

wrong. It was Swampman's ontogeny, his personal intellectual development (the lack of it), his prior involvement with the world (his lack of it), his (missing) wider embryology as it were, that exercised Davidson. What exercised me, more especially, was the peculiar phylogenesis (the lack of it) of your newly created double, the fact that Doppleyou has no supporting evolutionary history. I will discuss these two issues in turn, the second first, the first second. I conclude with a tentative thought on the imagined origin of Swampman: it's just possible that he's impossible.

1. *A Verbal Dispute?*

William James once illustrated what verbal disagreement is by recounting a discussion over whether someone in his camping party had 'gone around= a squirrel. They had gone around the tree trunk where the squirrel was perched in an attempt to see it better, but it had kept to the opposite side of the tree so that it's stomach was always facing. James said there were two senses of 'going around=, one of which involved being, say, to the east, then the north, then the west, then the south, then the east again of the squirrel, the other involved being in front, then beside, then in back, then beside, then in front again. The example has an interesting structure commonly found in verbal disputes. In the vast majority of instances, when one 'goes around= something in one of these two senses one also 'goes around= it in the other. The problem arises when one of these two typical features is missing. Then there is a choice about how to use the language that is not clearly determined by prior usage.

Compare the 19th Century 'discovery=, apparently much opposed to common knowledge, that there is such a thing as nonconscious thought. This involved a genuine change in scientific theory, for people had not supposed before that inner states with many of the characteristic effects of thoughts could occur in the absence of a subject's explicit awareness of them. But there was resistance to the idea of nonconscious thought on another level. Thought

without awareness of it seemed contradictory. Looking back, this seems to have been a wrongheaded essentialist scruple. Should there be phenomena that are enough like thought in every other way that matters to us, what could possibly militate against calling it nonconscious thought? A similar remark might be made about John Searle's dogmatic insistence that all intentionality must involve potential awareness (Searle 1992). Should there be relations that are exactly like ordinary of-ness or about-ness relations between thought and the world in every other respect, except that they are not potential objects of awareness, which god will be angered by calling these relations 'intentional'? Certainly not ordinary folk. 'Intentionality' is philosopher's jargon.

Now the usual sort of case in which a person thinks, say, of his wife, exhibits at least the following four features.

1. First is a normal phylogeny. Behind the person lies a lengthy evolutionary history involving natural selection, or better, natural 'deselection', from which were salvaged the collection of genes responsible for the formation of his characteristically human sort of body and brain, complete with the capacity to develop thoughts if supplied with the right sort of environment.
2. Second is a normal 'wide ontogeny'. Behind his thoughts of various properties, kinds and objects including his wife lies a characteristically human sort of conceptual development, which has resulted from interaction with an environment containing these very properties, kinds and objects, or from interaction with other persons who have interacted with or been affected by these things. For instance, his wife was part cause the fact that he has the disposition sometimes to think of his wife.
3. Third is a characteristic human sort of arrangement inside his head, inner 'wiring' or 'neural connections' and so forth, supporting perceptual dispositions, inference dispositions, and basic action dispositions of the 'narrow' sort. (To describe these 'insides' it is not necessary to mention

anything beyond his body. The relevant description of the 'narrow= dispositions of his insides can be given in terms of possible Quinean 'stimulations=, 'irradiations=and so forth, and resulting brain configurations and bodily movements.)

4. Fourth, let us provisionally say (later I will demur) are his 'wide cognitive dispositions=. These depend on his peculiar environment, specifically, on what there is in it that can activate his perceptual and cognitive dispositions and be affected by his dispositions to bodily movement. One of his wide cognitive dispositions, we suppose, is to form beliefs about his wife in response to a variety of kinds of causal manifestations of her, but to few if any things not causally manifesting her. Another is to have most of his intentions concerning his wife manifest themselves in effects upon her.

Now we ask the following question. Suppose that one or more of these usual trappings of thoughts about a wife is absent, or one of the usual connections among them is missing. For example, suppose that everything is normal but wider ontogeny: all the neural connections resulted from damagingly severe electric shock treatments, or from the brain's being brought up in a vat. Or suppose that Putnam is stealthily transported to TwinEarth where he unknowingly takes the place of TwinPutnam, so that although the wide ontogeny of his thoughts about 'water=and 'Wife= is normal, and his wide dispositions connecting these thoughts, one with a stuff and the other with a person, look normal too, in each case the history and the wide dispositions relate him to different things instead of to the same thing. In such cases, is it more than a verbal question whether to count the thoughts as having 'referents=, and if so what to count their 'referents= as being? Is there any substance to dispute here?

Alternatively, suppose the question concerns not reference, but whatever aspect of thought is the proper subject of intentional psychology, to be understood as a science that explains human behavior. One contemporary view is

that although reference depends on (synchronous and/or historical) external relations between the head and the world, something called 'narrow content' does not, and that narrow content alone correlates with the input-output dispositions of a person, hence that it alone is of interest to the science of psychology. The generalizations of such a science must range at least over humans, but if a Swampman actually turned up with a head arranged just like Davidson's, it appears they would range over him too. Can there be substance to a dispute about whether to call what Swampman does 'thinking', or whether to label the relevant aspects of his inner arrangements 'narrow contents'? Neander ('Swampcow', this issue) objects that it is not in our province as philosophers to meddle with the biologist's definition of a species, a definition that clearly excludes Swampman from the species Homo sapiens. But what turns on this deference to biologists' usage? Anyone discussing these issues is obliged, I think, to show why they are not merely verbal.

I will argue, first, that the principle in accordance with which the members of the human race are members of the same natural or 'real' kind is importantly different from the principle by which Davidson and Swampman belong to the same real kind. You, me, and Swampman cannot all be encompassed within the same science unless the science includes all other material objects as well. Similarly, the kinds, belief, desire, thought, and so forth, defined such that you and I each harbor instances, are formed the same way as the kind human. Swampman harbors no states of these kinds, nor has the science of human psychology anything to say about the states he does have.

I will argue, second, that reference requires appropriate ontogeny. Appropriate ontogeny is required because wide functional capacities do not help even to limit, let alone determine, reference. There is nothing to determine reference but history, so history can't be removed. (In (Millikan 1984; 1993) I have argued that reference also requires appropriate phylogeny. Appropriate phylogeny is needed to determine how the wider ontogeny determines

the reference.)

2. *The Importance of Phylogeny*

Neander is right, of course, about how contemporary biologist's understand biological species, at least for the familiar sexually reproducing species. M.T. Ghiselin (1974) and David Hull (e.g. 1978) point out that by biologist's usage, species would seem to be not classes but big, scattered, historical entities enduring through time. What species an individual organism belongs to depends not on its timeless properties but on its historical relations to other individuals, relations essentially imbedded in space and time. Dogs must be born of other dogs, not just like other dogs; sibling species count as two or more for the same reason that identical twins count as two, not one, and so forth. Indeed, Ghiselin and Hull claim that species not only are not 'spatiotemporally unrestricted classes', they are actually individuals, distinguished by exactly the same sorts of criteria as are ordinary individuals.

Because species are historical entities, according to Hull 'their names function in no scientific laws'. Individuals are not examples but rather parts of species and 'parts do not have to be similar...to be part of the same whole'. Hence no 'statement of the form "species X has the property Y"' is ever a 'law of nature', a fully universal law, true by natural necessity rather than historical contingency. This, I add, would seem to remain true even if we include among 'laws of nature' also ceteris paribus laws, meaning by this laws that, though not strict, could be made strict by specifying enough additional details of circumstance. From all this Hull concludes, 'there is no such thing as human nature' (p. 211).

On the best known contemporary theory of natural kinds, the view espoused, for example, by Putnam (1975), it follows as well that species are not natural kinds. Natural kinds, on this view, are defined by reference to an inner nature of some sort, such as an inner molecular structure, from which

the more superficial or easily observable properties of the kind's instances flow by natural necessity. Because they are defined by identity of inner structure, natural kinds are classes over which strict laws can be run. But the kind Homo sapiens displays no identity of inner structure, or none that has relevance, specifically, to being human. Your and my genes are not the same genes, but are merely taken from the same gene pool. Although we may have about 90% of our genes in common, there are almost no genes in the entire human pool that have no alleles left at all. Nor should it be thought that the genes that most of us happen to have in common are what really make us be human, the rest causing inessential differences. On the contrary, alternate alleles frequently perform essential developmental functions. Now add that empirical sciences deal in empirical laws or at least generalizations, which require definite classes to quantify over. And classes (as opposed to big scattered individuals) are defined by the fact that their members have something in common. It apparently follows that not only is the species Homo sapiens not a natural kind, there can be no such thing as a science of human psychology, nor indeed, any other human science.

SSAnd that result is plain wrong!

The trouble lies, I believe, in the description of kinds and their relation to the sciences. Science can range, not only over Putnam-style natural kinds, but over a more general category of kinds that I will call 'real kinds'. As is traditional, 'real=' contrasts here with 'nominal='.

Given any species, there are innumerable traits that most of its members have in common not by accident but for a very good reason. Hull himself emphasized that species as well as individuals (quoting Eldrich and Gould 1972) 'are homeostatic systems....amazingly well buffered to resist change and maintain stability in the face of disturbing influences' (Hull, p.114). Stability results, for example, from continuity of selection pressures in a niche, continually weeding out the numerous deleterious mutations that arise,

thus preserving the well adapted status quo. And it results from the necessity that the various genes in a gene pool be compatible with one another, so that randomly throwing alleles together in pairs will still result, more often than not, in a viable individual. Underlying these stabilizing forces, of course, is an even more powerful force: new gene tokens are copied from old ones; a massive replicating process is at work in the continuation of a species.

For these reasons, it is possible to run richly numerous inductions over the members of any species, learning about most members from observing a few. The elementary student learns about sulphur from experiments with one sample, and also learns about frogkind by dissecting one frog, and about the human's susceptibility to operant conditioning by conditioning one friend to blink for smiles. It is possible to learn from sample members of a species about the whole species for much the same reason one can learn about one temporal stage of a person from other temporal stages of the same person. If John is blue eyed, tall, good at mathematics and intolerant of gays today it is likely he will be so tomorrow and even next year. This is because he too is a 'homeostatic system....amazingly well buffered to resist change and maintain stability in the face of disturbing influences, and because John tomorrow will be a sort of copy of John today.

Thus it is that although the names of species do not figure precisely in laws, not even in ceteris paribus laws, they do figure in legitimate scientific generalizations. Species are real kinds. Real kinds I define as groups over which a variety of relatively reliable inductions can successfully be run not accidentally but for good reason. The essence of a real kind is whatever accounts for its instances being alike. Only in some cases does the best explanation of this likeness concern likeness in inner constitution. In the case of a species, for example, although a statistically significant likeness among inner constitutions results from the principles that group the members into the kind, this probabilistic result is not what defines the

species=unity.

Besides species, and besides substance kinds such as gold and water whose unity does rest on inner constitution, there are many other sorts of real kinds too. I have discussed some of these under the name 'secondary substances', claiming, for example, that 1969 Plymouth Valiants (Millikan 1984 chapter 16) and even chairs (Millikan forthcoming b) form rough real kinds over which inductions can be run for good reason.

The science of human psychology ranges over members of the real kind Homo sapiens. Despite Hull's warnings, there is certainly such a thing as human nature--a limited range of properties, capacities and dispositions found quite reliably in humans. The question we must ask now is whether Swampman partakes of that nature.

At the moment when he is created, Swampman's inner nature is exactly like Davidson's was a moment before. It follows that Swampman's outer nature, his more superficial and easily observable nature, is like Davidson's too. It would be possible to run successful inferences from any of the superficial properties of Davidson to parallel properties for Swampman, and vice versa, and all this is for a very good reason. Thus Davidson and Swampman are, at least during these brief moments, members of the same real kind, defined by sameness of inner nature. As argued above, you and Davidson are also members of the same real kind, the kind Homo sapiens. Does it follow that you and Swampman are members of the same real kind? Is being members of the same real kind a transitive relation?

Obviously it is not, since it is possible for a thing to be a member of more than one real kind at once. Indeed, Davidson is. Davidson and Swampman are (very likely) the only members there are of a certain Putnam-style natural kind, defined by possession of a certain very exact inner constitution. You and Davidson are members of the real kind Homo sapiens, defined in accordance with an entirely different principle which I have described above. Swampman is

not a member of the real kind Homo sapiens, and you are not a member of the kind Davidson-double. Neither of these kinds includes both you and Swampman. Real kinds are such relative to specific property ranges. For example, there are only certain things I can find out about gold by inference from a sample or two ~~SSnot~~ its weight or its shape or its relative rarity or its owner. And there are only certain things I can find out about Rana catesbeiana (the bull frog) by examining the specimen in the lab tray ~~SSnot~~ the exact number of catesbeiana's spots or its sex or age or the placement of its scar tissues. Similarly, examining Swampman and examining you will not tell me the same things about Davidson. From Swampman I can infer that Davidson is male and tall, that he speaks French with an accent and English without one, and that he can be induced to play the piano. After sampling you and other humans I can guess much less ~~SSnot~~ Davidson's sex, or his language or his talents. This is because each real kind affords grounded generalizations only over its own property ranges.

But, of course, that being members of the same real kind is a non-transitive relation does not imply it is intransitive. Surely, you may think, there is some real kind of which you and Swampman are both members? Indeed, aren't all properties that probably characterize a human as such also properties that probably characterize both Swampman and you? If so, doesn't it follow that there is indeed a real kind covering both you and Swampman?

Consider the following argument:

(P1) Because humans generally have a salivation reflex it is likely that Davidson has a salivation reflex.

(P2) Because Davidson has a salivation reflex it is likely that Swampman has a salivation reflex.

(Conclusion) Because humans generally have a salivation reflex, it is likely that Swampman has a salivation reflex.

The argument is sound. But we must not confuse the logical 'because=' in the

conclusion with the causal 'because's in the premises. It follows by logic from the premises that Swampman probably has a salivation reflex given that humans do. But real kinds have properties in common not by logic but by empirical connection, and there is no empirical connection between the properties of humans qua human and Swampman. There is no way to run a univocal empirical science over both.

As physical systems, swamp persons have no defining unity except that each doubles some particular actual human. Molecule by sorites molecule, there is a continuum in swamp world of swamp-possible entities running from each and every swamp person, not just to every other swamp person, but to every other actual and possible physical object in the world, from elephants through starfish and trees and the Eiffel Tower to computers and the latest flue virus. On this level of physical systems, there is no way to delimit a real kind covering swamppersons short of the real kind physical object itself. Nor can a class of swamp persons be delimited by having each be physically identical to some physically possible member of Homo sapiens. What variety of possible things nature might throw up out of the human gene pool, given the inconceivably many combinations and possible mutations there are to play with, has no reasonable limits, certainly none that human psychology should or could reasonably reach toward. Some may be tempted to reach at this point for a functionalist definition of, say, what the student of human psychology should study. The difficulty is that without an anchor to the historical species to determine in what hardware the relevant functions must be realized, although much may follow logically or mathematically from a particular functionalist definition of cognition, nothing whatever will follow empirically. Human psychology is supposed to be an empirical science.

Not only is there no science that can predict properties of Swampman from properties of humans, there are many human properties that Swampman does not even have. There are no answers to a vast number of questions about

Swampman that can be answered about every human, such as when he was born and where, who his parents were, which is his native language, and so forth. Swampman has no CV. More crucial, no predicates that make reference to normality or abnormality, even of the statistical kind, apply to Swampman, and none that make reference to the proper or improper functioning of his body parts or brain. He is neither tall nor short, neither strong nor weak, neither quick nor slow, either physically or mentally, for each of these predicates makes reference to ones biological group and he has none. None of his organs are functioning either properly or improperly except relative to an observer's interests. If his brain makes good cannibal soup, that is as much its function as thinking. Since he has in his head no organs that are adaptations for concept development, belief fixation, contradiction elimination and so forth, nothing specifies whether he uses his brain correctly or incorrectly. This, I suggest, entails that he thinks neither truly nor falsely, indeed, that he thinks not at all. An organ is not an eye if it focuses light for the purpose of warming the ova, or worse, for no purpose at all. Similarly, an activity is not thinking if it exists for no purpose at all.

3. *The Importance of Ontogeny*

Alternative to the view that wide ontogeny determines which are the referents of thoughts is the view that wide functionalist dispositions do. For example, ceteris paribus laws are invoked, or 'long armed functionalism', in order to connect thoughts with their objects. Roughly, the idea is that Swampman's wide dispositions will converge on the very same things that Davidson's thoughts concern, so that he is in no way handicapped as a thinker by his lack of a normal ontogeny. There is a division between behaviorists and others over whether it matters what inner arrangements produce the relevant wide dispositions, on whether, for example, these dispositions must involve inner representations, with or without a compositional semantics, and so forth. I will try to show that given even the perfect complementary structure

that is in Swampman's head, wide dispositions place no restrictions on his references at all. The reason is that there is no principled way to define the notion of a wide disposition so as to do any more work than a narrow one.

Swampman's wide dispositions are supposed to depend on the structure of, or on what there actually is in, his peculiar distal environment that might interact, through intervening media, with his narrow perceptual and cognitive dispositions. For example (using '*' to indicate problematic descriptions) Swampman's dispositions to believe* things about his* wife's current activities in response to sights and sounds that emanate from her are wide dispositions. Certainly Swampman is constantly being affected by and having effects on his distal environment, and each of these interactions expresses a disposition that he has to act or react, indeed, in exactly the way that he does.

But the contents of Swampman's thoughts* can not be set merely by wide dispositions expressed in actual interactions. First, a great many thoughts* that Swampman has may concern things that, during the whole rest of his life, he never gains any more information about, moreover, concerning which he never uses the knowledge* he does have in a practical way. For example, the thought* of molybdenum might well turn out to be such a thought* for Swampman or for you, or for me. Perhaps no wide dispositions that we have in connection with these concepts will ever be realized. Second, the actual course of anyone's cognitive life includes many mistakes, in particular, many occasions when misidentifications are made. Likely there will be times when Swampman mistakes* someone else for his* wife, even times when he never discovers* that the person he thought* was his* wife (say, in the garden that time) was really her sister Elise. He may even have concepts* that, through unlucky accident, are applied only once or twice in his life and then wrongly. Clearly the actual history of application of his concepts will be an unreliable guide to their contents.

If reference is to be set or limited by invoking wide dispositions, merely possible interactions will have to be added to the actual ones to define them. Disposition talk is implicitly counterfactual conditional talk: if Swampman were in these conditions the result would be those reactions. The if..then's are causal if...then's, defined relative to the actual causal structure of the world. No one is interested merely in logically possible interactions, but those that are 'nomologically possible'. But given the actual initial conditions in this world, the only interactions that are nomologically possible are those that do occur. Talk of wide dispositions must be talk of other 'possible worlds' where initial conditions are different.

On the other hand, the point of introducing wide dispositions over and above narrow ones to fix or to place restrictions on reference is to make use of the actual situations of thinkers, as opposed to situations they might have been in. For example (granting for the sake of argument the nomological possibility of Twinearth) we want it to matter that in fact Swampman is on earth, not on Twinearth, that Davidson has an actual wife that Swampman may think* that he recognizes, and so forth. What then delimits the set of antecedents that can figure in legitimate conditionals helping to define Swampman's wide perceptual and cognitive dispositions? The set has to include more possibilities than the actual conditions of Swampman's world, but fewer than the set of all nomologically possible conditions in which he might have been placed. Further, the actual world of the thinker must be involved in the narrowing of the set. The narrowing principle must be some function from the actual world to allowable possible antecedents. What, exactly, is this function supposed to be?

It is not the best way of arguing, but there are times when it actually is reasonable to insist that the burden of proof is on others. I want someone to tell me just what limiting principle is supposed to be involved in determining this function and why. To convince you of the urgency of the

problem, here are some candidates that fail.

One way to limit the allowable antecedents might be to permit reference only to actual individuals, actual species, actual stuffs, and so forth. For example, we might prohibit Swampman's possible situations from containing twinwater, unless twinwater is both nomologically possible and actual, from containing Moses, if Moses is in fact mythical, from containing possible but nonactual fruits perfectly designed, say, to fool Swampman into thinking they are pears, apples and peaches. That is, we might claim that Swampman's wide dispositions to interact with such possible but nonactual things are not relevant. But two problems arise immediately. How much modification from their actual character are the existent items to be allowed? What rearrangements of their positions relative to Swampman are to be allowed?

Concerning modifications, we would need a criterion telling how much a thing, say an individual or a fruit, could change while still counting as the same one. Taking mild changes, can we place Swampman in a world where Davidson's wife has taken on a disguise cunningly designed exactly to avoid his ever recognizing her again? Can Swampman's situation be one in which a variety of oblong, orange apples has been cultivated and all other varieties destroyed, so that Swampman never recognizes* any apples as apples again*? Surely it is not true that he has a general disposition to recognize* his* wife and apples no matter how these are altered?

Concerning arrangements, if we suppose that none are prohibited, then what Swampman is thinking ofSSwhat Davidson is thinking ofSSwill depend on whether certain of Davidson's more distant friends have convincing lookalikes in Australia and what fruits happen actually to be growing on Planet Gamma off Alpha Centura. For we can easily project Swampman into counterfactual situations in which the existent lookalikes live in Berkeley or the existent Gamma fruits have been planted on earth. Alternatively, counterfactuals can posit Swampman himself born on Gamma, or provide him with appropriate

transportation. Don't plead, for example, that he has to use 'actually available=transportation. How much required effort is compatible with 'availability=and how much luck (winning lottery tickets to Australia?) and how much emergent technology? Are new inventions prohibited? Does the U.S. patent office decide what counts as a new invention? How far from his exact present circumstances can Swampman start in testing out this 'availability=?

More worrisome concerning rearrangements is what media are to be allowed to intervene between Swampman and the objects of his perceptions* and cognitions* in counting up wide dispositions. Consider, first, instruments of perception. Suppose he arises from a swamp in deepest Africa without glasses or a hearing aid and that without these (apologies to Davidson) he is nearly blind and deaf. Can our counterfactuals supply him with these needed items so he can recognize* his* wife and tell* apples from pears by sight. If so, may he have access to a telescope, a PET scan, an EKG machine and an electron microscope on the assumption he knows* how to read* or interpret* them? If he doesn't know* how, may he have access to technician's manuals telling him how to use them?

Consider, second, instruments of deception. May we examine Swampman's wide dispositions to token the thought* *rabbit* on the Disneyland testing ground for mechanical rabbits? At the annual International Magicians=Association convention? With his brain put in a vat? Can we posit that his origins are revealed, he is consequently denied human rights, then incarcerated for life in MIT's perception and cognition lab full of sophisticated modern equipment designed to produce perceptual and cognitive illusions?

Suppose that these various questions have been answered and Swampman's 'wide dispositions=delimited in some principled way. There is still the question what it would be for this collection of dispositions to converge on a set of referents for Swampman's thoughts. Is there a way of counting the

counterfactuals posits to see what connections between thoughts and distal circumstances are most frequently found? What would it be for the set of wide dispositions to converge on a referent? What would it be for a particular interaction between thoughts and the world to accord with a 'ceteris paribus law?

The illusion that there are determinate wide dispositions that somehow limit reference relations rests in some cases, I believe, on the assumption that the environment of the thinker can be treated like his insides as just another part of a bigger functionalist system. But the analogy is fatally flawed in two ways. There is no parallel in the wider environment to the boundary between the functionalist system itself on the one hand and its inputs and outputs on the other, that is, nothing corresponding to a stable system upon which inputs have stable functionally definable effects. And there is no nonarbitrary way to define, for the wider environment, the distinction, so crucial to any functionalist analysis, between proper functioning and breakdown, that is, between the occurrence of inputs or internal events that would destroy the system and those that would merely activate it. Correction: there is no way to define such a distinction without making reference to the phylogeny and ontogeny of the thinker (Millikan 1984, 1993, forthcoming a).

In all cases, the illusion that there are determinate wide dispositions that somehow limit reference relations rests also, I believe, on an implicit appeal to 'normal conditions' for use of a person's perceptual and cognitive systems. The object-thought interactions that determine reference are supposed to be ones that must occur or that have a high probability of occurring under normal conditions. But the notion normal conditions, though providing an indispensable backdrop for all contemporary discussions of wide dispositions and ceteris paribus laws, has remained an unexamined notion.

The notion normal conditions floats free, first, unless anchored to a

reference class. Given a reference class, one thing 'normal conditions' might mean is average conditions, conditions that members of the reference class, on average, are in. One would still have to determine a method of measuring or counting the aspects of these conditions, and decide in a principled way how much deviation from the mean is to count within the normal. But more crucial is determining the reference class.

When talking about human psychology, the obvious reference class might seem to be humans. Then what is statistically normal, for starters, is being on the ground, in a sea of air composed of specified gasses, at about one atmosphere pressure, where the surrounds are bathed in considerable ambient light a portion of each day, and so forth. Contrast what is statistically normal for some marine species that lives three or four miles down in the great Java Trench. But a reference to humans, I have argued, would be a reference to actual history, the history of Homo sapiens, its actual historic members. What conditions some physically identical species or collection of swamp people might have lived under cannot be relevant here. Similarly, what's normal for humans is not what is normal for swampman. There is no anchor for Swampman's wide dispositions here.

Nor have we found here an anchor for the relevant wide dispositions of humans. A person in a perception lab or at a magician's convention or on the Disneyland mechanical rabbit testing ground, or on Planet Gamma or with a specimen of twinwater in his drinking glass, or reading a PET scan monitoring screen or looking through a telescope or at data from an electron microscope—none of these people have departed from conditions of the sort just described as normal for humans. What then delimits 'normal conditions' (not just for human life but) for human perception and cognition?

There cannot, I submit, be a principled general answer to that question. The perceptual/cognitive equipment of each individual adult human has been trained and tuned in a different individual environment to respond

perceptually and cognitively to different items under different conditions. My systems, for example, have been trained to tell beeches from elms in reasonable light at some distance (contrast Putnam's systems) but not, I think, to tell elms from ash trees so easily. I can tell a viola from a violin under the right conditions (by sound in the right acoustical environment, by sight at close range) but not under all conditions (not by sight 30 feet distant). I can tell temperature by looking at a thermometer and time by looking at a clock, although a rather small proportion of historic humans have been able to do so. Medical laboratory technicians can tell many things with the use of various scopes and meters and grams that I cannot tell. Might there be such a thing then as conditions that are normal, in the sense of average, for operation of an individual person's cognitive systems? Or more pertinent, for use of one concept belonging to one individual? Over what reference class would the average be taken?

In Swampman's case, one cannot average over conditions in which he himself has been at various times, or in which various of his concepts were tuned, for he has not been at any previous times and his concepts have not been tuned. But for Davidson, one might try averaging over some subset of circumstances in which he has actually been, or over circumstances in which certain concepts of his were actually developed. That would at least turn us in the right direction, namely, away from current dispositions to look back at history. I don't myself believe that a notion of normal conditions useful for present purposes can be derived from mere averages of any kind, and I have given a different analysis altogether of the role that history plays in grounding a useful definition of normal conditions for various cognitive tasks (Millikan 1984, chapters 1,2,6,8,9; 1993 chapters 4-8; forthcoming a). But my purpose here has merely been to show that invoking wide cognitive dispositions without allusion to history cannot be enough to place any limits on reference. If Davidson's thoughts have referents, just as he claimed, this must be due in

part to their history.

4. *Is Swampman Really Possible?*

Now for the comic relief. Neander ('Swampcow', this issue) reminds us of the ludicrous improbability of arriving at Swampman by randomly combining molecules of, even, just the right basic amino acids. Biologists snigger at the benighted philosophers' Swampman for another reason. You can't in principle build large organic molecules such as hemoglobin, they say, just by throwing the right amino acid molecules together at the right angles with the right energies and having them stick. The trouble is they won't stick!¹ Molecules like that must be built up through long chains of enzymatic cascading reactions that proceed in just the right order and require support from just the right helping catalysts timed to come on stage at just the right moments.

But the physicists, as I understand it, tell another story. Last I heard they still claimed that when looked at minutely, all physical processes are symmetrical with respect to time. We label as future the direction in which entropy is increasing during our era, but there is nothing physically impossible about its starting to decrease again. For example, if you were to take every vector quantity within a given isolated physical system and simply reverse its direction, the system would start running backwards (with respect to the rest of nature) just as readily as it had been running forwards,

¹ The mode of expression is that of the biologist Jennifer Troyer. Thank you, Jennifer!

happily decreasing its entropy in mirror image of its former increases.

So why cannot we create Swampman this way. Suppose that Davidson dies in the swamp and decomposes into materials indistinguishable from the rest of the goo in the swamp. If this is possible, it should also be possible to run the process backwards, to redirect the molecules in an innocent looking swamp in just the right sort of way that it will slowly compose itself over time into Swampman. This would take considerable timeSSas long as it would have taken Davidson completely to decompose. But we might speed up the process, perhaps, by first blowing Davidson into very small bits with explosives. (I must pause to apologize again to Davidson.) Bits of pieces of apparently human body matter will now arise out of the swamp very rapidly and implode to form Swampman (and to form also the now unexploded explosives). Of course it is only an isolated system that can be completely reversed in direction this way. For example, the energy given off into the environment when Swampman decomposes will have to emanate from the environment after reversal if Swampman is to form again. If the bacteria that decompose Davidson use energy somehow derived from the sun in order to metabolize, this energy will have to be returned outer space to form Swampman. More intriguing, the bacteria that decompose Davidson will have to have their chemical processes reversed so that they too are running backwards.

Which brings me to the point. A Swampman so originated will himself be running backwards when he has been formed. His cells will be getting younger rather than older, coalescing rather than dividing, returning nutrients to his blood which will run backwards, returning the nutrients to his digestive system from whence they will eventually emerge as new good hamburgers getting fresher by the moment. His immediate memories will be of the movements he is about to make rather than those he has just made. Rather than seeing his surroundings, energy will be emanating from the cells of his retina to project through his lenses and out. What will happen when this energy it meets the

light coming in? Is it plausible that Swampman will manage to negotiate the interface with his forward running environment, somehow gracefully reversing all his molecular-level vectors, in time to behave normally with Davidson's wife and to meet his printers' deadlines on radical interpretation? Or will the friction generated at the interface between forward and backward running parts instantly destroy him?

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