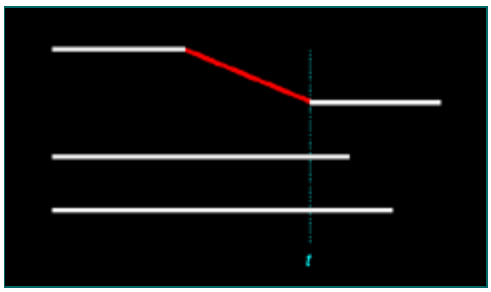


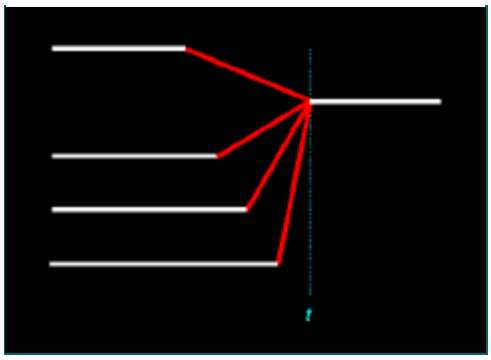
Fig. 13.10

Of these four figures, only Figure 13.7 contains a three-to-one merger. And so the probability of a three-to-one merger is here 1/4, or 0.25.

$$p_3 = 0.25$$

If we add a fifth person, we can determine the probability of a four-to-one merger. Adding this fifth person increases the number of possible outcomes to eight:

Fig. 13.11



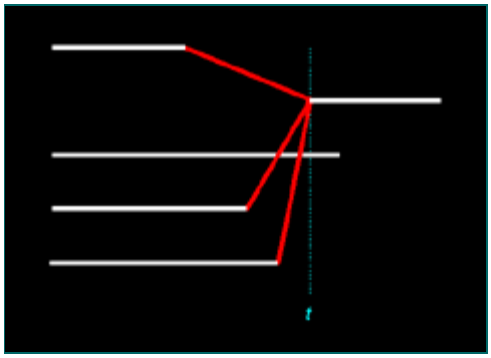


Fig. 13.12

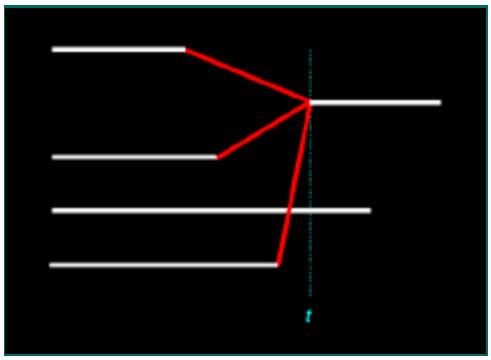


Fig. 13.13

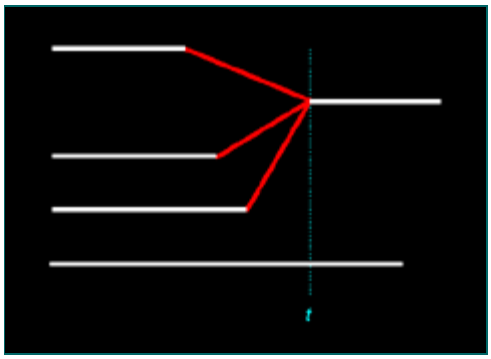


Fig. 13.14

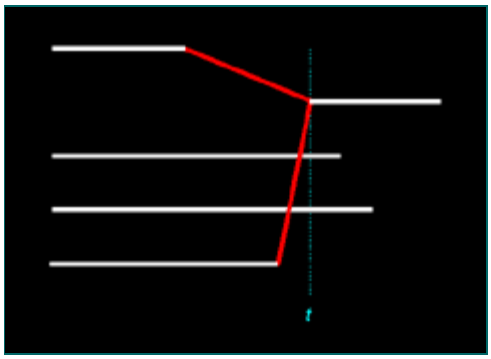


Fig. 13.15

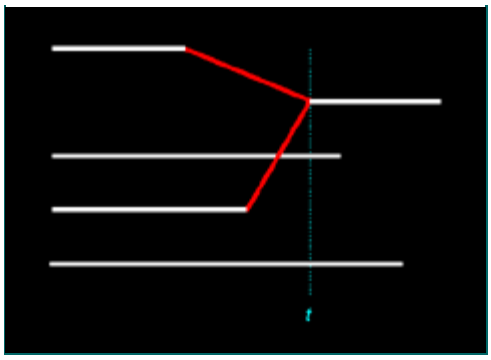


Fig. 13.16

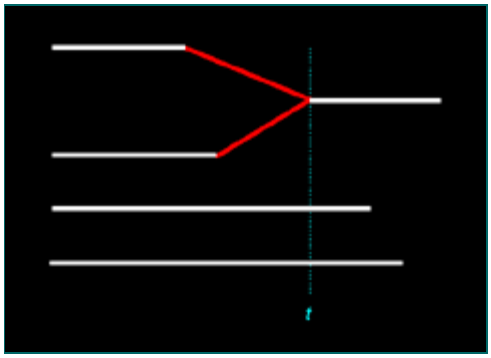


Fig. 13.17

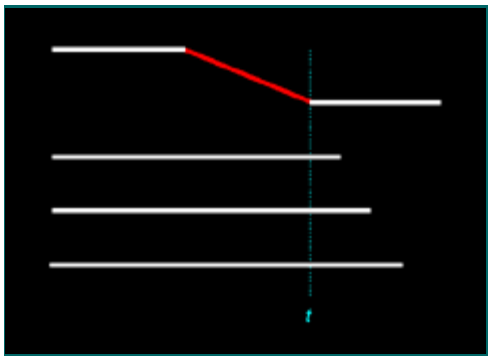


Fig. 13.18

Of these eight figures, only Figure 13.11 contains a four-to-one merger. And so the probability of a four-to-one merger is here 1/8, or 0.125.

$$p_4 = 0.125$$

Relative probabilities for each passage type are emerging now, following the rule:

$$p_n = (1/2)^{n-1} \quad \{ n = 1 \text{ to infinity } \}$$

where, again, *n* is the number of persons passing through an *n*-to-one passage.

The first ten relative probabilities are tallied in Table 13.1:

Table 13.1
Relative passage probabilities

passage type	relative passage probability
1-to-1	1
2-to-1	0.5

3-to-1	0.25
4-to-1	0.125
5-to-1	0.0625
6-to-1	0.0313
7-to-1	0.0156
8-to-1	0.00781
9-to-1	0.00391
10-to-1	0.00195

We can see from these results that merged passages grow increasingly unlikely as the number of participants rises. This makes sense, as we have presupposed random timings.

Now we need to consider another important factor: the *experiences* of the persons involved in passage are at issue here, rather than the passages themselves.

Table 13.1 lists relative passage probabilities, but those probabilities are only a *part* of the finished solution. To get closer to the real solution we should think about the persons moving through the passages. Specifically, we note that:

1. In a unitary passage, one person passes through.
2. In a two-to-one merger, two persons pass through.
3. In a three-to-one merger, three persons pass through.
4. In a four-to-one merger, four persons pass through

— and so on.

The importance of this observation is that although mergers grow increasingly unlikely as the number of participants increases, we must not lose sight of the corresponding fact that *the number of participants is increasing apace*. And these participants should be accounted for, if the calculated probabilities are to match up with their experiences. Another way of saying this is to point out that when a high-order, large-number merger occurs, many persons must perforce pass through it. That "aggregation" makes the merger more likely, from the standpoint of those involved, than the numbers of Table 13.1 would indicate.

The relative probabilities of each passage type, *as experienced by the participants*, can be calculated by multiplying the relative probability of the passage type by the number of persons involved in that passage. The modified probability formula becomes:

$$p_n = n \times (1/2)^{n-1}$$

where, again, *n* is the number of persons involved in an *n*-to-one passage.

For a one-to-one unitary passage:

$p_1 = 1 \times (1/2)^0 = 1$

For a two-to-one merger:

$p_2 = 2 \times (1/2)^1 = 1$

For a three-to-one merger:

$p_3 = 3 \times (1/2)^2 = 3/4 = 0.75$

For a four-to-one merger:

$p_4 = 4 \times (1/2)^3 = 4/8 = 0.5$

And so on. Table 13.2 summarizes the first ten of these relative *experienced* probabilities.

Table 13.2
Relative experienced probabilities

passage type	relative experienced probability
1-to-1	1
2-to-1	1
3-to-1	0.75
4-to-1	0.5
5-to-1	0.313
6-to-1	0.188
7-to-1	0.109
8-to-1	0.0625
9-to-1	0.0352
10-to-1	0.0195

This gets us closer to the real solution, but one more refinement remains. The probabilities in Table 13.2 are relative probabilities: that is to say, they are correctly proportioned, relative to one another. But they do not add up to 1 (*i.e.*, 100%), which is what we should want of the *absolute* probabilities. Instead, we see that the first ten probabilities add up to 3.9772, which is larger than 1.

In order to convert these relative probabilities into absolute probabilities, it is necessary to find a normalizing constant, α, which, when divided into all the probabilities, makes them sum to 1 exactly. We can see that α must be larger than 3.9772. Its exact value can be calculated by summing the relative experienced probabilities for *all* merger types, from $n = 1$ to $n =$ infinity. The power series for this sum is:

$$\alpha = \sum_{n=1}^{\infty} n\,(1/2)^{n-1}$$

$$= 1 + 1 + 0.75 + 0.5 + 0.313 + 0.188 + 0.109 + \ldots$$

This sum is *proved* to be of the form: $1 / (1-x)^2$. Here $x = 1/2$, so:

$$\alpha = 4$$

For confirmation *Appendix E* sums the series mechanically, with same result.

This value of α, when divided into all the probabilities, makes them sum to 1 exactly. Hence they become the absolute experienced

probabilities we've been seeking. So, dividing the relative experienced probability formula by 4, we get the formula for absolute experienced probability. Modifying our formula one last time, it becomes:

$$p_n = 0.25\ n \times (1/2)^{n-1}$$

Table 13.3 summarizes the first ten *absolute* experienced probabilities.

Table 13.3
Absolute experienced probabilities

passage type	absolute experienced probability
1-to-1	0.25
2-to-1	0.25
3-to-1	0.188
4-to-1	0.125
5-to-1	0.0781
6-to-1	0.0469
7-to-1	0.0273
8-to-1	0.0156
9-to-1	0.00879
10-to-1	0.00488

These probabilities can provide the solution to the problem. Restating and summarizing the original question:

> *What is the experienced ratio of merged versus unitary passage?*

We can see in Table 13.3 that one-to-one unitary passages have an absolute experienced probability of 0.25, or 25%. We interpret this as meaning that a person should have a 25% chance of experiencing a unitary passage.[3]

All other passage probabilities sum to 75%. Since all other passages are merged passages, a person should have a 75% chance of experiencing a merged passage.

The ratio, 75:25, is just 3:1.

We conclude that the experienced ratio of merged versus unitary passage is 3:1. Under normal circumstances, a passage participant would be three times as likely to encounter a merged passage as a unitary passage.

In the next chapter we will determine the likelihood of *ex nihilo* passage.

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next Chapter 14: *Ex Nihilo* Probability

Chapter 13 Endnotes

[1] As cited previously in *Chapter 9, Section 3, note 15*: "Nature is the one who has granted us the loan of our lives, without setting any schedule for repayment. What has one to complain of if she calls in the loan when she will?"

[2] The definitions and theorems of this calculus follow from John G. Kemeny and J. Laurie Snell, *Finite Markov Chains* (Princeton: D. Van Nostrand Company, 1960) 25, 35-39, 99-100. For additional references to these topics see William Feller, "Waiting Line And Servicing Problems," *An Introduction to Probability Theory and Its Applications*, 2 vols., 2nd edition (New York: John Wiley & Sons, 1957) 413-21.

[3] It may be surprising to see that two-to-one mergers are just as likely to be encountered as one-to-one unitary passages. But the formula for absolute experienced probabilities correctly sets odds on both at 25%.

Chapter 14
Ex Nihilo Probability

In the previous chapter we determined that a person encountering existential passage would be three times as likely to experience a merged passage as a unitary passage. Now we can turn our attention to the *recipient* of the existential passage.

Not all newborns are thought to receive passages under Metaphysics by Default. As we've seen previously in Figure 11.6, a newborn can appear at a time when no passage participant (*i.e.*, no ending terminus) is available.

Figure 11.6 is printed again below as Figure 14.1. In this figure Dacia (at bottom) receives no existential passage:

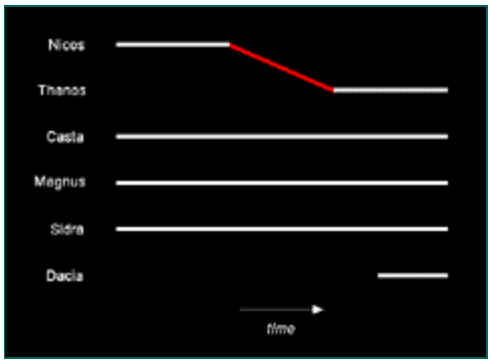


Fig. 14.1
Ex nihilo passage

This situation was defined in Chapter 11 as *ex nihilo* passage, passage out of nothing. This is a passage event which involves no transmigrating participant: it is "unparticipated" in that sense.

Continuing our mathematical analysis from the previous chapter, we now ask:

> *How likely is* ex nihilo *passage, relative to participated passage?*

We can use the same probability technique developed in the previous chapter to find an informal answer to this new question. As before, a formal answer does also exist. The formal derivation is located in *Appendix A*.

We set up our informal solution to this new mathematical problem by considering the most basic *ex nihilo* passage scenario.

The simplest scenario is this: a person has been born into a simple cosmos, and thereafter has passed away at some time t. We "freeze" that person's timeline in Figure 14.2. We'll assume that it cannot be altered, and that for now it represents the only life that has existed in the cosmos.

Fig. 14.2
One *ex nihilo* birth

In figure 14.2 we see that this person, being the only person extant in his cosmos, must have been born as an *ex nihilo* passage. This is certain. We will denote this probability as p_{ex1}, thus:

$$p_{ex1} = 1$$

where $p_{ex\ n}$ stands for the relative probability of *n* persons being born into *ex nihilo* passage.

Now we add a second person, a potential recipient of that first person's existential passage. The timing of the birth of this second person we will consider to be random. This potential recipient may be born at any time, either before or after time *t*, unpredictably. The two possible types of outcomes are illustrated in the following two figures:

Fig. 14.3

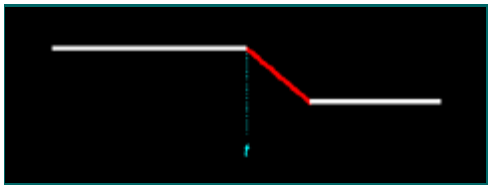


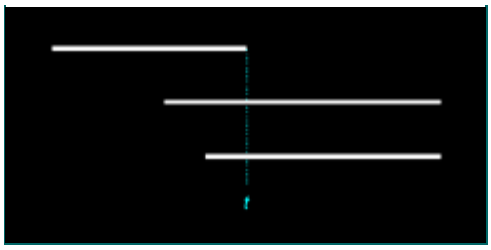
Fig. 14.4

In Figure 14.3 we see that *both* of the illustrated births are *ex nihilo* passages. However, this is not the case in Figure 14.4, wherein only one birth is an *ex nihilo* passage. Since each of these two outcomes is equally likely, the probability that all births will be *ex nihilo* passages is here 1/2, or 0.5. We denote this probability as p_{ex2}:

$$p_{ex2} = 0.5$$

What if we add a third birth to the scenario? We can create another set of figures to determine the probability that all *three* births will be *ex nihilo* passages. Again, the random births we've added may occur at any time, either before or after time *t*. Four outcomes are now possible:

Fig. 14.5



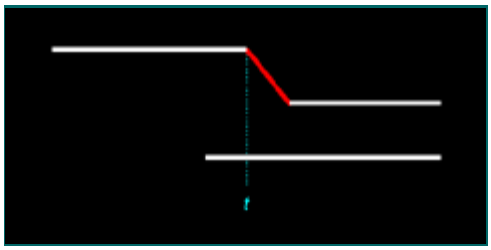


Fig. 14.6

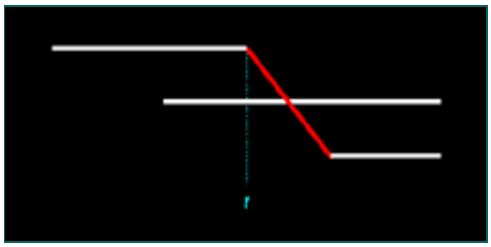


Fig. 14.7

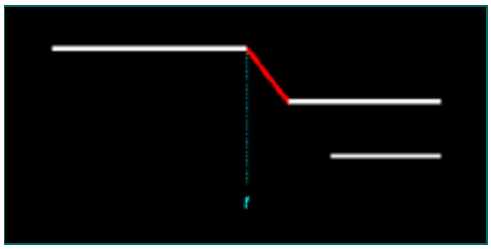


Fig. 14.8

Only in Figure 14.5 are all three births *ex nihilo* passages. Since each of the four outcomes is equally likely, the probability that all births will be *ex nihilo* passages is here 1/4, or 0.25.

$$p_{ex3} = 0.25$$

What if we add a fourth birth to the scenario? We can create another set of figures to determine the probability that all *four* births will be *ex nihilo* passages. Again, the random births we've added may occur at any time, either before or after time *t*. Eight outcomes are now possible:

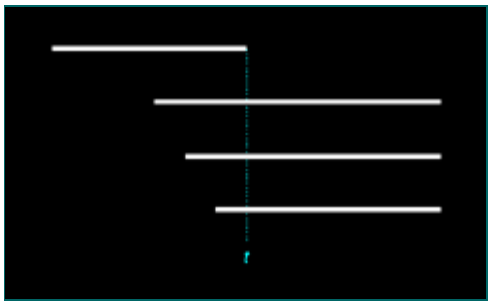
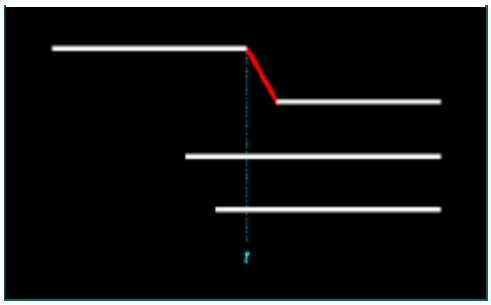


Fig. 14.9

Fig. 14.10



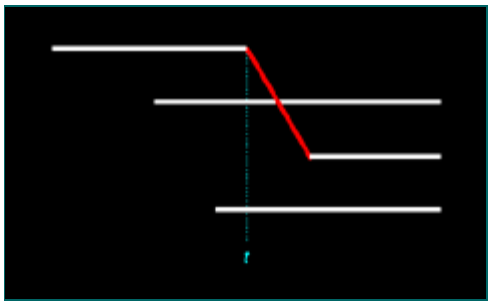


Fig. 14.11

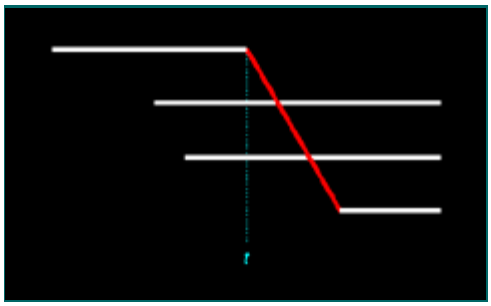


Fig. 14.12

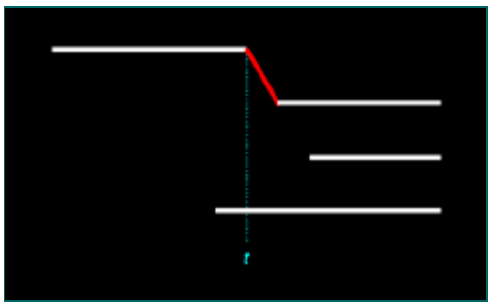


Fig. 14.13

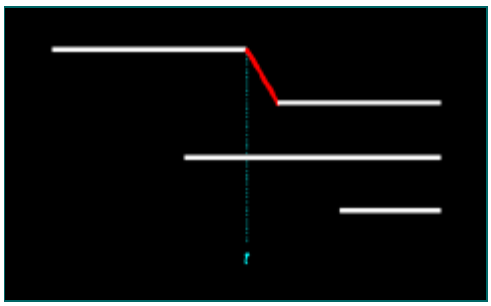
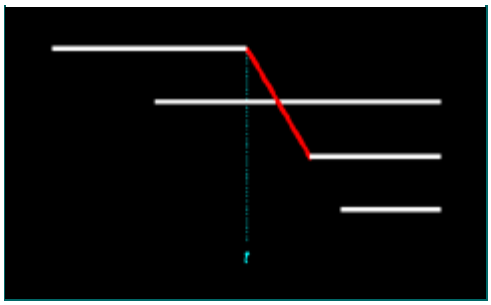


Fig. 14.14

Fig. 14.15



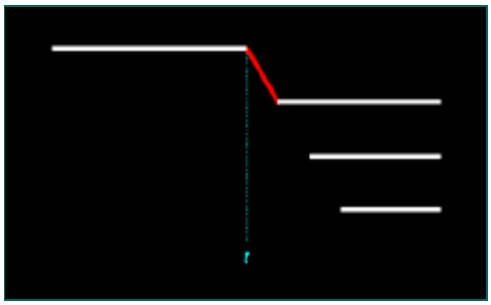


Fig. 14.16

Only in Figure 14.9 are all four births *ex nihilo* passages. And so the probability that all four births will be *ex nihilo* passages is here 1/8, or 0.125.

$$p_{ex4} = 0.125$$

A progression of relative probabilities for each *n*-tuple group of *ex nihilo* passages is emerging, according to the rule:

$$p_{ex\ n} = (1/2)^{n-1} \quad \{ n = 1 \text{ to infinity } \}$$

where, again, *n* is the number of newborns experiencing *ex nihilo* passage.

And now the informal derivation of the overall *ex nihilo* probability is almost complete.

Let's recall from *Chapter 13* our very first attempt at a probability rule. We came up with a rule for determining the relative probability of each *n*-to-one passage type:

$$p_n = (1/2)^{n-1} \quad \{ n = 1 \text{ to infinity } \}$$

This rule is identical to the relative probability rule predicting the occurrence of *n ex nihilo* passages:

$$p_{ex\ n} = (1/2)^{n-1} \quad \{ n = 1 \text{ to infinity } \}$$

Since the rules are the same, the probabilities are the same. And so we see that the probability that a newborn would experience an *ex nihilo* passage is the same as the probability that the newborn would

be the recipient of a passage. It follows that a newborn would be equally likely to experience *ex nihilo* passage, as not.

Stated as a ratio: Newborns' experienced ratio of *ex nihilo* passage, relative to participated passage, would be 1:1.

From the probability results derived so far, we can also generate the mathematics of a corollary property, "noetic reduction." This property will be defined, and its mathematics determined, in the next chapter.

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next Chapter 15: Noetic Reduction

Chapter 15
Noetic Reduction

There is another property of existential passage which deserves mention. I'll call it "noetic reduction," with a definition to come. This corollary property derives from the following observation:

Under the proposed tenets of Metaphysics by Default merged passages would be common, and of course more persons would enter each merged passage than would leave it. For example a two-to-one passage would begin with two persons and end with only one. A three-to-one passage would begin with three and end also with one. As a rule, every merged passage is thought to end by dropping the number of participating persons down to one.

Now, subjectively, the passage participants would be ignorant of this decrease in their number. But objectively we can see that a decrease should occur with every merger.

In *Chapter 11* we saw that an apparent shrinkage of the population was actually balanced by *ex nihilo* passages. That result still holds true, for the *overall* population. But this decrease in the number of passage participants would produce a cumulative effect on any *particular* group of individuals. Over time, generations *within that group* would cascade through a series of passages; each generation encountering a decrease in number as members of the group merge into fewer recipients.

Figure 15.1 illustrates a decrease due to merged passages. Three generations are represented. The first generation is at upper left, the second at center, and the third at lower right:[1]

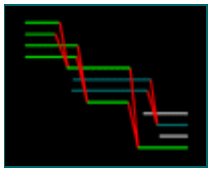

Fig. 15.1
Noetic reduction

Colors on the timelines mark off distinct population groups. We can trace like-colored lines to see where each group's population has decreased. For example, the blue-line group shows a decrease from the second generation to the third, with two members of the second-generation group merging into a single member of the third. Green lines mark off a different group, which undergoes a separate, multi-generation decrease. Here all four members of the first-generation group merge into two members of the second. That second-generation group merges in turn into a single individual, in the third generation.

Although these passage participants cannot know it, they are being "packed together," and rapidly.

In Figure 15.1 the green multi-generation decrease is that of four persons passing through two generations of mergers into a single

final recipient. That one recipient now continues the life experience of that group's original four members. Mergers have here "reduced" those four persons down to one. (Here I am drawing upon a meaning of reduction that equates with the "removal of volatiles," as when a dilute solution is boiled to remove water.)

In the metaphysics, what is reduced is not the overall population *per se*. For the sake of mathematical simplicity we have assumed back in Chapter 13 that the overall population remains near some equilibrium number, and we continue to hold by that assumption. This is reiterated visually in Figure 15.1, wherein each generation is assigned an unvarying population of four individuals.

So the reduction does not apply to the overall population. Rather, it applies to a *given group's starting population.* When we track that particular group over successive generations we see that the number of recipients inheriting that group's passages tends always towards one. The group members' personal identities are being coalesced progressively closer to a single common identity as each generation of merged passages reduces the number of individuals remaining from the group's original population.

The mergers are forcing out the "space" between distinct living minds, joining their subjectivities together into a progressively smaller number of individuals: down to the final reduction of *one*. When the group is reduced to one individual, no further reduction of that group can occur; as *one* is the minimum number of participants, *n*, in any *n*-to-one passage.[2]

Taking a page from Teilhard de Chardin, we might say that the group's starting population constitutes a "noosphere"[3] of independent minds. As merged passages force out the space between those minds, and reduce the group, that noosphere shrinks. When the number of individuals reaches one, the noosphere has reduced to its smallest possible size. The phrase "noetic reduction" can serve as a moniker for this coalescent process.

Now, how can we quantify the process? Well, one quantity we can determine directly is the average decrease a given population would undergo in the course of a single generation. More specifically, this will be the per-generation percentage decrease due to merged passage. Once we have determined this percentage, we can go on to derive additional results.

So, what is the per-generation percentage decrease due to merged passage (*i.e.*, the noetic reduction percentage)?

To get this percentage we will need to find two factors which will be multiplied together in the result. The factors are:

(1) the percentage by which each merged passage type decreases a group's population.

(2) the probability that a person will experience each merged passage type.

To get (1), let's consider the following:

1. In a unitary passage (a one-to-one merger), there is no decrease in the number of persons. It is a 0% decrease.
2. In a two-to-one merger, one of the original two persons is lost. It is a 50% decrease.
3. In a three-to-one merger, two of the original three persons are lost. It is a 66.7% decrease.
4. In a four-to-one merger, three of the original four persons are lost. It is a 75% decrease.

As we can see, it is the number of persons, *n*, participating in the *n*-to-one merger which determines the percentage decrease. The percentage decrease for *n*-to-one merger follows this rule:

Percentage decrease = $((n\text{-}1)/n) \times 100\%$

This takes care of (1). And we already have (2), from *Chapter 13* (verified in Appendix A):

$p_n = 0.25\ n \times (1/2)^{n-1}$

We multiply these two factors together to get a formula for the group's per-generation percentage decrease. And then we sum this formula over all possible values of *n*, to get the group's *total* per-generation percentage decrease.

Here is the power series sum, without simplification.[4] The noetic reduction percentage, per generation, is:

$$\sum_{n=1}^{\infty} \left[\ 0.25\ n \times (1/2)^{n-1}\ \right] \times \left[\ ((n\text{-}1)/n) \times 100\%\ \right]$$

This sum is *proved* to be of the form: $a\ x\ /\ (1\text{-}x)^2$. Here a = 25% and x = 1/2. The result:

> Noetic reduction would decrease a group's size at the rate of 50% per generation.

For confirmation *Appendix G* sums the series mechanically, with same result.[5],[6]

The effect would seem to be fast; operating not on a geological time scale, but on a social time scale. Now that we have the noetic reduction percentage, we can quantify the effect on any population.

Specifically, we can calculate the number of generations (*nGEN*) for an arbitrary population (x) to reduce to some smaller population (y), given the decimal percentage of noetic reduction per generation (d_{NR}). The formula for this calculation can be derived in a few steps:

In one generation noetic reduction decreases a population x

down to a population *y*. Solving for *y*:

$y = x - d_{NR}\, x$

$y = x - 0.5\, x$

$y = x(0.5)$

The process continues for *nGEN* generations. Over those *nGEN* generations, population *x* is multiplied by 0.5, *nGEN* times, in order to obtain the final reduced population *y*. Solving now for *nGEN*:

$y = x\ (0.5)^{\,nGEN}$

$(0.5)^{\,nGEN} = y / x$

$nGEN = \ln (y / x) / \ln (0.5)$

Now we have a formula for *nGEN*:

$nGEN = \ln (y / x) / \ln (0.5)$

We can use this formula to find the number of generations required to reduce one arbitrary population to another. For example: We begin with a starting population roughly that of the United States, where:

$x = 300{,}000{,}000$

And we'd like to know how long it would take for a population of this size to reduce to the size of a small country town, where:

$y = 3{,}000$

Applying our formula for *nGEN*:

$nGEN = \ln (3{,}000 / 300{,}000{,}000) / \ln (0.5)$

$= \ln (0.00001) / \ln (0.5)$

$nGEN$ = 17 generations, or roughly 510 years.

For a more dramatic example, we could ask, "How long would it take for the world's current human population to reduce down to a single individual?"

Here we'll take *x* as 6 billion. *y* we'll take as 1.5, rather than 1, because noetic reduction is "step-wise." When the population is calculated theoretically as a fractional value of less than 1.5, it should in reality "step down" to 1 exactly, because fractional personal identities are not thought to exist.[7]

So, with these values of *x* and *y*, we get the following *nGEN*:

$nGEN = \ln (1.5 / 6{,}000{,}000{,}000) / \ln (0.5)$

$= \ln (2.5 \times 10^{-10}) / \ln (0.5)$

nGEN = 32 generations, or roughly 960 years.

Noetic reduction would appear to be capable of reducing a whole-species population group down to a single individual, over the course of several hundred years.[8]

At this point a review of the most important mathematical results is in order.

---

next Chapter 16: Summary of Mathematical Results

Chapter 15 Endnotes

[1] Actual generations overlap more than indicated by the timelines of Figure 15.1. Here as elsewhere in the essay, generations are temporally separated so as to improve the visual clarity of the timeline illustrations. Chapter 16 will certify that this convention does not alter the mathematics.

[2] No "partial" or "fractional" personal identity seems plausible. For this reason we can suppose that a single identity will pass to a single identity, indefinitely; with no further reduction. As noted in Chapter 11, split passages may exist, but the practical difficulty of synchronization would appear to be considerable. And for this reason split passages are thought to be, at best, extremely rare. Consequently their negligible probabilities are not factored into these equations, or into any equations of Metaphysics by Default.

[3] This author takes no strong position with regard to the truest meaning or teleology of the word "noosphere", only noting that the vision of "mind-space" which it establishes can serve as a well-known point of departure for the hike to noetic reduction. For an introduction to noosphere — and other concepts in the philosophy of Teilhard de Chardin — see Pierre Teilhard de Chardin, *Let Me Explain*, trans. Rene Hague, et al. (London: Collins, 1970). Hague provides a definition of Teilhard de Chardin's noosphere on pages 17-18. Quoting:

> "*Noosphere* (from *Noos*, mind): 'The terrestrial sphere of thinking substance.' It is the thinking envelope woven around the earth, above the biosphere, and made up by the totality of mankind. Its reality is already existing, and its density is constantly increasing through the rise in the human population, its inter-relations, and its spiritual quality."

By this definition we may infer that noosphere is to be understood as emerging through the social interaction of individual minds. Teilhard de Chardin's imagery sometimes suggests a noosphere which transgresses the boundaries of personal identity, but I think a conservative reading of the definition reconciles noosphere to personal identity as the latter concept has been presented in this essay.

[4] The formula for this sum can be simplified, but I leave all the original factors of (1) and (2) in this statement of the formula, so as to make the derivation clear. If we simplify and convert to decimal probability we get: $0.25\ n \times (1/2)^n$. $a = 0.25$, $x = 1/2$.

[5] Provided, again, that the overall population is stable over time near some equilibrium number.

[6] This result receives indirect support from the mathematics of Chapter 14. In Chapter 14 we found *ex nihilo* passage to be as likely as participated passage. In consequence, only half of each newborn generation is thought to inherit passages from the previous. The inference is that the previous generation has passed to a population half its size.

[7] That being said, there is less than one generation in difference between a calculation of $y = 1$ and $y = 1.5$.

[8] As a corollary, we can note that the individual recipient of the whole-species population group has won the title against long odds. In the example cited, the odds were 6 billion to 1. All other contemporaneous passage recipients have inherited younger population groups: these groups are comprised of members whose multi-generational ages are less than 960 years. (Again, granted population stability near 6 billion, and with the understanding that the reduction rate is only a probabilistic average.)

Chapter 16
Summary of Mathematical Results

Chapters 13-15 have derived three aggregate mathematical results. I should emphasize that these results can apply only to populations meeting the conditions assumed at the start of Chapter 13 — the assumption of population stability being especially critical.[1]

Summarizing the results in the order of their derivation:

Question:

What is the experienced ratio of merged versus unitary passage?

Answer:

3:1

We have seen in *Chapter 13* that unitary, one-to-one passage has an absolute experienced probability of 0.25, or 25%. We interpret this as meaning that a person would have a 25% chance of experiencing a unitary passage.

All other *n*-to-one passage types add up to a 75% probability. Since all other *n*-to-one passages are merged passages, a person should have a 75% chance of experiencing a merged passage.

The ratio, 75:25, is just 3:1.

And so the experienced ratio of merged to unitary passage would be 3:1. Under normal circumstances, a passage participant would be three times as likely to encounter a merged passage as a unitary passage.

Question:

How likely is ex nihilo *passage, relative to participated passage?*

Answer:

equally likely

The rule for predicting the occurrence of *n ex nihilo* passages ($p_{ex\ n}$) is the same as the rule for determining the probability of each *n*-to-one passage type (p_n). We have seen in *Chapter 14* that these probabilities are equivalent:

$$p = p = (1/2)^{n-1} \quad \{ n = 1 \text{ to infinity} \}$$

n *ex n*

Since the rules are the same, the probabilities are the same. The probability that a newborn would experience an *ex nihilo* passage is the same as the probability that the newborn would be the recipient of an *n*-to-one passage. And so newborns would be equally likely to experience *ex nihilo* passage, as not.

Question:
What is a group's per-generation percentage decrease due to noetic reduction?

Answer:
50%

The noetic reduction per generation for a particular group is calculated as the sum:

$$\sum_{n=1}^{\infty} \left[0.25\, n \times (1/2)^{n-1} \right] \times \left[((n-1)/n) \times 100\% \right]$$

We have seen in *Chapter 15* that this sum is 50%. And so with the passing of each generation a given population would undergo noetic reduction into a population just half its original size.

The cumulative effect would appear to be capable of reducing a whole-species population group down to a single individual, over the course of several hundred years.

These results have been derived by means of informal probability rules. Because the rules are informal, it is necessary to provide a separate, formal derivation of the results as a double-check of their validity. As stated previously, the formal derivation has already been done, and is printed in *Appendix A*. The formal results are close to the informal results on all points. The differences are small, and readily accounted for in the computational errors introduced by the particular application of the formal technique.

These two sets of results are listed side-by-side in Table 16.1 below. Each row in the table presents the calculated decimal probability for a different passage type. The final row presents the aggregate merged-to-unitary ratio:

Table 16.1
Comparison of results from two techniques

	formal probability	informal probability
ex nihilo	0.486	0.500
unitary	0.258	0.250
2-to-1	0.265	0.250
3-to-1	0.198	0.188
4-to-1	0.127	0.125

5-to-1	0.074	0.078
merged/unitary	2.85	3.00

The formal and informal results match well. This satisfies the purely mathematical requirements of the philosophy.

Beyond this, a visual calculation of the system dynamics can give additional confirmation. Interactive visuals can engage the reader at each controlled step. For these reasons I attach a "Monte Carlo program" below. It performs interactive visual calculations of the three aggregate results reviewed above.

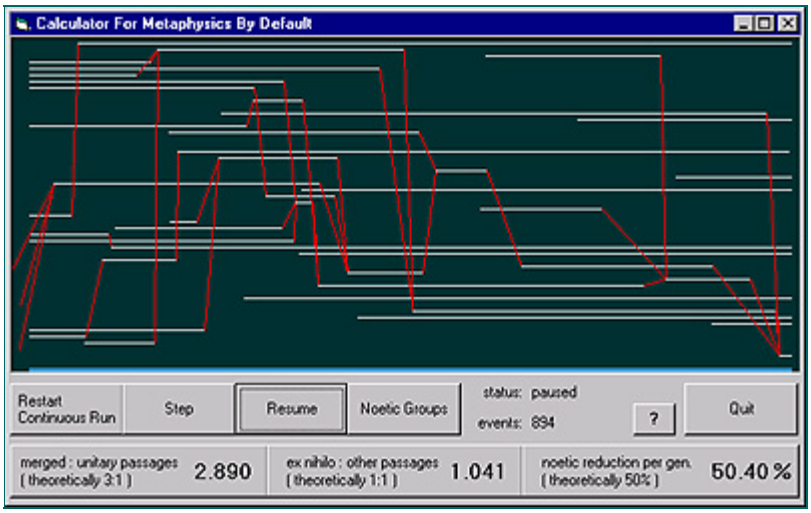

Fig. 16.1
Calculator for Metaphysics by Default
(Click image to download the application.)

Appendix B — calculator for Metaphysics by Default.

Appendix C — source code to calculator for Metaphysics by Default.

The calculator of Appendix B sets up a series of random population events. Once the events have been generated, the program "walks through" the events, progressing along a simulated timeline. At each time increment the program records the passage events specified by the conditions of that moment. The program then updates the three aggregates derived previously: the ratio of merged to unitary passage, the ratio of *ex nihilo* to all other passages, and the noetic reduction percentage.

A ReadMe file guides installation. A question mark button on the display panel opens operating instructions. ?

The program's numeric output is close to the values of Table 16.1. It provides a third independent derivation, and confirmation, of the mathematical results.

As the program runs, its outputs settle near the theoretical values derived informally in Chapters 13-15, and verified formally in Appendix A. The program contains no explicit rule which forces its calculated results to match the theoretical results. Instead the cumulative events conform naturally to a probability distribution similar to that found in the formal and informal probability arguments. For this reason the program produces aggregate values in accord with mathematical prediction.

Sample Monte Carlo program results, compiled from two different applications,[2] are printed alongside previous results in a combined table, Table 16.2, below. The close agreement of all three sets of results gives us greater assurance of the soundness of all three techniques.

Table 16.2

Comparison of results from three techniques

	Monte Carlo [3]	formal probability	informal probability
ex nihilo	0.512	0.486	0.500
unitary	0.253	0.258	0.250
2-to-1	0.250	0.265	0.250
3-to-1	0.189	0.198	0.188
4-to-1	0.124	0.127	0.125
5-to-1	0.075	0.074	0.078
merged/unitary	3.14	2.85	3.00

This concludes the mathematical results for Metaphysics by Default. In our mind's eye we have now stepped onto the fourth of five stepping stones strewn across the river Lethe. To reach the next and final stone, we will need to consider the metaphysical status of other species.

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next Chapter 17: Application to Other Species

Chapter 16 Endnotes

[1] A sustained population *increase* would result in the following qualitative changes to the three aggregate results summarized in this chapter:

- The merged passage probability would be *decreased*.
- The *ex nihilo* passage probability would be *increased*.
- The noetic reduction rate would be *decreased*.

A sustained population *decrease* would produce metaphysical changes opposite those attendant a population increase.

[2] The *ex nihilo* and merged/unitary Monte Carlo ratios were

obtained by a Visual Basic 5 program over the course of 1,000,000 simulated events. *Appendix B*; *Appendix C*. All other Monte Carlo results were obtained by a Macintosh Thin C program over the course of 1,000,007 simulated events. *Appendix D*.
[3] Please refer to note 2 for details of the Monte Carlo program results.

Chapter 17
Application to Other Species

In Chapter 8 we verified that three specific criteria are necessary (and are likely sufficient) for the maintenance of personal identity. Again, they are: *continuity*, *subjectivity* and *memory*.

It is self-evident that the human mind possesses capabilities far in excess of those required for the bare maintenance of personal identity. The three criteria operate at a level of consciousness which is lower than that of language, empathy, skill, foresight, and other advanced mental states. To the extent that a person develops these higher capabilities, that person gains distinction, and character. Or looking at it from the opposite pole: to the extent that a person neglects these capabilities, he or she falls short of the Ideal Character.

Of course, character development, as a body of thought, is well understood. We needn't review it here. The minimal, criterial requirements of personal identity do not approach character, or even intelligence. Identity criteria are really quite *base* in comparison with our higher qualities. And this raises a question:

Do any non-human creatures also satisfy the requirements of personal identity?

The baseness of the criteria imparts gravity to this question, for "when standards are low, many pass." Any non-human creatures that *do* satisfy the requirements should, we might think, be co-participants in existential passage. They would be commingled with us in passage — ontologically indistinguishable from humans.

Here I should be clear: by speaking of such creatures as "ontologically indistinguishable from humans," I mean to say that they would participate in passage as subjective unities, just as humans may be thought to participate. According to prior tenets of Metaphysics by Default, the minimum number of participants who can transfer through an existential passage should be *one*: no "fractional" participation seems possible. And so any participant should count as *one* participant, regardless of character, intelligence or evolutionary lineage.

Mental differences among creatures do exist of course. Creatures exhibit these differences in an amazing variety of behaviors. But the criteria of personal identity would seem to isolate those particular mental differences (or perhaps, ontologic differences) of metaphysical import.

So, do any non-human creatures satisfy the requirements of personal identity? The answer is not obvious, and we are easily misled by emotional guides. On the one hand, our imaginative empathy towards other creatures tempts us to see in animals the psychological qualities we appreciate in humans. On the other hand, our need to control the natural world tempts us to strip creatures of their innate psychological lives, so as to deal with them as mere "resources," or "automata."

I am subject to these distortions myself. My imaginative empathy wants all furry animals to be sentient and emotive — even furry caterpillars. This, while my need for control wills me to see chickens and cows as mere foodstuffs. The conflict inherent in these two views surfaces almost immediately. One can say, "But cows are furry animals," and set my mind at odds against itself.

We can resolve this sort of conflict (and reach an answer to the stated question) if we restrict our view to the three criteria of personal identity. This is the regimen we will follow in this chapter. We'll check each class of ontologic entity for each criterion of personal identity. When we've worked through all classes and all criteria, we will have filled in a table of results. Hopefully this table will help us answer the question with some useful accuracy.

First we should review the criteria, stating them as they will be understood throughout this chapter:

1. **Continuity**: "Continuity" will stand for "physical continuity." This is the continuance of physical structures in a body over time. Individual atoms may be replaced, but the replacement atoms must be of the same elements as the atoms lost, so that the structures retain their functional characteristics over time.

2. **Memory**: "Memory" will stand for "episodic memory." This is the ability to "reach back" into the past. More specifically, it is the ability to retrieve egocentric episodes as a temporal chain of life events.

3. **Subjectivity**: "Subjectivity" will stand for the "subjective locus," or "the ability to distinguish self from not-self." If the definition is to be substantial, it should exclude purely reflexive physiologies and behaviors. Reflexes do not separate, or abstract, conscious experience from primitive sensation. Bare reflexes are almost certainly inadequate for subjective awareness.

We start off with the empty table below:

Table 17.1
Personal identity criteria, ordered by entity class

	Continuity	Memory	Subjectivity
Humans			
Great apes			
Mammals			

Vertebrates
Invertebrates
Computers
Multi-celled plants
Eukaryotes/prokaryotes
Inanimates

Each criterion of personal identity heads its respective column. On the left, each row is assigned a different entity "class." These classes have not been derived according to any strict scheme, and they do not cover every possible type of existent: they are only convenient and useful categories. For the limited purpose of estimating the reach of personal identity, they will do.

The classes of entities are arranged bottom-up, in rough order of increasing complexity. This arrangement is something of a taxonomic tradition, so we keep it here. We will fill the table from the bottom, as this ordering conforms with notions of "evolutionary development." This ordering also makes for an easier exposition.

The five possible values of each table entry will be: *none*, *few*, *some*, *most*, and *all*.

We'll begin the classification by looking first at the continuity criterion.

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next Section 2 of 4

Chapter 17
Application to Other Species

continued, Section 2 of 4

The Continuity Criterion, by Entity Class:

Restating the working definition:

> **Continuity**: "Continuity" will stand for "physical continuity." This is the continuance of physical structures in a body over time. Individual atoms may be replaced, but the replacement atoms must be of the same elements as the atoms lost, so that the structures retain their functional characteristics over time.

Inanimates: Some inanimates lack long-term structure. Sparks, clouds, aurorae — all transient phenomena fall into this category. Other inanimates, such as crystals, passively retain their structure over time. And some inanimates actively maintain, and even replicate, their structure. As examples, we can note the autocatalytic, or "self-copying" chemistry of certain pre-biotic systems. Amino-adenosine and a complex aromatic ester form a product which autocatalyzes in chloroform. And micelles (charged polymers) of lithium hydroxide and octanoic acid sodium salt autocatalyze within an organic solvent.[1]

Do inanimates satisfy the continuity criterion? We can say that some do.

Eukaryotes/prokaryotes: These single-celled organisms maintain the integrity of their living structures over time. Some receive energy and nutrients passively. Others actively obtain their sustenance through simple chemistry-mediated searches. But regardless of the means, the end is the same: all single-celled creatures satisfy the continuity criterion.

Multi-celled plants: What is true of single-celled plants is true of multi-celled plants as well. All multi-celled plants satisfy the continuity criterion.

Computers: Computers are an odd case. It may be interesting to see how they compare with the other classes of entities when judged by the same criteria.

Computers passively retain their structure over time because they are composed of inert materials. Those computers equipped

with robotic appendages can replace parts which have failed, and thereby actively maintain themselves. Additionally, John von Neumann[2] has provided a proof that computers can, in theory, maintain *and* replicate themselves without error, indefinitely.

So by passive or active means all computers satisfy the continuity criterion.

Invertebrates: What is true of single-celled animals is true of multi-celled animals as well. All invertebrates satisfy the continuity criterion.

Vertebrates: Again, what is true of single-celled animals is true of multi-celled animals as well. All vertebrates satisfy the continuity criterion.

Mammals: As with vertebrates generally. All mammals satisfy the continuity criterion.

Great apes: As with mammals generally. All great apes satisfy the continuity criterion.

Humans: All humans satisfy the continuity criterion.

Table 17.2 summarizes the results for the continuity criterion:

Table 17.2
Personal identity criteria, ordered by entity class

	Continuity	Memory	Subjectivity
Humans	all		
Great apes	all		
Mammals	all		
Vertebrates	all		
Invertebrates	all		
Computers	all		
Multi-celled plants	all		
Eukaryotes/prokaryotes	all		
Inanimates	some		

The column for continuity has now been filled in. We can proceed to the next criterion of personal identity — *memory*.

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Chapter 17, Section 2 Endnotes

[1] Cristiano Batalli Cosmovici, Stuart Bowyer, and Dan Werthimer, eds., *Astronomical and Biochemical Origins and the Search for Life in the Universe* (Capri: Editrice Compositori, 1996) 424-25.
[2] See John Von Neumann, *Theory of Self-Reproducing Automata*, ed. and completed by Arthur W. Burks (Urbana: University of Illinois Press, 1966).

Chapter 17
Application to Other Species

continued, Section 3 of 4

The Memory Criterion, by Entity Class:

Restating the working definition:

> **Memory**: "Memory" will stand for "episodic memory." This is the ability to "reach back" into the past. More specifically, it is the ability to retrieve egocentric episodes as a temporal chain of life events.

Inanimates: Some inanimate bodies retain historical information in their structure. A varve, or sedimented lakebed, may retain a record of seasonal droughts as layers within the sediment. A lava rock may retain a record of its age in the form of gas isotopes trapped within its matrix. But inanimates themselves lack any means of retrieving these historical data as useful memories. Among the inanimates found in nature, none satisfy the memory criterion.

Eukaryotes/prokaryotes: Some mobile bacteria demonstrate a short-term memory of their environments.[3] This environmental memory helps the bacteria navigate towards food sources. But this short-term memory is chemical, rather than neural, and is used only for food-navigation. It can serve no other purpose. Specifically, it cannot store long-term episodic memories.

Other single-celled organisms operate under comparable memory constraints.[4] So no unicellular organism satisfies the memory criterion.

Multi-celled plants: Plants are sessile by definition. They lack the nervous systems found in mobile animals. Lacking the nervous systems necessary for perception, they cannot retain memories of life events. So among multi-celled plants, none satisfy the memory criterion.

Computers: Computers store data in short-term memory structures, such as RAM chips, and in long-term memory structures, such as disks and tapes. But here our anthropomorphic tendencies can deceive us: most "data" bear no correlation to the episodic memories germane to the memory criterion. In the great majority of computers the stored data says nothing about the computer itself. The information useful to humans is useless to the computer because

it is irrelevant to the computer's "welfare," if we can use that word.

Only that data which constitutes historical information about the computer's own structure and environment might be considered relevant. This category probably covers "diagnostic files" and "sensor inputs," for example. A robotic computer could be expected to retrieve and interpret these memories in order to repair a fault or execute some maneuver.

If the diagnostic files and sensor inputs were stored as autoassociation patterns and chained temporally, they could form a valid episodic memory trace;[5] and hence satisfy the memory criterion. In fact, one such scheme has already been employed successfully in a mobile robot. Jun Tani has developed a neural net robot which uses a visual episodic memory trace to navigate a dynamic maze.[6]

Still, most computer memory systems clearly fail the test.

Invertebrates: Many invertebrates operate under a learning constraint which puts them at a disadvantage relative to vertebrates:

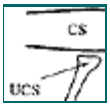

Fig. 17.1
Difference between vertebrate and invertebrate conditioned synapses[7]

Figure 17.1 highlights the difference. Invertebrate memory conditioning is shown at left, in (a). For the invertebrate, a teaching input ("unconditioned stimulus," or "UCS") must position its synapse on a single stimulus which is to be conditioned (CS). The teaching input conditions just that *one* stimulus.

The vertebrate architecture, shown at right in (b), is different. In the vertebrate, a teaching input (UCS) can spread long distances along a dendrite (in this case, vertically up and down the whole dendrite at right). As a result, the vertebrate teaching input can condition *many* stimuli simultaneously.

The vertebrate mechanism is the one appropriate for pattern association and autoassociation.[8] And autoassociation enables storage and retrieval of episodic memories (memories of events). Invertebrates lack that autoassociative mechanism, and hence lack episodic event memory.

As a behavioral example of this difference, we can contrast the ways in which vertebrates and invertebrates learn mazes. Both can learn simple T-mazes. But an ant taught a T-maze with one eye covered must relearn the maze when that cover is removed and placed on the other eye.[9] No vertebrate would be hindered by such trickery. The vertebrate's general-purpose associative memory store is isolated from the individual sense organs. A vertebrate's memory of the maze is therefore a memory of a series of events which can be recalled at will, independent of sensory cues. Ants, like all insects, operate without benefit of such an abstract and centralized memory store.[10]

Or, might there be exceptions to this rule? The honeybee brain

deserves special attention because the bee's foraging technique requires an exceptionally robust memory system — perhaps the most highly developed among insects. The honeybee brain contains a pair of organs called "mushroom bodies," due to their mushroom-like shape. They are the bee's primary organs for the acquisition of complex memories.[11]

Fig. 17.2
Frontal view of honeybee's head, with window opened into head capsule[12]

Figure 17.2 shows the position of the mushroom bodies (MB) inside the honeybee head. The scale at lower right indicates that the mushroom bodies have a combined diameter of about 1 mm.

Fig. 17.3
Honeybee brain[13]

Figure 17.3 shows details of the honeybee brain. Possible regions of long-term memory storage in the mushroom bodies are labeled as median calyx (mC) and lateral calyx (lC). The microstructure of these regions bears a resemblance to that of the vertebrate cerebellum.[14] We can see the similarity if we compare diagrammatic illustrations of the two structures.

Figure 17.4 illustrates typical connections in the vertebrate cerebellum:

Fig. 17.4
Connections in the vertebrate cerebellum[15]

In Figure 17.4 parallel fibers (PF) can be seen synapsing on the dendrites of vertical climbing fibers (CF). A similar arrangement is visible in Figure 17.3, inside the a-lobe (aL) of the mushroom body at left. There the parallel fibers of Kenyon cells (K) appear to synapse on the dendrites of protocerebro-calycal tract (PCT) neurons.

If function here follows form, then the learning which occurs in mushroom bodies may be similar to that known to occur in the cerebellum. This would be a kind of "conditioned motor learning."[16] This "motor learning" is less flexible than that of the general-purpose autoassociator. The mechanism, while powerful, does not appear to be capable of building the episodic memories required by personal identity. Figure 17.5, below, illustrates diagrammatically the wide gap in function separating motor memory (or "skeletal musculature memory") from episodic memory (memory of events).[17]

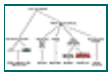

Fig. 17.5
A taxonomy of mammalian memory types[18]

This line of reasoning leads us to think that even advanced forms of insect invertebrate memory cannot satisfy the memory criterion of personal identity.

Cuttlefish — the cephalopod class of invertebrates — break from the invertebrate mold. Cephalopod neurons are closer to vertebrate structure than common invertebrate.[19] Cephalopods also possess an organ analogous to the vertebrate hippocampus. This organ, the vertical lobe, appears to fashion autoassociation event memories, which cephalopods are known to store long-term in the optic lobes.[20]

Fig. 17.6
Octopus brain. The vertical lobe is central, and the optic lobes are symmetrical to left and right.[21]

The octopus is the cephalopod most studied, and the one whose mental life is best understood. The octopus appears to use event memories in much the same way that vertebrates use memories recorded by the hippocampus. For example, among vertebrates the hippocampus is vital to mapmaking. *Octopus vulgaris* has also been observed to engage in mapmaking. Field observations suggest that this octopus follows a detailed topographical map when navigating the coral reef near its den.[22]

Figure 17.7 traces some typical octopus foraging trips:

Fig. 17.7
Octopus foraging trips[23]

During each trip the octopus departs from its den, navigates to a foraging area, and then returns to its den. Note in Figure 17.7 the *directness* of the final leg of each trip: the foraging octopus, when startled, darts directly home.

An animal follows a direct path, and ignores landmarks, when it knows the direction to its destination. The octopus' vertebrate competitors use a mental map to obtain that knowledge. The same is likely true of the octopus. In functional terms, *Octopus vulgaris'* vertical lobe seems to be autoassociating optical views of the reef into a unified mental map.

Octopus vulgaris has also demonstrated the ability to retain arbitrary T-maze memories over a long period of time in the laboratory.[24] This ability is comparable to that exhibited by the lower vertebrates.

By the example of *Octopus vulgaris* we can say that a few cephalopod invertebrates do appear to satisfy the memory criterion.

Vertebrates: The function of the human hippocampus was sketched in Chapter 6. The hippocampus stores and retrieves episodic memories.

The hippocampus is not an organ new to the human brain. It is actually an ancient organ found in all vertebrates, from early fishes to man.[25] Much theoretical work on the human hippocampus (such as that presented in Chapter 6) has actually been based on studies of the hippocampus in lower vertebrates, especially rats. The

hippocampus is a ubiquitous vertebrate organ of memory: one which records and retrieves episodic memories for all vertebrate species. It follows that all vertebrates most likely do satisfy the memory criterion.

Some labeled cross-sections and diagrams can illustrate the commonality of hippocampal structures among vertebrates:

Fig. 17.8
Evolution of the hippocampus and associated structures, in side view[26]

In Figure 17.8 the hippocampus is marked in black. "A" is the condition in monotremes and marsupials; "B" is a hypothetical intermediate stage; "C" is the condition in the hedgehog; "D", the bat; "E", the rodent; "F", primates and other advanced mammals.

Fig. 17.9
Goldfish hippocampus[27]

In support of the theoretical unity of vertebrate memory, we can note that several fish species have demonstrated an ability to learn simple mazes. The ability is degraded by ablation of higher brain centers.[28] Similar abilities and ablation impairments have been recorded throughout the vertebrate sub-phylum.[29],[30]

Fig. 17.10
Frog hippocampus[31]

Fig. 17.11
Alligator hippocampus[32]

Fig. 17.12
Diagram of bat hippocampus, side view[33]

Fig. 17.13
Diagram of koala hippocampus, side view[34]

Mammals: As with vertebrates generally. All mammals satisfy the memory criterion.

Fig. 17.14
Opossum hippocampus[35]

Fig. 17.15
Cat hippocampus[36]

Great apes: As with mammals generally. All great apes satisfy the memory criterion.

Fig. 17.16
Monkey hippocampus[37]

Fig. 17.17
Monkey hippocampus, with labeled regions[38]

Humans: All humans satisfy the memory criterion.

Fig. 17.18
Human hippocampus[39]

Table 17.3 appends the results for the memory criterion to the results for the continuity criterion, compiled previously in Table 17.2:

Table 17.3
Personal identity criteria, ordered by entity class

	Continuity	Memory	Subjectivity
Humans	all	all	
Great apes	all	all	
Mammals	all	all	
Vertebrates	all	all	
Invertebrates	all	few	
Computers	all	few	
Multi-celled plants	all	none	
Eukaryotes/prokaryotes	all	none	
Inanimates	some	none	

The column for memory has now been filled in. We can proceed to the final criterion of personal identity — *subjectivity*.

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Chapter 17, Section 3 Endnotes

[3] D. E. Koshland, Jr., "A Response Regulator Model in a Simple Sensory System," *Science* 196:4294 (1977): 1055-63.
[4] R. Menzel and G. Bicker, "Plasticity in Neuronal Circuits and Assemblies of Invertebrates, "*The Neural and Molecular Basis of Learning*, eds. J.-P. Changeux and M. Konishi (Chichester: John Wiley & Sons, 1987) 449. Quoting:

> "There is no firm evidence for associative learning in unicellular organisms such as protozoans or 'brainless' multicellular organisms such as the coelenterates, whereas nonassociative plasticity is found in both phyla."

[5] For some recent neural net memory models see Edmund T. Rolls, "A Theory of Hippocampal Function in Memory," *Hippocampus* 6:6 (1996): 601-20; Levy 579-90; Moll and Miikkulainen 1017-36. For theory and experiment concerning temporally-ordered memory recall, see Levy 579-90. See also August and Levy 231-36; Qin et al. 1525-33.
[6] Jun Tani, "An Interpretation of the 'Self' from the Dynamical

Systems Perspective: A Constructivist Approach," *Models of the Self*, eds. Shaun Gallagher and Jonathan Shear (Thorverton, UK: Imprint Academic, 1999) 149-76. For details of the robot's hippocampal analogue, see page 162.
[7] Rolls and Treves 34.
[8] A "pattern associator" learns to map an input pattern to an output pattern. An "autoassociator" is a special type of pattern associator, which learns to map an input pattern as its own output. See Rolls and Treves 33-36 for an analysis of possible differences between vertebrate and invertebrate association mechanisms.
[9] Theodore Holmes Bullock and G. Adrian Horridge, eds., *Structure and Function in the Nervous Systems of Invertebrates*, 2 vols. (San Francisco: W. H. Freeman and Company, 1965) 1: 337. This laboratory observation has been verified in the field. See Rudiger Wehner and Martin Muller, "Does interocular transfer occur in visual navigation by ants?" *Nature* 315 (1985): 228-29. For details of robust interocular transfer in mammals, see Giovanni Berlucchi, "Interaction of Visual Cortical Areas and Superior Colliculus in Visual Interhemispheric Transfer in the Cat," *Changing Concepts of the Nervous System,* eds. Adrian R. Morrison and Peter L. Strick (New York: Academic Press, 1982) 321-36. For a comparison of maze learning in the ant and the rat, see Richard A. Maier, Barbara M. Maier, *Comparative Animal Behavior* (Belmont: Brooks/Cole Publishing Company, 1970) 293-98.

A similar limitation of insect memory has been observed in honeybee olfaction. Bees trained to associate an odor on one antenna exhibit no associated memory of that odor when it is presented to the other antenna. This effect has been described in R. Menzel, J. Erber, and T. Masuhr, "Learning and Memory in the Honeybee," *Experimental Analysis of Insect Behaviour*, ed. L. Barton-Brown (New York: Springer Verlag, 1974) 195-217. R. Menzel has analyzed the effect *in situ*, in R. Menzel, "Memory Traces in Honeybees," *Neurobiology and Behavior of Honeybees,* eds. Randolf Menzel and Alison Mercer (Berlin: Springer-Verlag, 1985) 310-25.
[10] For surveys of the upper limits of insect learning, see B. Heinrich, "Learning in Invertebrates," *The Biology of Learning*, eds. P. Marler and H. S. Terrace (Berlin: Springer-Verlag, 1984) 135-47; and from that same text; J. L. Gould, "Natural History of Honey Bee Learning" 149-80. See also Menzel and Bicker 433-72.
[11] Jochen Erber, and Uwe Homberg, "Neural Signal Processing in the Median Protocerebrum of the Bee," *Neurobiology and Behavior of Honeybees* 253-64.
[12] Jurgen J. Milde, "The Ocellar System of the Honeybee," *Neurobiology and Behavior of Honeybees* 192. Quoting the original caption:

> "Frontal view of a bee's head with a window cut into the head capsule. Outlines of prominent brain structures are indicated. A single L-neuron from the median ocellus can be seen behind the central complex (CC). AL = antennal lobe; Ant = antenna; CE = compound eye; Lob = lobula; MB = mushroom body; Med = medulla; MOC = median ocellus; O = oesophagus."

[13] Menzel and Bicker 458. Quoting the original caption:

> "The brain of the honeybee. MC and lC: median and lateral calyx of the m.b.; aL: alpha lobe of the m.b.; K: Kenyon cells, the intrinsic neurons of the m.b.; mAGT and lAGT: median and lateral antenno-glomerularis tract; PCT: protocerebro-calycal tract; Oc: ocelli; AL: antennal lobe; Soe: subesophageal ganglion; AN: antennal nerve; MN: motorneuron to muscles moving the proboscis (tongue); OL: optic lobes."

[14] Friedrich-Wilhelm Schurmann and Karoly Elekes, "Synaptic Connectivity in the Mushroom Bodies of the Honeybee Brain: Electron Microscopy and Immunocytochemistry of Neuroactive Compounds," *Neurobiology and Behavior of Honeybees* 225-34. See especially the direct comparison with the cerebellum on page 227. See also Menzel and Bicker 457.
[15] Rolls and Treves 192.
[16] For an example of cerebellar conditioned motor memory acquisition in humans, see Fuster 163-64.
[17] Illustrated memory types are those known in mammals.
[18] Milner, Squire, and Kandel 451.
[19] Roger T. Hanlon and John B. Messenger, *Cephalopod Behaviour* (Cambridge: Cambridge University Press, 1996) 184.
[20] For a survey of associative learning in the octopus, see Hanlon and Messenger 138-48. See Hanlon and Messenger 27-29 for details of long-term memory storage in the optic lobes. For an earlier and complementary interpretation of vertical lobe functions, see M. J. Wells, *Brain and Behaviour in Cephalopods* (Stanford: Stanford University Press, 1962) 111-41.
[21] Hanlon and Messenger 28.
[22] Hanlon and Messenger 144-45. Recent experimental evidence indicates that honeybees also create mental maps of their foraging areas. The map images stored by honeybees are of a low resolution, in accord with the limited memory capacity of their brains' mushroom bodies (1mm combined diameter). However, the honeybee's ability to make even crude visual maps is truly remarkable, considering that bees lack the auto-association brain center (hippocampus) so important to vertebrate mapmaking. For details of honeybee mapmaking, see Gould 298-309. For details of vertebrate mapmaking, see N. Burgess, K. J. Jefferey, and J. O'Keefe, eds., "What are the parietal and hippocampal contributions to spatial cognition?" *Philosophical Transactions of the Royal Society of London: Series B* 352:1360 (1997): 1395-1543.
[23] Hanlon and Messenger 145.
[24] Hanlon and Messenger 140-41. See also, *octopus learning by observation*, in the following section.
[25] Harvey B. Sarnat and Martin G. Netsky, *Evolution of the Nervous System*, 2nd edition (Oxford: Oxford University Press, 1981) 338-41.
[26] Sarnat and Netsky 342. Quoting original caption:

> "Diagram of medial aspect of cerebral hemisphere to

show the evolution of the corpus callosum and septum pellucidum. (A) condition in monotremes and marsupials: hippocampus (black) and subiculum (stippled) lie dorsal to lamina terminalis; (B) hypothetic intermediate stage: hippocampal infolding brings subiculum closer to lamina terminalis; broken line in subiculum indicates position of incipient fibers of corpus callosum; (C) condition in hedgehog and bat: corpus callosum develops by penetrating subiculum; most of hippocampus beneath corpus callosum is obliterated; (D) except for small precommissural remnant, hippocampus lies entirely behind corpus callosum; (E) condition in rodents: splenium of corpus callosum expands as more fibers are needed; (F) condition of primates and other advanced mammals: rostral portion of corpus callosum expands and forms an arc, drawing the frontal part of lamina terminalis into the concavity to become part of the septum pellucidum; neural component is derived from paraterminal body. Subiculum above corpus callosum is induseum griseum in man. See text for further details. Arrows indicate direction of expansion; broken lines in the septum pellucidum are successive positions of the genu of the corpus callosum. Anterior commissure (CA); corpus callosum (CC); inferior fornix (FI); superior fornix (FS); lamina terminalis (LT); paraterminal body (PtB); rostrum (Ros); splenium (Spl); septum pellucidum (SL); subiculum (Sub). (Abbie, 1939)"

[27] Sarnat and Netsky 410.
[28] George Eric Savage, "The Fish Telencephalon and Its Relation to Learning," *Comparative Neurology of the Telencephalon*, ed. Sven O. E. Ebbesson (New York: Plenum Press, 1980) 149-50.
[29] The vertebrate sub-phylum is a branch of the phylum Chordata, which groups notochordate animals together with true vertebrates.
[30] For details of mapmaking and map utilization in the rat, see Gene V. Wallenstein, Howard Eichenbaum, and Michael E. Hasselmo, "The Hippocampus as an Associator of Discontiguous Events," *Neurosciences* 21:8 (1998): 317-23. An experimental validation of associative mapmaking in the rat can be found in David McFarland, *Animal Behavior: Psychobiology, Ethology and Evolution* (Menlo Park: The Benjamin/Cummings Publishing Company, Inc., 1985) 354-56. For details of mapmaking in the mountain chickadee, see Nicola Clayton, "Episodic Memory in Mountain Chickadees," *Neuropharmacology* 37 (1998): 441-52. See also Nestor A. Schmajuk, *Animal Learning and Cognition* (Cambridge: Cambridge University Press, 1997) 219-40.
[31] Sarnat and Netsky 410.
[32] Sarnat and Netsky 410.
[33] Ronald Pearson and Lindsay Pearson, *The Vertebrate Brain* (London: Academic Press, 1976) 611.
[34] Pearson and Pearson 606.
[35] Sarnat and Netsky 409.
[36] Sarnat and Netsky 410.

[37] University of Oregon, Biology Department images, *available online*.
[38] Robert L. Isaacson and Karl H. Pribram, eds., *The Hippocampus, Vol. 1: Structure and Development*, 4 vols. (New York: Plenum Press, 1975) 1: 42.
[39] Sarnat and Netsky 408.

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Application to Other Species

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The Subjectivity Criterion, by Entity Class:

Restating the working definition:

> **Subjectivity**: "Subjectivity" will stand for the "subjective locus," or "the ability to distinguish self from not-self." If the definition is to be substantial, it should exclude purely reflexive physiologies and behaviors. Reflexes do not separate, or abstract, conscious experience from primitive sensation. Bare reflexes are almost certainly inadequate for subjective awareness.

Inanimates: Inanimates in nature lack even reflexive behavior, and exhibit no subjective awareness of other inanimates. All natural inanimates fail the subjectivity criterion.

Eukaryotes/prokaryotes: Cells display a chemical recognition of neighboring cells, through the reaction of surface biochemistries. But the behavioral range of eukaryotes and prokaryotes would seem to be bounded by the formulae of biochemistry. Eukaryotes and prokaryotes lack structures for transmitting representations (or perceptions) of their external and internal environments — a prerequisite of subjective awareness. Even mobile bacteria, whose motions are certainly directed, are thought for this reason to be unaware of their environment.[40] Consequently, all single-celled organisms fail the subjectivity criterion.

Multi-celled plants: What is true of single-celled plants is true of multi-celled plants. All plants fail the subjectivity criterion.

Computers: No computer has yet demonstrated overt subjective awareness. Even global networks of computers behave as a single, undifferentiated entity unless explicitly programmed not to. Generally speaking, computer networks offer a poor "insect-like" imitation of social behavior. Indeed, some social insects (considered hereafter) exhibit a greater range of behaviors than can be found in the most sophisticated of computerized robots.[41]

On the other hand, the neural net models of attention and awareness mentioned in Chapter 8 might seem to contradict these

critical statements. Those models mimic the physiology of human brain systems; systems whose abilities far exceed those of insect neural groups, as demonstrated by their contributions to human subjectivity. So it might be tempting to assign subjectivity to robotic *models* of those systems as well.

But we cannot afford to lose sight of the fact that a model of a system is *just* a model — it is not the real system itself. When the system is simple a model may come close to acquiring all its fine-grained properties. For example, a ballistics model may predict projectile motion with great precision. It succeeds in this mimicry because a ballistics system is simple in comparison with, say, a biological system. But neural systems, being biological, are staggeringly complex. For this reason neural net models can mimic only the grossest behaviors of living neural net structures.[42] The hippocampal CA3 neural net of Chapter 6 is exceptional in that its small size and uniform structure have made it a good candidate for modeling and mimicry. The diverse attentional structures of Chapter 8, however, are among the largest and most complex neurologies ever modeled. Current models of these structures are therefore piecemeal: useful as tools of investigation, but useless as mimics. The models do not themselves enact attentional behaviors.

We might profitably compare this situation with the current state-of-the-art in hurricane simulation programs. These programs model the gross characteristics of hurricanes; predicting, for example, a hurricane's track, rainfall, and cloud coverage. The simulations are useful to meteorologists, but no one has ever confused a hurricane simulation with a real hurricane. Certainly, a simulation does bear a resemblance to the real thing from afar. But up close it is not at all faithful to the details. There are no "simulated raindrops" in a hurricane simulation. The mathematics of raindrop formation are not currently incorporated within the mathematics of hurricane formation.[43]

Nature operates at all levels and scales concurrently. A real hurricane may be an ocean-spanning weather system, but at the same time it is also every single raindrop that falls from its clouds. It follows that only when a simulation faithfully models all levels and scales of the hurricane — from the wide ocean down to the solitary raindrop — will it then qualify as a "full-blown" storm.

The functional gap between model and reality is vast, even for an inanimate like a hurricane. The neural intricacy of subjective animates suggests a functional gap of comparable vastness. Perhaps this gap will narrow in future, but at present all computers fail the subjectivity criterion.

Invertebrates: Social insects, such as bees, exhibit what might appear at first glance to be a rudimentary awareness of others of their own species. Their social behavior is, however, highly regimented and in large measure genetically determined.[44] With at most a million neurons,[45] and with no need for sophisticated social judgments, these creatures might find subjective awareness of other individuals to be an expensive and superfluous mental construct. For these reasons it is not surprising that some behaviors characterized as "social" are seen upon closer examination to be reflexive and instinctive. This seems to be the case with many,

though not all, complex invertebrate behaviors.[46]

A textbook on invertebrate nervous systems gives an example of this limitation, in a study of the apparent plasticity of arthropod locomotion. That plasticity was once thought to require a kind of sophisticated learning, but is now understood to be determinate:

> [A]n *apparent plasticity may in fact be its opposite* — a stereotypy in a complex and adaptable form.... [P]redetermined, fixed, alternative patterns can be instantly substituted by alternating components of a complex of interlocked circuits and loops and hence changing certain input magnitudes, coupling functions, or time constants....[47]

That text goes on to characterize the nervous systems of arthropods (the invertebrates with segmented bodies and jointed legs). Emphasis is on the independent function of neural groups, and also on the paucity of interneurons (those neurons which are located entirely within the central nervous system):

> The outstanding feature of the arthropod central nervous system is the *economy in number of interneurons*.... Frequently ganglia of the cord can coordinate a reflex response without the mediation of the brain. In the claw of the crayfish, touching the inside and the outside of the claw initiates opposite responses of closing and opening, but the brain apparently receives no interneuron which conveys directly the information of the position of the touch....[48]

Arthropod neurology might fairly be categorized as a neurology of loosely-coordinated reflexive structures. As arthropods lack the integrative superstructure of truly *central* nervous systems, they are likely incapable of centralizing any coherent subjective locus, or of using it to differentiate themselves from others.

Among invertebrates only the large-brained cephalopod (cuttlefish) species exhibit robust awareness of others. *Octopus vulgaris* has demonstrated subjective awareness of other octopuses under controlled experimental conditions, through the act of "learning by observation." A summary of the experiment[49] suggests the scope of subjectivity and memory shown to be present in the octopus:

> [W]orkers trained two groups of 'demonstrator' octopuses to discriminate between red and white spheres... until they reached criterion (no errors in five consecutive trials). Each animal was then tested without reward four times in the field of view of a naive 'observer' octopus in an adjacent tank. None of the

> demonstrators made any errors during testing, so what each observer octopus saw was its demonstrator attack one of a pair of objects four times (at five minute intervals). When the observers were themselves tested without any kind of reward, they attacked the 'correct' shape significantly more than the 'incorrect' one, and their performance was significantly better after four trials than that of the demonstrators at that stage of their own training.... [T]he rapidity claimed for 'observational learning' in this experiment is remarkable, especially as the observers never saw a food reward being given to the demonstrators for an attack on a sphere.
>
> This finding is yet to be corroborated but... whatever the theoretical basis for this type of learning,... it does seem remarkable in animals such as octopuses....[50]

The text cited above, *Cephalopod Behaviour*, is a recent (1996) survey of this invertebrate class. The authors express their broad opinion in an epilogue:

> It may also be necessary to temper some of our claims for cephalopods. In may ways their behaviour is no more remarkable than that of the many fishes, birds and mammals that compete with them and prey upon them, especially if one accepts the thesis... that cephalopods are 'honorary vertebrates.' It is only when one considers them as invertebrates, and especially as molluscs, that their behaviour seems extraordinary. The cephalopods we know best have life styles completely unlike those of limpets, sea-slugs, and clams....
>
> Yet if the behaviour of cephalopods is no more complex than that of fishes or lower vertebrates, it is certainly no less so. On reviewing the themes discussed in this book, it becomes clear that cephalopod behaviour has two striking characteristics: versatility and plasticity. By *versatility* we mean the possibility of selecting from among several possible courses of action.... By *plasticity* we mean the ability to change the responses made to a stimulus after it has proved inappropriate.....[51]
>
> ...To watch a foraging octopus, or a shoal of *Sepioteuthis* [squid] on a coral reef, is a remarkable experience; the way the animals exhibit what appear to be caution, stealth, intelligence and watchfulness would surely fascinate any biologist.[52]

On the basis of such evidence we can conclude that a few cephalopod invertebrates meet the subjectivity criterion. Of these, *Octopus vulgaris* is the most certain candidate.

Vertebrates: Vertebrates consistently demonstrate subjective awareness of others of their species. This awareness has been

confirmed under controlled conditions by mirror-image stimulation (MIS) experiments. MIS reflects a mirrored self-image back to the subject, in order to elicit a response. A qualifying response is a social behavior which the animal reserves for display among others of its own species. The most common response is a territorial defense action, directed against the (presumed) intruding competitor. Also common is an "incentive response," in which the animal selects its mirrored image over alternative rewards.

Many vertebrate species have been seen to respond to a mirrored image. Some of the lower vertebrate species known to respond readily include stickleback fish,[53] Siamese fighting fish, goldfish, pigeons, chaffinches, and hedge sparrows.[54],[55]

A mirror-image response is premised on an animal's ability to distinguish others of its species. The animal must interpret visual cues so as to be aware of the presence of other species-kindred existents. This species-awareness is a cognitive construct, and is almost certainly a legitimate form of subjective awareness.

MIS results are supported by field studies of social behaviors among vertebrates in the wild,[56] and also under domestication.[57] Such field studies provide indirect evidence of subjective awareness among lower vertebrates, in that the observed behaviors require those vertebrate creatures to maintain continual awareness of the presence, and disposition, of others. Some lower vertebrates, such as the stickleback, have even demonstrated preferential recognition of specific individuals within their social groups.[58]

In *Chapter 8* we looked at the thalamus' central role in the maintenance of subjectivity and awareness. The thalamus, like the hippocampus, is not unique to humans, but is instead common to all vertebrates. This structural commonality is consistent with vertebrates' common behavioral demonstrations of subjective awareness, noted above (and also, below). Photographs and illustrations of several vertebrate species' thalami will help to clarify this commonality. Figures appropriate to each entity class will be inserted among the paragraphs to follow.

Beginning with nonmammalian vertebrates: a schematic diagram of the nonmammalian brain shows the general location and connections of the nonmammalian thalamus in these lower vertebrates:

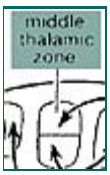

Fig. 17.19
Schematic representation of thalamus in nonmammalian vertebrates[59]

Some non-mammalian thalamic organs are shown below, in cross-section:

Fig. 17.20
Frog thalamus: dorsal thalamic nuclei and nucleus rotundus[60]

Fig. 17.21
Lizard nucleus rotundus of thalamus[61]

MIS experiments, field studies and thalamic similarities have been catalogued for only a few of the lower vertebrate species, but the data available at present suggests that all vertebrates satisfy the subjectivity criterion.

Mammals: As with vertebrates generally. Mirror-image awareness is pronounced among mammals. Some have demonstrated very robust subjective awareness of other members of their species. Mammals have demonstrated this robust awareness in experiment through expressions of *overtly social* MIS behavior. MIS behaviors falling into this category include acts of aggression related to social status, habituation to the "unfamiliar other," and curiosity (which animals sometimes demonstrate by looking behind the mirrors). Sea lions have demonstrated MIS social aggression; and squirrel monkeys, pigtailed monkeys and rhesus monkeys have demonstrated all of the listed MIS social behaviors in experimental settings.[62]

Field studies have recorded a wide range of mammalian social behaviors in the wild,[63] and also under domestication.[64] Such field studies provide indirect evidence of subjective awareness among mammals, in that the observed behaviors require the mammals to maintain continual awareness of the presence, and disposition, of others. Additionally, many mammals have demonstrated preferential recognition of specific individuals within their social groups.[65]

These MIS findings and field studies are amply corroborated by our experience with familiar mammals. The household social behaviors of dogs, cats and other domesticated mammals provide additional valid, if informal, evidence of subjective awareness in these species.

A schematic diagram of the mammalian brain shows the general location and connections of the mammalian thalamus:

Fig. 17.22
Schematic representation of thalamus in mammalian vertebrates[66]

The structure and location of the thalamus is notably uniform across mammalian species, as can be seen in the figures below:

Fig. 17.23
Opossum thalamus[67]

Fig. 17.24
Cat thalamus[68]

All mammals would appear to satisfy the subjectivity criterion.

Great apes: As with mammals generally. Additionally, all great apes exhibit robust subjective awareness of others of their species. Great apes have demonstrated this advanced degree of awareness through social MIS behavior, and through displays recorded in the wild. Recognition of individuals is commonplace. Authors of a recent (1997) study state this conclusion unequivocally: "The evidence that individual primates recognize one another is overwhelming."[69]

Beyond social behavior, a few of the great apes have also demonstrated subjective awareness of *self* through *self-directed* MIS behavior. The "mark test" is the most famous example of this self-directed behavior. In this test, researchers would anesthetize the ape and paint a red mark on its eyebrow (outside the ape's range of direct visual perception). Upon awaking, the ape would see the mark in a mirror and proceed to reach up and remove it. [To date, only a few orangutans, chimpanzees and bonobos (and a lone gorilla) have passed this test of self-recognition.][70]

Fig. 17.25
Monkey thalamus[71]

The great apes exhibit a wide range of social behaviors. Also, the ape thalamus is very close to the human in form and function. We can conclude that all of the great apes satisfy the subjectivity criterion.

Humans: All humans satisfy the subjectivity criterion. (*Self*-awareness is not, however, present at birth. Among human infants recognition of self in a mirror first occurs between 18 and 24 months.)[72]

Fig. 17.26
Human thalamus[73]

Table 17.4 appends the results for the subjectivity criterion:

Table 17.4
Personal identity criteria, ordered by entity class

	Continuity	Memory	Subjectivity
Humans	all	all	all
Great apes	all	all	all
Mammals	all	all	all
Vertebrates	all	all	all
Invertebrates	all	few	few
Computers	all	few	none
Multi-celled Plants	all	none	none
Eukaryotes/prokaryotes	all	none	none
Inanimates	some	none	none

A few notes on the emergence of advanced subjectivity may be appropriate at this point.

Generally speaking, central nervous system development increases awareness. A textbook on vertebrate evolution gives a succinct account of the process:

> The evolution of the vertebrate skeleton cannot be divorced from that of the central nervous system; with increased powers of locomotion there follows improved muscular coordination and, its corollary, a greater awareness of the environment. This can be clearly seen in the evolution of the gross morphology of the brain....[74]

The thalamic attentional system would seem to have evolved in such a way as to support more advanced forms of awareness. A vertebrate anatomy text points out the fact that simple locomotion does not require thalamic attention: only complex behaviors with need for focused attention rely upon the thalamocortical system:

> [I]n most mammals locomotion still occurs in the absence of the thalamus and isocortex. Functions that are impaired relate to complex behavioral sequences such as food seeking, predator avoidance, establishment and defense of territories, and reproduction, for example.[75]

We might conjecture to say that when a creature's complex behavior modifies its own environment in important ways, its awareness of environment must take its own behavior into account. From a physiologic perspective, this condition would require that the thalamic system direct attentional resources back to the self.

Daniel Povinelli and John Cant[76] have argued that the large arboreal apes acquired a self concept through such a mechanism. They hypothesize that the great weight of these apes makes clambering in trees especially dangerous, and requires that the apes pay close attention to the effect which their locomotion has on fragile arboreal surroundings. Such a sustained attention would amount to a persistent "online" self-monitoring strategy. And it is this strategy which Povinelli and Cant propose led to the emergence of self-concept. This hypothesis is consistent with experimental evidence that among apes, only the great apes (those large apes descended from the trees) exhibit self-awareness.[77]

Gordon Gallup has extended Povinelli and Cant's hypothesis.[78] He proposes that self-awareness, once engaged, has persisted in those great apes on whom it conferred a reproductive advantage. This hypothesis, too, has some evidence in its favor; for self-awareness is most acute among great apes and humans near the onset of puberty.[79]

But returning to the question which has driven this review, namely: "Do any non-human creatures also satisfy the requirements of personal identity?"

We have seen in Table 17.4 that many creatures do appear to meet all three of these "Great Criteria." These creatures share an

anatomic commonality, which is just the central nervous system (CNS). (It should be noted again that this commonality appears to extend to the invertebrate octopus, as well as to all vertebrate species.)[80]

In contrast, we've seen that creatures lacking a CNS exhibit only those behaviors allowed by reflexive instinct and conditioned memory. Consequently those creatures all fail to satisfy at least one of the necessary criteria.

Table 17.5 highlights this distinction. A green row indicates an entity class whose members invariably satisfy all three criteria. A yellow row indicates an entity class wherein only some members satisfy all three criteria. And a red row indicates an entity class whose members invariably fail to satisfy at least one of the three criteria.

Table 17.5
CNS creatures satisfy all three criteria of personal identity.

	Continuity	Memory	Subjectivity
Humans	all	all	all
Great apes	all	all	all
Mammals	all	all	all
Vertebrates	all	all	all
Invertebrates	all	few	few
Computers	all	few	none
Multi-celled plants	all	none	none
Eukaryotes/prokaryotes	all	none	none
Inanimates	some	none	none

The metaphysical significance of this table is clear. The CNS serves as a rough divide between those entities which appear to participate in Metaphysics by Default, and those entities which appear not to participate. The divide does exist; and the CNS is an imperfect, but increasingly factual, demarcation of that divide.

CNS transmigration is a defensible conclusion, but in some ways even more dour than the mortality conclusion of Chapter 7. Certainly, it is not what we'd prefer. But the conclusion does have some desirable qualities. These qualities will be examined in the final chapters. I think most readers will find that the final chapters lift us from the essay's current, bestial nadir.

To begin this recovery, I should emphasize that the conjectured entry of CNS creatures into human metaphysics cannot debase human beings. The soul is not base, but is divinely inspired. We know this from experience. Now, the question as to whether it be mortal or immortal — this is only of secondary concern. It follows that metaphysical theories are not capable of debasing the soul. To the contrary, the soul's ability to fashion a panoply of metaphysical ideas is testament to its essential divinity.

These facts of human nature are uncontroversial in my own mind. I only state them here out of concern for readers who may feel that theories of CNS transmigration somehow cheapen human life. Such debasement can never occur so long as we are mindful of what is divine in the human, and metaphysical philosophy does

always remind us of these things. Also, we should remember that Hindu, Buddhist and Neoplatonic philosophers have hypothesized CNS transmigration for thousands of years, to no ill effect. History shows CNS transmigration philosophy to be fully consonant with human dignity.

Even so, it is possible that a few confused readers might for a time pursue debasement, and attempt to use Metaphysics by Default as a tool for attaining base desires. We have experience with such persons. In the previous century self-styled "Social Darwinists" misused Darwin's theory of evolution by natural selection, twisting it into a rationale for brutality. Social Darwinists embraced evolution, but only as an excuse for their sins. A century on, we judge the Social Darwinists as misguided, and false. The same epithets await those who would misuse Metaphysics by Default for similar ends.

The philosophy's true social application will be presented in the following chapter. To close out this current chapter, we should reflect upon the words of a philosopher who will figure prominently in the arguments ahead. He wakes us again to a promethean fact — *emergences are real*:

> There is night and there is day, and to point out that there is twilight does not deny either. It is not arbitrary to regard one thing as living (a planarian) and another as nonliving (a quartz crystal) just because some things are intermediate (a crystallized virus). Wolves are sentient and trees nonsentient, although ants live in a twilight zone. There are gradients of passage, but emergences are real.[81]

In our mind's eye we have now walked onto the fifth and last of the five stepping stones. This last stone is just the understanding that other CNS species can participate with *Homo sapiens* in the existential passages of Metaphysics by Default. Standing on this last stone, we are in position to take a final step — out into the living world that waits beyond the river Lethe.

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next Chapter 18: Potential Benefits

Chapter 17, Section 4 Endnotes

[40] George McKee has noted this limitation of bacterial chemotaxis (movement along a chemical gradient) in a 1997 study of functional awareness, entitled "The Engine of Awareness: Autonomous Synchronous Representations." His paper is *available online*.

Quoting from section 4.1.2:

> "[B]acteria are sensitive to the distribution of nutrients in their environment and modify their swimming in a way that leads them in the direction of greater nutrient concentrations. Without understanding the way this modification of behavior occurs, it is characteristic of people to attribute awareness and motivation to each bacterium, saying that it "wants to go" up the nutrient concentration gradient. After decades of study, however, bacterial chemotaxis is now understood at the molecular level.... The models that have been developed are sufficiently detailed that they can be analyzed exhaustively.... Although such an [exhaustive computational] analysis has not been attempted, it appears likely that... bacteria are not aware of their environment."

[41] We could note, for example, the cooperative behavior exhibited by honeybees during the repair of broken hive combs. The behavior appears to be programmatic, rather than intentional; yet the honeybees demonstrate a remarkable flexibility under experimental conditions which have been designed to foil rigid rule-driven behavior. See Remy Chauvin and Bernadette Muckensturm-Chauvin, *Behavioral Complexities*, trans. Joyce Diamanti (New York: International Universities Press, Inc., 1980) 153-65. It would be interesting to subject robots to comparable experimental conditions, as a direct comparison of abilities. A robot which exhibits behaviors near the current limit of robotic neural net flexibility is described in Tani 149-76.
[42] References to ninety years of neuron modelling can be found in Maas, "Networks of Spiking Neurons: The Third Generation of Neural Network Models." *Neural Networks* 10:9 (1997): 1661.
[43] For results of a recent Delft University of Technology simulation of raindrop formation, see this *news article*. For an example of a hurricane simulation, see Yubao Liu's "A Multiscale Numerical Study of Hurricane Andrew (1992). Part I: Explicit Simulation and Verification," *abstract* and *images*.
[44] Robin F. A. Moritz and Christian Brandes, "Behavior Genetics of Honeybees (Apis mellifera L.)," *Neurobiology and Behavior of Honeybees* 21-35. Behavioral differences in arthropods can be modified readily through selective breeding, as in Felicity Huntingford, *The Study of Animal Behaviour* (London and New York: Chapman and Hall, 1984) 306-16. It should also be noted that explicit chemical cues trigger many arthropod recognition behaviors characterized popularly as "social." See, for example, Maier and Maier 230-33.
[45] Menzel and Bicker 456.
[46] The fiddler crab is an arthropod which might provide an exception to this rule. Fiddler crabs establish social hiercharies through ritualized competition, as described in Maier and Maier 220-21. The male fiddler crab appears to recognize other male competitors visually, as indicated by MIS experiment. See Maier and Maier 234.

In addition, some social insects have been known to exhibit goal-oriented behaviors which far exceed the cognitive abilities of solitary insects. Honeybees, for example, have been observed to innovate hive construction methods; to modify dance language within social context; and to plan hive migration routes via group consensus. See James L. Gould and Carol Grant Gould, *The Animal Mind* (New York: Scientific American Library, 1994) 88-113. See also note 41, above, concerning the flexibility of comb repair behaviors.

Each of these honeybee behaviors, if considered in isolation, might be explicable in terms of conditioned instinct. But as a whole, such innovative and cooperative stratagems suggest that honeybees have more going on upstairs than can readily be tested. If honeybees lack the neural mass requisite of true self-concept, as seems likely, perhaps they possess enough grey matter to maintain a general "forage-space-time concept," subservient to a selfless "hive-state concept." Conceivably, the latter concept could act as a master regulator, driving hive maintenance behaviors through variable action parameters; so that behaviors oriented always towards the ideal hive state. Such a scheme would make coordinated group behavior possible, without incurring the cost of self-conception. But here this author is merely speculating, with no clear idea as to how such group behavior really could be implemented in an utterly self-less manner.

Do social insects have a self concept? Do they maintain subjective awareness of others? Reflexive, regimented behaviors and millimeter-diameter brains suggest that they do not. But goal-oriented, social behaviors suggest something more. So this author is unsure, and would welcome edifying thoughts on the subject.

[47] Bullock and Horridge 1: 312.

[48] Bullock and Horridge 2: 1119-20.

[49] It should be noted that this experiment has not yet been duplicated.

[50] Hanlon and Messenger 140.

[51] Hanlon and Messenger 181-82.

[52] Hanlon and Messenger 187. An entertaining account of octopus foraging among laboratory tanks can be found in Ronald Rood, *Animals Nobody Loves* (Brattleboro, Vermont: The Stephen Greene Press, 1971) 79-81.

[53] For a study of stickleback MIS behavior, see Chauvin and Chauvin 129-32. For an MIS study of stickleback cooperation in predator inspection, see Lee Alan Dugatkin, *Cooperation Among Animals: An Evolutionary Perspective* (New York and Oxford: Oxford University Press, 1997) 59-70. See especially section 3.9.3, "Do inspectors use the Tit for Tat Strategy?"

[54] For a review of MIS among several vertebrate species, see Gordon G. Gallup, Jr., "Towards an Operational Definition of Self-Awareness," *Socioecology and Psychology of Primates*, Ed. Russell H. Tutle (The Hague: Mouton Publishers, 1975) 309-421.

[55] This author is not aware of any MIS studies which have been conducted on octopus species. References to any such studies would fill a lacuna in this section of the essay, and would be welcome.

[56] For entertaining descriptions of fish social behaviors, see Konrad Z. Lorenz, *King Solomon's Ring: New Light on Animal*

Ways (New York: Thomas Y. Crowell Company, 1952) 22-38; and Chauvin and Chauvin 123-40, especially 132-33. For cooperative social behavior among fish species, see Dugatkin 45-70. For cooperative social behavior among birds, see Dugatkin 71-89.
[57] For social behaviors of domestic birds, see E. S. E. Hafez, ed., *The Behaviour of Domestic Animals*, 2nd edition (Baltimore: The Williams & Wilkins Company, 1969). See especially the several sections devoted to social relationships in Part Four, "Behaviour of Birds."
[58] Stickleback and parrot indivualizations are noted in Chauvin and Chauvin 21-24. A relevant stickleback observation is recorded in Lorenz 32-36.
[59] Wake 683.
[60] Sarnat and Netsky 408.
[61] Sarnat and Netsky 408.
[62] See especially Gallup 310-12.
[63] See, for example, Trevor B. Poole, *Social Behaviour in Mammals.* (Glasgow and London: Blackie, 1985) 156-96; Chapter 6, "An Order-By-Order Synopsis of Social Behaviour." For recent field studies of dolphins, see Richard C. Connor, Rachel A. Smolker, and Andrew F. Richards, "Dolphin Alliances and Coalitions," *Coalitions and Alliances in Humans and Other Animals*, eds. Alexander H. Harcourt and Frans B. M. De Waal (Oxford: Oxford University Press, 1992) 415-43.
[64]See, for example, Hafez, *The Behaviour of Domestic Animals*. See especially the several sections devoted to social relationships in Part Three, "Behaviour of Mammals."
[65] See, for example, Chauvin and Chauvin 21-22.
[66] Wake 685.
[67] Sarnat and Netsky 409.
[68] Sarnat and Netsky 409.
[69] Michael Tomasello, and Josep Call, *Primate Cognition* (New York: Oxford University Press, 1997) 193. For supporting evidence of primate social awareness, see especially Chapters 7-12.
[70] An early study (1975) is found in Gallup 321-30. A more recent survey (1997) of great ape MIS studies is found in Karyl B. Swartz, "What Is Mirror Self-Recognition in Nonhuman Primates, and What Is It Not?" *The Self Across Psychology: Self-recognition, Self-awareness, and the Self Concept*, eds. Joan Gay Snodgrass and Robert L. Thompson (New York: The New York Academy of Sciences, 1997) 65-71. Another recent review of great ape MIS studies can be found in Tomasello and Call 331-37.

It should be noted that bottlenose dolphins may have passed a modified version of the test. See Kenneth Marten and Suchi Psarakos, "Evidence of self-awareness in the bottlenose dolphin (*Tursiops truncatus*)," *Self-awareness in animals and humans*, eds. Sue Taylor Parker, Robert W. Mitchell and Maria L. Boccia (Cambridge: Cambridge University Press, 1994) 361-79.
[71] University of Oregon biology images, *available online*.
[72] J. R. Anderson, "The Development of Self-recognition: A Review," *Developmental Psychobiology* 17:1 (1984): 35-49. See also Robert W. Mitchell, "The Evolution of Primate Cognition: Simulation, Self-Knowledge, and Knowledge of Other Minds,"

Hominid Culture in Primate Perspective, eds. Duane Quiatt and Junichiro Itani (Niwot: University Press of Colorado, 1994) 216.
[73] Sarnat and Netsky 409.
[74] L. B. Halstead, *The Pattern of Vertebrate Evolution* (Edinburgh: Oliver & Boyd, 1969) 57. See also: Encyclopaedia Britannica article on *vertebrate encephalization*.
[75] Wake 683.
[76] Daniel J. Povinelli and John G. H. Cant. "Arboreal Clambering and the Evolution of Self-Conception," *The Quarterly Review of Biology* 70:4 (1995): 393-421. See also: *"Animal Self-Awareness: A Debate with Gallup and Povinelli."*
[77] Swartz 65-71. See also Mitchell 177-232.
[78] Gordon G. Gallup, Jr., "On the Rise and Fall of Self-Conception in Primates," *The Self Across Psychology: Self-recognition, Self-awareness, and the Self Concept* 73-82. See also: *"Animal Self-Awareness: A Debate with Gallup and Povinelli."*
[79] Gallup, "On the Rise and Fall of Self-Conception in Primates," *The Self Across Psychology: Self-recognition, Self-awareness, and the Self Concept* 76-80. Other social factors may have contributed to the emergence of a self concept. The cognitive demands of apprenticeship and Machievellian scenarios have been examined in this light. See Sue Taylor Parker and Robert W. Mitchell, "Evolving self-awareness," *Self-awareness in animals and humans*, eds. Sue Taylor Parker, Robert W. Mitchell and Maria L. Boccia (Cambridge: Cambridge University Press, 1994) 424-25.
[80] For a well-written introduction to contemporary studies of animal cognition, see James L. Gould and Carol Grant Gould, *The Animal Mind*. Here also is a listing of some relevant online references:

- *A bibliography of animal cognition, organized by David Chalmers.*
- *A bibliography of animal cognition, after Griffin, Allen & Bekoff.*
- *Animal neuroanatomy atlases, organized by Neil A. Busis, M.D.*
- *Monkey image dataset with 3-D brain system models, Laboratory of Neuro Imaging (LONI), UCLA.*
- *Atlas of the primate brain, Regional Primate Research Center (RPSC), University of Washington.*
- *Cross-sections of monkey brain, University of Oregon Biology Department.*

[81] Holmes Rolston, III, *Environmental Ethics: Duties to and Values in the Natural World* (Philadelphia: Temple University Press, 1988) 70.

E-mail the author.
E-mail the webmaster.

Chapter 18
Potential Benefits

Heretofore I have presented Metaphysics by Default as an abstract, theoretical philosophy. This mode of presentation has fixed our attention on the properties intrinsic to the metaphysics; it's a presentation appropriate for our first, halting steps into a new idea.

Now I'd like us to take a big step forward, out into the living world. Metaphysics by Default has practical application to philosophies of environmental ethics. Its benefits derive from the distinctive properties we've come to understand through the theoretical presentation of previous chapters. In *this* chapter prominent philosophers will set the tone by defining environmental ethics in their own words. Once they've spoken I'll re-introduce some beneficial properties of Metaphysics by Default.

We lead off with a quotation from the philosopher Peter Singer.

Peter Singer has worked to raise awareness of animal suffering. His goal (sometimes obscured by his provocative manner) is to lift environmental ethics above the ancient "contract model," which applies justice only to those humans capable of reciprocating our actions. Singer believes that this model is insufficient for a humane society because some members of society are incapable of reciprocating our actions. Awareness of this deficiency prods humane societies to move beyond the contract model, extending ethics to non-reciprocating persons. Singer notes that this ethical advancement, while an improvement over the contract model, does not yet meet the legitimate ethical demands of other species and future generations. Those communities are still excluded by our outdated ethics:

> Most striking of all is the impact of the contract model on our attitude to future generations. "Why should I do anything for posterity? What has posterity ever done for me?" would be the view we ought to take if only those who can reciprocate are within the bounds of ethics. There is no way in which those who will be alive in the year 2100 can do anything to make our lives better or worse. Hence if obligations only exist where there can be reciprocity, we need have no worries about problems like the disposal of nuclear waste. True, some nuclear wastes will still be deadly for a quarter of a million years; but as long as we put it in containers that will keep it away from us for 100 years, we have done all that ethics demands of us. [1]

Metaphysics by Default argues against the contract model. It posits existential passage to a future generation, without exception. This rule was established back in Chapter 9. The existential passage is thought to take effect straightaway, as soon as a recipient emerges to break the stasis of mortal amnesia. As about five human children are born every second, the stasis would appear to be very brief — only a small fraction of a second on average. This temporal fact places our afterlife concern in the generation which follows hard upon our departure, rather than in some generation of the distant, hazy future. Arguably a focused concern for the immediate future generation is a better ethical motivator than an indistinct concern for all future generations. At the very least it is an improvement over the ethical concern of contract ethics, which makes no provision for future generations.

Singer's reciprocating ethicist asks, "Why should I do anything for posterity?" To this question Metaphysics by Default can reply, "Because I join posterity in the consequent of my present actions."

Noetic reduction also comes into play here. We recall from Chapter 15 that Metaphysics by Default posits a rapid[2] rate of noetic reduction for any group's given starting population. For example, noetic reduction would coalesce a group with a starting population of 300,000,000 down to a population of 3,000 in about 510 years. (This, while the *overall* population remained unchanged.)

Given a few hundred years more, the process would reduce a population group of several billion down to the minimum psychological atomic — a single individual.

Now, "common destiny" is a phrase with some panache among ethicists and ecological advocates. But the literal truth of the phrase remains unclear so long as we lack a metaphysics which can state that truth with some rigor. An audience indisposed to accept common destiny as gospel can ask, "Why ever should destinies be 'common,' and not individual?" Metaphysics by Default replies, "Because of noetic reduction."

Noetic reduction lends "common destiny" a very clear meaning.

In sum, these properties of Metaphysics by Default enhance Singer's ethical appeal towards future generations. The appeal holds true even if *Homo sapiens* should prove to be the only species whose future generations are deserving of ethical concern.

But is that actually the case? Or are some other species also deserving? If some are, how should we distinguish those deserving from those which are not?

For the moment, we'll ignore the arguments of Chapter 17 and let other philosophers speak to these points. Many philosophers of environmental ethics have composed answers to these questions. One of the first and most famous is Aldo Leopold.

Leopold was an early advocate of "ecocentrism," the belief that moral value is resident in nature. This philosophical forester turned a naturalist's eye towards the creatures of his farm. In *A Sand*

County Almanac Leopold sketched what he could imagine of their inner lives. It's a pleasure to read his field notes from a winter excursion, which I reproduce below. I encourage the reader to dawdle over this *Almanac* passage, giving freedom and ample time to the imagination as Leopold unpacks each animal's inner life:

> *January Thaw*
>
> Each year, after the midwinter blizzards, there comes a night of thaw when the tinkle of dripping water is heard in the land. It brings strange stirrings, not only to creatures abed for the night, but to some who have been asleep for the winter. The hibernating skunk, curled up in his deep den, uncurls himself and ventures forth to prowl the wet world, dragging his belly across the snow. His track marks one of the earliest datable events in that cycle of beginnings and ceasings which we call a year.
>
> The track is likely to display an indifference to mundane affairs uncommon at other seasons; it leads straight across-country, as if its maker had hitched his wagon to a star and dropped the reins. I follow, curious to deduce his state of mind and appetite, and destination if any.
>
> = = =
>
> The months of the year, from January up to June, are a geometric progression in the abundance of distractions. In January one may follow a skunk track, or search for bands on the chickadees, or see what young pines the deer have browsed, or what muskrat houses the mink have dug, with only an occasional and mild digression into other doings. January observation can be almost as simple and peaceful as snow, and almost as continuous as cold. There is time not only to see who has done what, but to speculate why.
>
> = = =
>
> A meadow mouse, startled by my approach, darts damply across the skunk track. Why is he abroad in daylight? Probably because he feels grieved about the thaw. Today his maze of secret tunnels, laboriously chewed through the matted grass under the snow, are tunnels no more, but only paths exposed to public view and ridicule. Indeed the thawing sun has mocked the basic premises of the microtine economic system!
>
> The mouse is a sober citizen who knows that grass grows in order that mice may store it as underground haystacks, and that snow falls in order that mice may build subways from stack to stack: supply, demand, and transport all neatly organized. To the mouse, snow means freedom from want and fear.
>
> = = =
>
> A rough-legged hawk comes sailing over the meadow ahead. Now he stops, hovers like a kingfisher, and then

> drops like a feathered bomb into the marsh. He does not rise again, so I am sure he has caught, and is now eating, some worried mouse-engineer who could not wait until night to inspect the damage to his well-ordered world.
>
> The rough-leg has no opinion why grass grows, but he is well aware that snow melts in order that hawks may catch mice. He came down out of the Arctic in the hope of thaws, for to him a thaw means freedom from want and fear.
>
> = = =
>
> The skunk track enters the woods, and crosses a glade where the rabbits have packed down the snow with their tracks, and mottled it pink with urinations. Newly exposed oak seedlings have paid for the thaw with their newly barked stems. Tufts of rabbit-hair bespeak the year's first battles among the amorous bucks. Further on I find a bloody spot, encircled by a wide-sweeping arc of owl's wings. To this rabbit the thaw brought freedom from want, but also a reckless abandonment of fear. The owl has reminded him that thoughts of spring are no substitute for caution.
>
> = = =
>
> The skunk track leads on, showing no interest in possible food, and no concern over the rompings or retributions of his neighbors. I wonder what he has on his mind; what got him out of bed? Can one impute romantic motives to this corpulent fellow, dragging his ample beltline through the slush? Finally the track enters a pile of driftwood, and does not emerge. I hear the tinkle of dripping water among the logs, and I fancy the skunk hears it too. I turn homeward, still wondering.[3]

Leopold's narrative places us in the minds of his farmland denizens. It is tempting to grant these creatures ethical consideration solely on the strength of Leopold's imagination. But as a precaution against hidden anthropomorphism, we should check Leopold's empathy against what other ethicists have to say about animals' inner lives.

The nineteenth-century philosopher Jeremy Bentham attempted to "trace the insuperable line" dividing those creatures deserving of natural rights from those undeserving. He succeeded in narrowing the problem down to a single question:

> [T]he question is not, Can they *reason*? nor, Can they *talk*? but, Can they *suffer*?[4]

Singer has taken Bentham's question to heart and proposed an argument which equates animal suffering (Bentham's "insuperable line"[5]) with one *particular* anatomic structure:

> *How Do We Know That Animals Can Feel Pain?*

> We can never directly experience the pain of another being, whether that being is human or not. When I see my daughter fall and scrape her knee, I know that she feels pain because of the way she behaves — she cries, she tells me her knee hurts, she rubs the sore spot, and so on. I know that I myself behave in a somewhat similar — if more inhibited — way when I feel pain, and so I accept that my daughter feels something like what I feel when I scrape my knee.
>
> The basis of my belief that animals can feel pain is similar to the basis of my belief that my daughter can feel pain. Animals in pain behave in much the same way as humans do, and their behaviour is sufficient justification for the belief that they feel pain. It is true that, with the exception of those apes who have been taught to communicate by sign language, they cannot actually say that they are feeling pain — but then when my daughter was a little younger she could not talk either. She found other ways to make her inner states apparent, however, so demonstrating that we can be sure that a being is feeling pain even if the being cannot use language.
>
> To back up our inference from animal behaviour, we can point to the fact that the nervous systems of all vertebrates, and especially of birds and mammals, are fundamentally similar. Those parts of the human nervous system that are concerned with feeling pain are relatively old, in evolutionary terms. Unlike the cerebral cortex, which developed only after our ancestors diverged from other mammals, the basic nervous system evolved in more distant ancestors common to ourselves and the other "higher" animals. This anatomical parallel makes it likely that the capacity of animals to feel is similar to our own.
>
> It is significant that none of the grounds we have for believing that animals feel pain hold for plants. We cannot observe behaviour suggesting pain — sensational claims to the contrary have not been substantiated — and plants do not have a *centrally organized nervous system* [emphasis added] like ours.[6]

For Singer, the critical anatomic structure is just the central nervous system (CNS) itself. The CNS makes possible the sensation of pleasure and pain. Consequently the CNS makes a creature deserving of natural rights and ethical treatment.

Singer's ethical conclusion dovetails with the metaphysical conclusion of Chapter 17. In that chapter we found that Metaphysics by Default would seem to apply not to *Homo sapiens* alone, but to CNS species generally. CNS species have been shown to meet the criteria of personal identity: it follows that creatures of all CNS species may be thought to participate in the web of existential passages described by Metaphysics by Default.

The CNS has now become a common criterion, both for participation in Metaphysics by Default, and also for justification of ethical treatment. This common criterion formally conjoins the metaphysical and ethical conclusions in a harmonious whole.

With this joint conclusion established we can aim towards a more appropriate ethical model, one which serves us better than the "contract model" which Singer has lamented. Holmes Rolston, III (quoted at the end of the previous chapter) joins Singer in rejecting anthropocentric ethics outright:

> There is something overspecialized about an ethic, held by the dominant class of *Homo sapiens*, that regards the welfare of only one of several million species as an object and beneficiary of duty. If the remedy requires a paradigm change about the sorts of things to which duty can attach, so much the worse for those humanistic ethics no longer functioning in, or suited to, their changing environment. The anthropocentrism associated with them was a fiction anyway.... [7]

It seems we're called upon to overturn the anthropocentrism that Rolston counts as a fiction. How we should summon the *will* to do this, Rolston does not prescribe. Perhaps willpower is triggered by what Paul Taylor calls "moral concern":

> Moral concern is the ability and disposition to take the standpoint of animals or plants and look at the world from the perspective of their good. Unless this ability and disposition are well developed in a moral agent there will be a question of whether and to what extent the agent genuinely has the attitude of respect for nature. For we have seen that *willingness to take the standpoint of an organism* [emphasis added] is part of what it means to regard it as an entity possessing inherent worth. And unless and until we so regard it we have not taken an attitude of respect toward it. Here we must have the moral capacity to overcome the all-pervasive tendency to be dominated by our anthropocentricity, just as in human ethics we must have the power to overcome the ever present tendency toward egocentricity. In particular, for a life-centered system of environmental ethics it is necessary to develop a certain kind of magnanimity. We must achieve a breadth of concern that enables us to transcend the anthropocentric bias implicit in the assumption that the final ground of all value is what furthers the good of humans. [8]

Can Metaphysics by Default help us develop the "moral concern" of which Taylor speaks? Well, Taylor emphasizes the "willingness to take the standpoint of an organism." Aldo Leopold has

demonstrated something similar in the passage quoted from *A Sand County Almanac*. Leopold has imagined the inner lives, the subjective experiences, of CNS creatures inhabiting his farmland; and we may say he was within reason in doing so.

Leopold imagined those subjective experiences in the third person, by designating each animal as a "he" or a "she." But subjective experience, integrated within personal identity, is a first-person datum. Each creature capable of personal identity knows *itself* only in the first person, as an ontologic "I."

This is not to imply that language is a requirement of personal identity: the ability to *say* the word "I" is irrelevant. As we've seen in Chapter 8, the three Great Criteria of personal identity — continuity, subjectivity and memory — would seem to constitute by themselves the ontologic "I."

When we imagine a creature in the third person, as Leopold has done, we are placing an ontologic barrier before the subject of our imagination. It is as if we have committed to a conceit, saying to ourselves, "I will imagine this animal's subjective experience, but only from a safe distance." By this conceit we attempt to eject that animal from the human metaphysical realm.

But this conceit is not tenable.

Nothing in the criteria of personal identity justifies it. Consequently Metaphysics by Default grants the same ontologic weight to all CNS creatures. The ontologic "I" is seen to subtend all CNS creatures equally, so that all participate in existential passage *as equals*. For this reason the subjective experience of each animal is best imagined in the first person. We empathize with an animal when we imagine "what it would be like" to experience the animal's condition *firsthand*.

This result relates back to Taylor's plea for "moral concern." As Taylor has defined it, moral concern is "the ability and disposition to take the standpoint of animals or plants and look at the world from the perspective of their good."[9] Certainly, Metaphysics by Default does give us reason to take the standpoint of CNS creatures, very much from a first-person perspective. Existential passage from man to beast is an event which the imagination can only conceive from the point of view of the passage participant. A vivid conception of the event bridges the gap between first- and third-person concern. Non-CNS life remains outside the charmed circle, but our moral concern for CNS creatures draws naturally towards self-interest.

This shift of moral concern is a force we can use to dislodge lethargic willpower. In analogy, we can think of a drill sergeant's rifle instruction:

A drill sergeant wants to impress upon a recruit the importance of rifle maintenance. How can he do this? He *might* appeal to the recruit's disinterested commitment towards his platoon. We imagine the drill sergeant's speech:

> *This is your rifle.*
> *Maintain it well,*

and your platoon will be victorious.

That speech conveys a simple truth — but no drill sergeant worth his salt would use it. Instead he would appeal to the recruit's *self*-interest, as with this speech:

This is your rifle.
Maintain it well,
and you will live.

Metaphysics by Default marries environmental ethics to an enlightened self-interest. As we bear self-interested duties more willingly than disinterested duties, this metaphysics eases the burden of duty concomitant with environmental ethics.

Now, concerning that burden: Paul Taylor has elaborated four duties appropriate to environmental ethics. These duties equate to four "rules of conduct." They are: the Rule of Nonmaleficence, the Rule of Noninterference, the Rule of Fidelity, and the Rule of Restitutive Justice. [10]

Taylor explicitly extends moral consideration to all organisms, including those below CNS life; whereas Singer judges the CNS to be the minimum standard. Both views hail from noble philosophy, and Taylor's may earn the prize for audacity. But I think we can follow Singer's more conservative tack here. As we've seen, the CNS appears to be a common criterion: both for participation in Metaphysics by Default, and also for justification of ethical treatment. So Taylor's four rules of conduct can serve as a reasonable guide for actions which affect CNS creatures.

Taylor also sets down five "priority principles"[11] for the fair resolution of conflicting claims. When our actions cause harm to CNS creatures, those priority principles can become principles of applied justice.[12] Even if we should restrict the application of justice to CNS creatures alone, the priority principles might yet benefit non-CNS life — by *indirectly* aiding species which lack a CNS. A hypothetical example can illustrate:

We can imagine that a strip mining company has destroyed the grazing lands vital to a species of elk. The elk go hungry, and some die. The fifth priority principle, restitutive justice, compels the company to restore grazing lands for the elk. In restoring those lands the company will plant native grasses suitable for elk consumption.

Once the grasses have been planted, they thrive; as do the elk. The end result is that Taylor's priority principles, here applied to a CNS species (the elk), have indirectly aided non-CNS species (the native grasses).

Plants and animals cannot flourish in isolation. They require natural surroundings. For non-CNS species the barest patch can sometimes suffice. A stem of grass prospers indifferently in a plastic test tube

if provided with nutrients, moisture, air and light. But CNS creatures need more. An elk needs acres of grazing land; an eagle needs miles of river; an octopus needs ocean harbor.

Considerations of this kind readily extend our ethical concern, drawing it out beyond CNS creatures, into the ecosystems which sustain those creatures — or rather, sustain *us*, I should say.

As in the previous chapter, Dr. Rolston once again gets a final word:

> A species is what it is where it is. No environmental ethics has found its way on Earth until it finds an ethic for the biotic communities in which all destinies are entwined....[13]

---

next Chapter 19: A Dedication

Chapter 18 Endnotes

[1] Peter Singer, *Practical Ethics*, 2nd edition (Cambridge: Cambridge University Press, 1993) 80-81.
[2] Specifically, the population curve follows this formula, derived in Chapter 15:

$$y = x(0.5)^{nGEN}$$

where x is the starting population, and y is the population remaining after *nGEN* generations.
[3] Aldo Leopold, *A Sand County Almanac* (Madison: Tamarack Press, 1977) 4-7.
[4] Jeremy Bentham, *An Introduction to the Principles of Morals and Legislation* (London: The Athlone Press, 1970) XVII, Section 1, footnote to paragraph 4. From *The Collected Works of Jeremy Bentham*, gen. ed. J. H. Burns.
[5] Bentham's "insuperable line" hails from his footnote referenced previously: Bentham XVII, Section 1, footnote to paragraph 4. See note 4, above.
[6] Singer 69-70. See also, Singer's essay on animals' perception of pain. *Available online.*
[7] Holmes Rolston, III, "Environmental Ethics: Values in and Duties to the Natural World," *Environmental Ethics: Divergence and Convergence*, 2nd edition, eds. Richard G. Botzler and Susan J. Armstrong (Boston: McGraw Hill, 1998) 85.
[8] Paul W. Taylor, *Respect for Nature*, 2nd printing (Princeton: Princeton University Press, 1989) 203.
[9] Taylor, *Respect for Nature* 203.
[10] Paul W. Taylor, "Respect for Nature," *Environmental Ethics: Divergence and Convergence* 369-79. This printing of Taylor's definitions is abstracted from Taylor, *Respect for Nature* 245ff.
[11] The priority principles are: the principle of self-defense, the

principle of proportionality, the principle of minimum wrong, the principle of distributive justice, and the principle of restitutive justice. The principles are applied according to the hierarchical scheme of Taylor, *Respect for Nature* 279.
[12] Developed in Taylor, *Respect for Nature*, Chapters 4-6.
[13] Holmes Rolston, III, "Environmental Ethics: Values in and Duties to the Natural World," *Environmental Ethics: Divergence and Convergence* 80.

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Chapter 19
A Dedication

The statue cornicing each page of this essay is a reproduction of Athena Varvakion, itself a reproduction of the original, Athena Parthenos. That original statue watched over Athens from its vantage in the Parthenon's sacred eastern chamber.

Writers have long identified the goddess Athena with the civilized mind.[1] The story of Athena's birth is readily interpreted as the irruption of Mind into the world. It bears a playful reading:

> So there was Zeus, father of gods and men, pacing beside Lake Triton in Libya. Every step he took reverberated with the crashing headache that hammered inside his skull. He thought his head would burst. He roared. It took Hermes to see what had to be done. He called up Hephaestus the smith-god, or maybe Prometheus the Titan, or maybe both of them, so great was that headache. And between them, they swung the axe and split Zeus's head right open.
>
> And then
> Out sprang Athene![2]
> Full-grown, and fully-armoured too, shaking that golden spear of hers, a bellow of a war-cry on her lips, in a great shower of golden rain.
>
> It was aweful, that birth.
> The earth itself groaned and shuddered.
> The ocean foamed up hugely and then stopped, just there.
> The very sun halted his course across the skies.
> Time stood still, waiting.
> It was as if all creation held its breath.
>
> And then,
> Athene moved.
> Her spangled gold armour glinted and her bright grey-green eyes flashed. And she danced. Her very first steps on this earth were a war-dance.
>
> And then — enough.
> The goddess took off that golden armour, put down her spear, shook her bright golden hair free from her helmet, eased her shoulders a little.
>
> Ah! The earth gave a great sigh and settled back into

shape. The ocean refound its rhythm and the sun moved on his accustomed course.

'O Lor',' said Ares, 'this one's going to be trouble.' Zeus just laughed.[3]

What an entrance.

Athena darts to center stage in Homer's *Odyssey*. Here we see Athena coaching the youth Telemakhos; planting in his imagination the vision of a grand sea voyage, and helping him undertake it. It's Athena as scoutmaster; very much a boy's mentor.[4]

Here, too, we see Athena at Odysseus' side. Athena holds council with her friend, spending patient hours in planning the battle he must fight if he is to recover wife and home.[5]

And here we see aged Laertes. Weak, spent, he must watch from a distance as Odysseus his son and Telemakhos his grandson withstand Eupeithes' murderous assault. Athena takes pity, and lends Laertes a god's strength for one more spearcast.

His spear drills Eupeithes' helmet through the cheek plates.

At this shock the Ithacans flee, scattering before enraged Odysseus. Merciful Athena steps in to staunch the bloodshed and broker peace.[6]

These scenes convey something of the early Greeks' reverence for the brave and civilized mind; a reverence they lavished on their champion, Athena. With this literary history before us we can understand why philosophers have sometimes turned to Athena for inspiration. Proclus counted Athena as his great muse, going so far as to write odes in her honor.[7] More recently Sigmund Freud was known to keep a statuette of Athena always on his writing desk. It was a favorite keepsake.[8]

Freud's little muse is with us still. It is on display in his home, now a museum. But Proclus had the misfortune to lose his muse. The rulers of Greece removed Athena Parthenos from Athens by force during Proclus' lifetime. This sacrilege reduced the Parthenon to its present husk. The loss to humanity grieved Proclus and the other remaining Hellenes beyond words. Proclus' misery eased only when Athena's messenger greeted him in a dream, with an announcement:

"The Athenian Lady wishes to dwell with you."[9]

Athena's image is an apt talisman for those who would attempt metaphysical philosophy. Dedicating this essay to Athena would be an act in accord with a good, though now lost, philosophical tradition.

But a discrepancy bothers me. The discrepancy stands out when we consider the design of Proclus' *Elements*: two hundred and eleven

propositions in all, going astray early on at *Proposition 15*. In Proposition 15 Proclus turns his back to the corporeal, denying corporeal nature those powers of life which men knew even in his time to be self-evident. Perhaps Proclus willed himself to "look past nature." If he petitioned Athena for the strength and wisdom to compose metaphysical philosophy, never did Proclus' Athena direct him to study nature, or to incorporate nature's simple truths into his philosophy.

The classicist Jane Harrison has shed light on this failing of Athena myth psychology. As cited by Ann Shearer:

> The circumstances of Athene's birth have defined her as the very image of the father's girl. 'To the end she remains manufactured, unreal, and never convinces us. We cannot love a goddess who on principle forgets the earth from which she sprung.' Thus the classicist Jane Harrison passionately sees Athene as 'a sexless thing, neither man nor woman', and her birth from her father's head as 'a desperate theological expedient to rid an earth-born Kore of her matriarchal conditions', 'a dark, desperate effort to make thought the basis of being and reality'.[10]

Harrison has issued a harsh indictment. Not of the Athena myth *per se* — every myth tells a story; no myth can tell them all. What Harrison has really denounced is a trait common among men: the desire, or talent, that drives men to fashion worlds of their own. Historically, men have cultivated this trait in order to wrench civilization out of nature, with the result that civilization is now estranged from nature.[11]

Proclus is a case in point. Proclus fought mightily to justify the metaphysics he'd fashioned; justifying it not within nature, but through pure reason. His was a well-intentioned but "desperate effort to make thought the basis of being and reality."

And that is why I cannot in good conscience dedicate this essay to the Athena Proclus knew. The premises of this essay are naturalistic, whereas Proclus' grey-eyed Athena was blind to nature.

This discrepancy hinders the dedication, but needn't block it. Proclus' Athena was not the only one known to the Greeks. There were several Athenas, actually. All were truly the invincible goddess, but each moved in a different milieu. Listing a few of the incarnations:

- Athena Areia: goddess of war.
- Athena Nike: Athena victorious.
- Athena Hygieia: the healer.
- Athena Polias: goddess of the city's life.
- Athena Ergane: patroness of the arts.

Athena's attributions matured as they tracked Hellenic civilization. Her transformations are recorded in the progression of titles; titles which drift towards a dedication fit to the present work.

In fashioning the required dedication we will need to extend the Athena myth in two directions simultaneously: towards the present — and also towards the ancient past, back to the verdant pre-history which antedates Athena's classical titles. This should be done, not to slight the Athena myth or the classicists who've recovered it for us, but only so that we might inaugurate a *new* Athena: one exempted from Harrison's indictment.

What, then, should we add to Athena's attributes? Any addition must lift the Athena myth closer to what is ultimately true and good. And as mature souls value *natural* truths, the qualities of spirit most needful are those by whose aid we may end our blood feud with nature.

Those qualities of spirit are within reach — our good naturalists are everywhere our exemplars. They garland Athena with their metiers. If we will consent to learn life from the naturalists, they will seal our diplomas with a temperance sufficient for lasting peace with nature.

Such temperance Athena granted Odysseus. His implacable countenance belied a heart that was glad for peace with Eupeithes' vanquished clansmen.

Greek mythology accommodates this innovation. A small shift in emphasis works the necessary change, and in just this way:

Athena's birth from Zeus was a birth of Mind. Yet Zeus was, we should remember, grandson of Gaia — Mother Nature to the Hellenes. In consequence, Mother Nature holds rights over all the Olympians; even over bold Athena. Nature can reclaim Athena as Her own.

That wish coins the dedication.

I dedicate this work to a new Athena, icon of Mind at peace with Nature.

To ᾽Αθήνα γεγενητής.

To *Athena Gegenetes*.[12]

To Athena, Earth-born.

End of essay.

Significant Addendum — May 2009

Or... that *was* the end of the essay. Something's come up, and I've added a postscript chapter to address the issues raised. Please see:

Chapter 20: Proof and Speculation

Chapter 19 Endnotes

[1] For two recent surveys, see Lee Hall, *Athena: A Biography* (Reading, Massachusetts: Addison-Wesley, 1997); Ann Shearer, *Athene: Image and Energy* (London: Viking Arkana, 1996). See also: Encyclopaedia Britannica article on *Athena*.
[2] Here Ann Shearer is using an alternate spelling, "Athene." See Jane Harrison, "Athene" Section, *Prolegomena to Greek Religion* (Princeton: Princeton University Press, 1991) 300-07. (First published in 1903 by Cambridge University Press.)
[3] This quotation is from Shearer 1-2. Shearer has compiled this version of the story from three separate sources. For details, see Shearer, Prologue, note 1.
[4] Homer, *The Odyssey*, trans. Robert Fitzgerald (Garden City: Anchor Books, 1963). Book Two, "A Hero's Son Awakens." Athena adopts a common guise with Telemakhos, taking the form of a trustworthy seafarer, comrade in arms to Odysseus. The seafarer's name is *Mentor*.
[5] Homer, Book Thirteen, "One More Strange Island."
[6] Homer, Book Twenty-four, "Warriors, Farewell."
[7] Hall 244. A translated ode is *available online*. See also Ernestus Vogt, ed., "Procli Hymni," *Klassisch-Philologische Studies* 18 (1957): 31-33. Hymn VII [Greek].
[8] Shearer 224.
[9] Al. N. Oikonomides, trans., *Marinos of Neapolis, The Extant Works, or The Life of Proclus and the Commentary on the Dedomena of Euclid* (Chicago: Ares Publishers, 1977) 69.
[10] Shearer 3. Harrison's quotations are from Harrison, *Prolegomena to Greek Religion* 302-03, 648.

[11] Harrison saw this trait as a common failing of the Olympians. Jane Harrison, *Themis: A Study of the Social Origins of Greek Religion*, 2nd edition (London: Cambridge University Press, 1927) 446. Quoting:

> "The Greek Gods, in their triumphant humanity, kicked down that ladder from earth to heaven by which they rose. They reflected, they represented the mood of their worshippers, which tended always to focus itself rather on what was proper to humanity than on what was common to man and the rest of the universe."

[12] Pronunciation: "gay-ge-NE-tays" with all "g's" hard and all "e's" soft, as in "get." Etymology: ge = earth; gene = born; tes = one who is. The appellation is taken from the pre-Olympian Greek gods, known also as Titans. They were the children of Gaia. For a spirited (and graphic) re-telling of the relevant myths, see Hall 7-16.

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Appendices

These appendices augment the essay text. All appendices have been verified to be free of viruses upon upload to the web site.

Most of the documents are stored in compressed "WinZip" archives. A free tool which decompresses these archives is available online at *http://www.winzip.com*.

Appendix A
formal probability calculus for Metaphysics by Default
(Appen_A.pdf - Adobe *PDF* file - 1,122 kb)

Appendix B
calculator for Metaphysics by Default
(Appen_B.zip - Windows .EXE application - 1,354 kb)

Appendix C
source code to calculator for Metaphysics by Default
(Appen_C.zip - Visual Basic 5 project files - 88 kb)

Appendix D
source code to Macintosh calculator for Metaphysics by Default
(Appen_D.txt - Macintosh Thin C text file - 8 kb)

Appendix E
calculator for absolute probability divisor
(Appen_E.zip - Windows .EXE application - 1,262 kb)

Appendix F
source code to calculator for absolute probability divisor
(Appen_F.zip - Visual Basic 5 project files - 2 kb)

Appendix G
calculator for noetic reduction percentage
(Appen_G.zip - Windows .EXE application - 1,262 kb)

Appendix H
source code to calculator for noetic reduction percentage
(Appen_H.zip - Visual Basic 5 project files - 2 kb)

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see also Works Cited

Appendices

Wayne Stewart
Last update 4/19/11

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E-mail the webmaster.

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Wayne Stewart
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