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Source: *Canadian Journal of Philosophy*, Vol. 24, No. 2 (Jun., 1994), pp. 261-279

Published by: Canadian Journal of Philosophy

Stable URL: <http://www.jstor.org/stable/40231865>

Accessed: 16-03-2018 23:48 UTC

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Why Potentiality Does Not Matter: A Reply to Stone

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I Introduction

In its earliest stages the macroscopic properties of a human embryo are merely those of a few-celled organism, not so very different from (say) a fly embryo. If all goes well, however, it will eventually develop into a *human* infant. Expectation of such future development leads to the absolutist view that from the moment of conception the zygote has the same moral status as an infant. When the absolutist view is based on this expectation, I shall say it is based on a *potentialist* intuition that sees fetal development as the unfolding of a pre-established essence. This intuition was expressed by a Tennessee judge dealing with a custody case concerning frozen embryos, who claimed that 'the entire constitution of the man is clearly, unequivocally spelled-out, including arms, legs, nervous system and the like....'¹ Singer and Dawson put the potentialist picture (with which they disagree) in these terms: 'The development of the embryo inside the female body can be seen as a mere unfolding of a potential that is inherent in it.'²

This way of looking at development almost certainly depends upon such traditional but debatable ideas as biological 'natures' and natural

1 Quoted in Charles Gardner, 'Is an Embryo a Person?' *The Nation* (November 13, 1989), 557.

2 Peter Singer & Karen Dawson, 'IVF Technology and the Argument from Potential,' *Philosophy and Public Affairs* 17 (1988), 89

teleology. Evidence of this comes from the impressive defense of potentialism given by Jim Stone in 'Why Potentiality Matters.'³ Stone gives an analysis intended to explain why the embryo's potentiality seems to matter morally. His analysis firmly grounds this intuition on natures. These, considered as the determinants of future development, are the repositories of the potential developmental store of an organism's future properties. Stone gives a tempting explanation of how, given this is so, an organism's nature can underwrite the relevance of merely potential properties. His account is especially worthy of serious consideration because it is based on purely secular premises and is intended to be coherent with modern biological ideas.

Stone's reconstruction astutely explicates common sense thinking about developing organisms. Nonetheless, I shall argue that it cannot cope with the understanding of organisms that has been developed by molecular biology. The common sense view which I believe Stone and potentialism presuppose is as out of date as pre-Copernican astronomy. In section II I will explicate the metaphysical basis of Stone's potentialist position. In sections III-V, I sketch alternative possible developmental futures for embryos and argue that there is no coherent notion of a creature's 'nature' or of 'normal' development that will plausibly defend the pivotal potentialist claim that only along some of these paths is a creature's nature actualized.⁴

II The Elements of Potentialism

Potentialists appeal to an organism's actual possession of a potentiality to have certain properties. But not every potentiality will be plausible. It is not the potentiality to catch this bird or become President that counts, but rather something biologically more central. In Stone's version it must be in the organism's nature to develop the relevant properties. In effect Stone argues:

3 *Canadian Journal of Philosophy* 17 (1987) 815-30. Parenthetical page numbers are to this article.

4 What is at issue is whether the objective, observer-independent character of the embryo grounds a claim to protection. It is undeniable that the potentiality of the embryo to be an infant, and of an infant to be an adult, matters very much to prospective parents. Stone's account aims to show that to deliberately throw away a glass dish with fertilized eggs in it is a harm comparable to killing an infant, and that independently of whether anyone cares about a given embryo it merits protection because of the sort of entity that it is.

1. X is a creature of a certain sort.
2. Creatures of this sort have right R.
3. Therefore, X has right R.

Potentiality enters this argument as logically related to the nature of the creature (premise 1). Stone would say that to note that an embryo will become a human infant is to note the *nature* of the embryo, and to note that the embryo has a certain biological nature is to note how it will develop if it develops *normally*. The embryo is a human animal; if it develops normally, it will become, first a human infant, and then a human adult. The embryo is just a *very* young person. The importance of potentiality is that it determines just what sort of creature the embryo is.

Nonetheless, an obligation is being claimed to an organism that does not yet have the characteristics and capacities that ultimately ground our concern. To overcome this gap Stone posits 'a prima facie duty to all creatures not to deprive them of the conscious goods which it is their nature to realize' (821). In short, we have a *special obligation* not to deprive creatures of the fulfillment of their biological nature. Stone thus justifies our 'conviction that infants have a claim to our care and protection' (820) by grounding it in our regard for the *actualization* of the infant's nature.⁵

Stone avoids the objection that appeals to potentiality extend the right to preservation back to the sperm and the egg by connecting the relevant potentiality to identity preservation. By distinguishing between causal chains in which, so he claims, identity is preserved from those in which identity is not preserved, he draws a distinction between *strong* and *weak* potentiality. A is *weakly potentially* B if A 'can be an element in a causal condition that produces a B and, further, the matter of A will be (or at least will help produce) the matter of the B' (818). Under this definition, 'the sperm is a potential human being even though it will not be identical to the adult animal it produces' (818). *Strong potentiality* adds the additional identity requirement 'that A will produce a B if A develops normally and the B so produced will be such that it was once A' (818).

5 Stone implies that appeal to a special developmental obligation is the only plausible way to ground our concern for infants. However, an 'actualist' can account for a right of babies not to be painlessly killed by appeal to the properties and capacities that even a young infant already has.

Since neither the sperm nor the egg separately can be identical with the adult human they help to cause, they 'have no rights at all' (818).⁶

Finally, Stone attempts to apply this potentialist account to some scenarios made possible by molecular biology. Using the additional principle that 'one cannot be two,' he argues that a cell which divides, such as the zygote or an egg with cloned DNA, cannot be strictly identical with the subsequent pair of cells. Hence an organism with an interest in its future development only begins with the two-celled embryo. In the case of identical twins, an organism with an interest only comes into existence after the division of the original cell mass into two viable embryos.⁷ So adult twins are not identical to the two- or four-celled stages from which they came. He uses such claims about non-identity to exclude from having rights to life a whole range of biologically (if not yet technically) possible organisms, such as clonable cells and eggs that can develop through parthenogenesis (819). In all such cases he would claim that the resulting infant would not be identical to the pre-embryonic entity, and hence the pre-embryonic entity has no claim upon us to protection and development.

Potentialism is a plausible doctrine only if we view the development of an organism as an ineluctable progression toward a specific predetermined goal; only in this way can we view the goal-state as somehow implicitly present in the embryological-state. Strong potentiality would not be enough if it were merely interpreted as relating earlier and later states of an organism such that (a) the later state is a normal development (in an ordinary sense of 'normal') and (b) the two states connect the identically same organism. Presumably Stone means something stronger by 'normal' development, for it is dictated by the creature's nature; the potentialist requires that 'normal' development leads to a unique and common result in all adults, results like having a tail or a capacity for visual sensation. And it is to just such results that the potentialist appeals (thinking, self-awareness, etc.) to ground our obli-

6 We have obligations to creatures in virtue of their strong potentiality but not in virtue of their weak potentiality. He summarizes his argument this way: 'As the fetus is identical to the adult animal she produces and identical animals share their properties, the fetus will think, feel, and be self-aware if she develops normally. If we kill the fetus we deprive her of a welfare she would otherwise have realized for herself. The sperm and the egg, on the other hand, can never have these properties even though they can produce something which can. If we kill them there is no good of which they are deprived' (823).

7 See Clifford Grobstein, *From Chance to Purpose: An Appraisal of External Human Fertilization* (Reading, MA: Addison-Wesley 1981), 41-2.

gations to the organism. However, embryological development is not necessarily a rigid progression. As I will elaborate in subsequent sections, it is causally possible for the embryo to follow a range of developmental paths. Yet if the embryo could develop into different goal-states and even goal-states incompatible with each other, how can we claim *before development* that one and only one goal-state, with its associated properties, out of the many possible goal-states, is already implicitly contained within the embryo? Stone is aware of this possibility, and his idea is to rule out the alternative developmental paths as not identity preserving. If the embryo develops in non-standard ways it becomes something that is not identical to what it was; it goes out of existence in the way that an egg goes out of existence when it becomes an embryo.⁸ In this way Stone attempts to accommodate the fact of alternative embryological development while appealing to the notion of a nature already possessed by the embryo which dictates a specific development; only one development is properly contained within the embryo.

On this view, the embryo is said to have a 'blueprint' or text 'spelling out' what we are to be, it contains properties which are 'unfolded.' Although teleological thinking is suggested by such metaphorical talk, Stone insists that potentialist positions do not need to appeal to teleology: 'The adult stage is not construed as a *final cause* or goal, for the sake of which the organism develops' (821, n. 12).

However, potentialism is teleological in the sense that it views the goal as *built into* the process, as present from the beginning. So if the goal is the adult of the species, then the adult is somehow present in the infant, fetus, embryo. Stone finds present from the beginning a creature whose nature is to be understood fully in and only in the adult of the species:

An animal's nature determines a developmental path which guarantees identity, a path that produces the animal's adult-stage. In human animals that stage involves the attainment of conscious goods, which are produced by the nature as it actualizes itself along an identity-preserving path that evolved because it produces those

8 In fairness to Stone, I note that in places he offers a weaker claim. He says in a footnote, 'The fetus needn't cease to exist if he veers from the developmental path determined by his nature; still that path has a special status,' and 'the path determined by the creature's genetic constitution is the paradigm of a path which guarantees identity' (821, n. 11). This won't do at all. If the embryo can develop into various different creatures which will be identical to it, then, if these creatures differ from each other in important ways, potentialism collapses. Presumably Stone would not wish to grant that identity is even possibly preserved if the paths differ as much as they do in the examples I discuss below.

goods.... What the fetus is finally, is something that makes *itself* self-aware; that good is the fetus's good — this is its nature. (821)

Having examined the elements of Stone's potentialism, I want to concentrate in the remainder of this essay on his notion of a nature and on his pivotal argument that identity preserving developmental paths can be delimited by means of that nature.

Clearly, every sophisticated potentialist requires identity preservation for 'normal' paths. In addition it is a precondition for a plausible potentialist position that identity preservation be limited to one path (the 'normal' path) or at worst a small set of nearly normal paths. Otherwise whatever is said about the end being contained in the beginning will be equally sayable about other ends being so contained. If this embryo might or might not develop into a creature with property P it cannot plausibly be treated as if it were already a creature possessing property P; the properties that an embryo might develop in future in such a case would be *merely* potential, as the sculpture's properties are merely potential in the bronze. Hence the potentialist needs to give an account of identity preservation that allots identity preservation to 'normal' paths and rules out identity preservation on other paths in a non-question begging way.

The possibility of alternative developmental paths suggests that the potentialist position is less secure than at first it might seem. For one thing, there are many competing accounts of diachronic identity in the philosophical literature.⁹ And even if we are able to agree upon some one metaphysical account of identity, we might not be able to agree on one correct way to apply it to examples involving embryological development.¹⁰ Thought experiments involving such examples are much

9 Several of the more salient are usefully summarized in George Myro, 'Identity and Time' in Richard E. Grandy and Richard Warner, eds., *Philosophical Grounds for Rationality: Intentions, Categories and Ends* (Oxford: Clarendon Press 1986) 383-409. See also Harold Noonan, *Objects and Identity: An Examination of the Relative Identity Thesis and its Consequences* (The Hague: Nijhoff Publishers 1980); Eli Hirsch, *The Concept of Identity* (Oxford: Oxford University Press 1982); and Andrew Brennan, *Conditions of Identity: A Study of Identity and Survival* (Oxford: Clarendon Press 1988).

10 Even worse, there are alternatives to the potentialist assumption of identity between embryo and adult. E.g., on the *constitution view* one might hold that the relation of the embryo to the baby is analogous to the relation of a lump of wax to a statue that it is formed into. The wax *constitutes* the statue but is not identical to it. Although a developing embryo is enormously more complicated than a lump of matter, it could be viewed as being constituted by material that will develop into the material out of which a child is constituted. Just as the wax only becomes (in the constitution

more difficult than the usual magic-wand examples considered by identity theorists, such as, a dog (adult) being changed (mysteriously) into a cat or into a protoplasmic blob.¹¹ While magic-wand transformations readily elicit firm intuitions of a vaguely Aristotelian sort — that is, that the dog goes out of existence because he has ceased being the kind he was — our intuitions may be just baffled, or at least much less clearly committed to this way of thinking, if our examples change to embryological thought experiments.

I want to show, however, that even if one grants the fundamental potentialist intuition that the adult is the same individual as the embryo, potentialism fails. Granting, then, that the embryo and infant *are* the same individual, I will dispute two related aspects of potentialism: (a) the potentialist's notion of an organism's nature, and (b) the claim that an organism's identity is connected to actualizing its nature (understood in the potentialist's sense). The implication of the argument is that the potentialist's idea of an organism's nature should be replaced by the notion of an open-ended set of biologically possible processes.

III Natures and Identity Preserving Paths

In outline, the argument I wish to defend is this: Many developmental paths are possible (causally and even biologically conceivable), and this 'open' or unformed character of the embryo is as much a part of its nature as that it will as a matter of fact develop along a particular path.

sense of 'becomes') a statue after it is formed into a particular shape, so a developing prenatal organism only becomes a baby after its organic matter and structures are formed into a particular functioning organism with certain phenotypic characteristics (e.g., sensation). For example, in the development of a frog, there is first a fertilized egg, then a tadpole with gills and a tail fin, then a frog with lungs and legs. The frog and the tadpole are, in this way of thinking, analogous to two sculptures made out of the same lump of wax, and like two different sculptures are not themselves identical to each other. This account, if defensible, shows that Stone's assumption of identity is not logically necessary.

Stone is aware of this alternative. He devotes section III of his paper to trying to block the person-comes-into-existence move. But his treatment is not directed at the (biologically) general form of the constitution position. Moreover, he continues to assume an identity of the adult animal (on the hypothesis he is arguing against, not assumed to be the person) and the embryo in his counter-argument, an identity that would be denied by the constitution position.

11 See Baruch Brody, *Identity and Essence* (Princeton: Princeton University Press 1980) for dogs-into-blobs examples.

Unusual paths are not different in principle from the usual paths. Hence if identity is preserved in one (or a narrow range), it ought to be preserved in a much broader range of paths with phenotypically different organisms as their outcomes. I shall therefore try to show that Stone's reasoning for the limitation on identity preserving paths (IP paths) is either arbitrary or incoherent and that this is a general and central problem for potentialism.¹²

One reason this is far from obvious is that the notion of the embryo's *nature* may seem to dictate one developmental path and outcome as the 'right' one. We can therefore usefully structure the discussion of IP paths around the notion of a nature. For the potentialist, natures are predetermined and only fulfilled along certain developmental paths. At one point Stone defines 'nature' this way: 'A nature, we might say, is an inner principle a creature has from its beginning which primarily determines a developmental path leading to the creature's adult stage and which also primarily determines the creature's fundamental characteristics' (818).

The underlying assumption about the relation of nature to identity can be formulated as:

- (I) An organism maintains its identity iff it retains the same nature.¹³

An organism that loses its nature thereby goes out of existence.

But what is a nature, and what determines that a particular developing organism, e.g., a particular embryo, has a particular nature? The potentialist is tempted to answer in terms of normal developmental paths. But this merely displaces the question. Suppose his proposal is this: The embryo has a particular nature because it has a particular normal development (ND) path defined for it. What, however, determines the *normal* developmental path? Which are those paths? A circular answer threatens: those are the paths that preserve identity. Why do they preserve identity? Because they are predetermined by the embryo's nature.

12 There is an additional problem with the 'one cannot be two' slogan that Stone uses to dispense with awkward but real possibilities like a cloned cell and an ova that is about to divide through parthenogenesis. This slogan invites the 'Placenta objection': on the grounds that 'one cannot be two,' mustn't we reject the identity of the fetus with that of the embryo before it separates into the embryo proper (fetus) and the extraembryonic membranes?

13 Strictly this may have to be reduced to an 'only if' to deal with puzzle cases from the personal identity literature, but for simplicity I will keep the formulations of identity conditions throughout 'iff.' This does not affect my argument.

(Stone: 'Talk of normal development for an entity belonging to a biological kind presupposes the existence of a developmental path determined primarily by the biological natures of members of the kind to which the entity belongs, a path which leads to their adult stage' [818].)

So on this answer a creature's nature is determined by normal paths; normal paths are determined as those which preserve identity; identity preservation is determined by a creature's nature. This is blatantly circular. We could retort that on this answer the embryo has as many natures as there are distinguishable possible developmental paths. Why should those paths that preserve identity be just those that result in the 'standard' model adult? We could just as well widen the circle to include all paths that are continuous and on which there is a developing organism. All of these could be thought of as, in their own way, perfectly normal development. Hence they preserve identity; hence they are predetermined by the embryo's nature(s).

The potentialist may try to break out of this circle by proposing instead a *Materialist Theory* of natures:

- (M) The embryo has a particular nature because it has particular DNA. (This suggestion occurs in Stone: 'In higher animals we can identify a creature's nature with its genetic constitution' [818, n. 7].)

This account of a nature, along with (I), immediately yields a *genetic definition of identity*:

- (GI) Identity is preserved iff an organism retains the same DNA.¹⁴

As I will use biological thought-experiments to question this and other approaches to natures and identity, a word should be said about such examples. My imaginary cases need not turn out be technically possible; they need only be biologically possible, i.e., consistent with current theory of genetics and development (a condition not met by magic-wand transformations). Just as Aristotelian physics was the most natural theory to adopt given the limited range of physical experience until recently available to humans, so a biology of natures is the most natural view to adopt given the limited range of biological experience until recently available. To transcend this limitation it is useful to use thought experiments.

14 I am assuming in all formulations of identity conditions that twinning or splitting does not occur.

My examples seem natural enough if we replace potentialist metaphors of an unfolding of precontained properties with a better metaphor, such as one offered by Yvonne Baskin:

DNA alone is not life.... Life is that code implemented in space and time. Life requires bureaucracy, architecture, schedules, assembly lines, a constant flow of energy, materials, and information. Variations in scheduling can make an enormous difference in the sort of creature that gets built and operated. Only a 1 percent difference in DNA separates us from the apes; the striking differences are largely a consequence of changes in a few genes that control the timing of our development.¹⁵

The misleading character of potentialist metaphors becomes clearer if we consider future genetic technology. For example, an artificial womb will certainly be developed if it is technically possible. Not only could it be a safer place to grow, but, as one writer observes, 'it would be easier for doctors to examine [fetuses] and treat their disorders.'¹⁶ Such technology will very likely reveal a certain amount of plasticity in the developmental process, and enable scientists to control and manipulate embryonic development; they may be able to correct genetic flaws, introduce new genetic material, control and alter the expression of genes as the cells differentiate themselves and the organism develops its physical structure. Already in other species alterations of 'normal' embryo development have been achieved. Mouse embryos have been fused; mice have been cloned; human genes have been introduced into mice and passed on to the next generations (but not expressed);¹⁷ and a new species of mouse has been patented.¹⁸

It is useful to distinguish two different ways of modifying embryological development. One is genetic alteration, the other is some sort of modification of the developmental environment. If the potentialist adopts a view like (M), we can immediately see that there will be cases which will allow for multiple futures for the embryo. If so, according to (GI) the same embryo could be different sorts of creatures. Thus (M) undermines potentialism; as such it cannot be the potentialist's answer.

To see this, consider cases that involve alterations in the developmental environment — call these *DA cases*. There are many conceivable

15 Yvonne Baskin, *The Gene Doctors: Medical Genetics at the Frontier* (New York: Morrow 1984), 190-1

16 David Lygre, *Life Manipulation* (New York: Walker 1979), 28

17 C.f. Gordon Edlin, *Genetic Principles: Human and Social Consequences* (Portola, CA: Jones and Bartlet 1982), 329-30; also Baskin, 177-84.

18 *Science Impact Letter* (May 1988), 1

changes in gene expression affecting adult characteristics that would not require altering the genetic material.¹⁹ An artificial womb, for example, might allow infants to grow in the womb for a much longer time and develop larger brain capacities. This could lead to novel and perhaps even bizarre mental capacities. It is imaginable, as well, that certain causal shocks to the embryo might elicit repeatable atavistic phenotypic effects from an earlier stage in evolution. Such possibilities show that having a certain genetic constitution does not by itself necessitate having certain adult characteristics. These are cases in which the original genetic constitution, and according to (M), the animal's 'nature' has not changed. Therefore there are no grounds, on (M), for denying identity preservation.

DA cases show that Stone's account confuses the idea that an embryo has sufficient genetic information with the idea that the embryo has sufficient causal power to make the developmental process necessarily produce a certain sort of creature. Stone characterizes a nature as an 'inner principle,' but there are not different principles in each organism which *make it* develop as the natural kind that it is. The inner principles of genetic development are the *same* for all kinds of organisms and have to do with the constitution of DNA and the mechanisms of gene expression. Further, to claim that the embryo makes itself self-aware makes as little sense as to say that the embryo makes itself grow five fingers or makes itself divide from the placenta or (to take more telling cases) makes itself spontaneously abort, or in cases of non-standard development, makes itself grow a malformed brain, etc. All the genetic information required for the process may be present in the fertilized egg, but the process, and thus the way the genetic code gains its specific meaning and function depends on the physical chemical context provided by the mother's uterus.

I conclude that potentialism cannot successfully use (M) to explain what determines a creature's nature. The only remaining option appears to be to return to the idea of linking nature with normal developmental paths, but to do so in a way that gives a non-circular answer to the definition of those paths. Thus the potentialist is pushed to give a *Normal Development* theory of natures:

19 Many variables have already been identified that can alter the expression of genes in plant cells, e.g., water stress, heat shock, pathogens, heavy metals, anaerobiosis, etc. C.f. G.L. Matters and J.G. Scandalios, 'Changes in Plant Gene Expression During Stress,' *Developmental Genetics* 7 (1986) 165-75. Alterations in the development of *Drosophila* due to heat shock on the embryo at certain stages have been demonstrated. See S. Ebertein, 'Stage Specific Embryonic Defects Following Heat Shock in *Drosophila*,' *Developmental Genetics* 6 (1986) 179-97.

(ND) The embryo has a particular nature because it has a particular normal development (ND) path defined for it. (The ND path is to be determined independently of identity preservation and of the embryo's nature.)²⁰

This yields as a principle of identity preservation:

(NI) Identity is preserved iff the organism develops normally.

(It is evident that failure to satisfy [GI] would automatically mean failure to satisfy [NI].)

In the next two sections I will try to illustrate why this option won't work either and that there is no such thing as a 'nature' in the required sense. It follows that Stone's distinction between identity and non-identity preserving paths cannot be sustained, nor the claim that 'normal' developmental paths preserve identity whereas abnormal paths do not.

IV Multiple Futures and Identity

Consider gene alteration (GA) cases. Various new properties might be engineered into humans by altering their DNA. For example, thinkers have speculated that it would be desirable to create humans with much larger brains, much smaller brains, much smaller in size (to be astronauts), able to hibernate, quadrupedal, etc. (J.B.S. Haldane once proposed "'gene grafting'" to endow man with some of the structural features of a gibbon or a New World monkey for the low gravity of space ships.²¹)

(i) Imagine, for example, an IVF (*in vitro* fertilized) zygote created from human egg and sperm donors. Then imagine that monkey genes are introduced while the resulting embryo is being grown in an artificial womb, and that the resulting adult creature combines phenotypic features of the two species. A potentialist would regard the adult creature as not identical to the original embryo, which does not realize the potential that it would have through normal development. Thus, we would have no obligation to produce it even if it had some highly desirable traits.

(ii) Consider a related case: suppose we could alter an ordinary chimp embryo to make a super chimp (with greater mental abilities) by means

20 Stone appears to have elements of both accounts, (M) and (ND), of a nature.

21 Baskin, 240

of adding some human genes. Stone would say that the super chimp is not identical to the ordinary chimp embryo with which we began, and he would therefore say that we have no obligation to carry out this process on an ordinary chimp embryo because it would not be realizing its (ordinary chimp) nature. It has no interest in such a life.

These cases get the same answer from either (M) or (ND) potentialism. On (M), as soon as foreign genes are introduced into the embryo, it is not correct to identify the various stages of the creature with each other. This is because identity on (M) requires that different causally continuous organism stages have the same nature, understood in terms of genetic structure. Thus, at every moment in its development an embryo has a particular nature, and in the imaginary examples that nature is changed by the insertion of new genetic material. Each change brings into existence a different creature. As soon as we cease changing the genetic structure of the organism we then have an early stage of a potential adult.

These limitations on identity are implausible. Consider case (iii): imagine that after a future nuclear war some human survivors suffer from mutations that doom their fetuses to die before they come to term. Chimps on the other hand have healthy fetal development, and it is discovered that by combining chimp genetic material with the genes of a human zygote healthy infants are produced with almost entirely human characteristics. I take it we would welcome such genetic alteration and would consider the infants to be identical with the embryos from which they came, just as we do in the healthy case.

Finally, consider cases of genetic defects that can be corrected by adding foreign genetic material. Is it reasonable to think that such future genetic therapy will destroy the embryo by not preserving identity? If the embryo lacks genes necessary for survival, then its nature would create no obligation to save or improve it through genetic alteration, according to (GI). But surely that is an implausible result.

In light of these examples, I propose a much broader criterion for identity preservation in embryological development:

- (W) developmental paths preserve identity iff they are spatiotemporally continuous, there is continuity of organic structures over brief periods of time, and the changes occur as part of a biologically possible developmental process.²²

22 The last clause is necessary to rule out magic-wand examples such as those that might transform a kitten into a puppy; these would otherwise be counter-examples if we interpret 'developmental paths' very loosely.

By this standard, cases involving genetic alteration, such as (i), (ii), and (iii), as well as DA-cases, would count as identity preserving. From the point of view of the embryo it could develop into (and be identical with) either of two rather different adult organisms.

On both (GI) and (NI), identity is preserved only if the embryo's DNA is not altered. To alter its DNA is to alter its nature on either view, and thus to cause it to go out of existence. On (W), by contrast, non-alteration of the embryo's DNA is not a necessary condition of identity preservation.

The intuitions that support (W) can be amplified. In cases (i) and (ii), barring discontinuity, it is clear that we have different stages of the *same organism*. ([W] is perhaps even more obvious in DA cases.) Even in the case of an organism that is a total biological novelty it may develop *its* nervous system, organs and structure in a continuous way. We can truly describe the developing embryo as, not just the same organism, but the *same animal*, *same chordate*, *same mammal*, and even *same primate*, even though we find it difficult to describe it as the same species throughout.

It is common in the literature on diachronic identity to explain identity over time by appeal to the concept of a sortal. Hirsch explains a sortal this way: "The general term F is a sortal" means: it is a conceptual truth (a rule of language) that any spatiotemporally and qualitatively continuous succession of F-stages corresponds to (what counts as) stages in the career of a single persisting F-thing.²³ This means that for an object to continue in existence (maintain identity between stages) it must fall under a general term throughout that corresponds to a genuine sortal; in short, objects must remain the same *sort* of thing throughout their careers. (Obviously, 'red thing' and 'hot thing' do not correspond to genuine sortals.)

For Hirsch, falling under a genuine sortal is a sufficient condition of identity through change. He states the 'Sortal Rule' this way:

A sufficient condition for the succession S of object-stages to correspond to stages in the career of a single persisting object is that: (1) S is spatiotemporally continuous; and (2) S is qualitatively continuous; and (3) there is a sortal term F such that S is a succession of F-stages.²⁴

23 Hirsch, 37

24 Hirsch, 36

The question then is this: Is 'animal,' or perhaps 'primate,' a genuine sortal (or in Wiggins's terminology, 'substance sortal'²⁵), and thus able to underwrite the preservation of identity over the course of the embryo's developmental stages in examples like (i) and (ii)? The answer seems to be, yes. Certainly the developing primate does not go out of existence when the embryo's DNA is modified (nor does the mammal or animal). Hence it seems that we have one persisting organism.

Although, unfortunately, they were not thinking of developmental examples, it is worth remarking that both Wiggins and Hirsch²⁶ count 'animal' as a genuine sortal. Wiggins notes 'that a concept may be very general or virtually unrestricted and still qualify [as a sortal predicate]. Perhaps *animal* is such a concept. "It is an animal" counts as a minimally satisfactory answer to the "what is it?" question.'²⁷ But if animal is a genuine sortal concept, and if the embryo is the same animal through DNA modification, it follows that the embryo before DNA manipulation and the resulting animal are the same organism.

It may be objected that if a human embryo could be identical with a non-human adult, then each of us might have been a different kind of animal than in fact we are. I might have had a tail, for example. But this, it might be said, is absurd. Hence the proposal to broaden IP paths isn't coherent.

But what sort of absurdity is this? Surely we can make sense of the claim that, e.g., a particular statue might have had different properties. Throughout the process of fabrication we can trace the career of an individual sculpture as it develops, and make sense of the claim that it once had different properties that, contrary to fact, it might have retained. Suppose that the arms of *Venus di Milo* had been knocked off intentionally by the sculptor before she was first displayed. We can, in that case, make sense out of the thought that *Venus* might have had arms.

Our question concerning the potential of the embryo views identity forward from the time the embryo is developing, not backwards from the adult animal. This is like looking at a piece of fabric and asking whether it can become a shirt or, on the contrary, a dress. Perhaps, as essentialists about origin claim, *this* shirt I am wearing could not have been made out of any other swatch of material; but considering the material before we decide what to make out of it, surely we can say that

25 David Wiggins, *Sameness and Substance* (Oxford: Blackwell 1980), 24-5

26 See Hirsch, 56.

27 Wiggins, 63

it could be made into a dress. Similarly, once the embryo develops into an organism with a tail, perhaps it cannot have been an ordinary human, and once the embryo has developed into an adult human, perhaps it could not have been anything else. But this is compatible with the embryo having an open future when it is an embryo. So I do not think there are grounds for finding that other paths, including those that involve alteration of DNA, do not preserve identity if identity is preserved on the familiar developmental path.

V The Notion of Normal Development

So far I have argued the following concerning 'natures' and identity. DA-cases show that (M) does not support potentialism. GA- and DA-cases seriously challenge (GI) and (NI); when such cases are supplemented by (W), they show that potentialism is specious. To buttress this argument I will now argue that (NI) has an internal problem, and that is to define a reasonable notion of 'normal development' that will do the job of limiting outcomes in the way potentialism requires. Success at explaining natures in terms of normal development, i.e., at supporting (ND), requires both that 'normal development' be given a coherent and plausible definition and that a reason must be given for why (NI) is true under that definition. We must therefore discuss any definition of 'normal development' in conjunction with (NI).

There appear to be two ways to think of 'normal development': the embryo develops normally iff either (a) the *process* of development is in some independent sense 'normal' or (b) the *outcome* is in some independent sense 'normal.' Are either of these conditions necessary in order to keep the developing organism in existence? In short, is it plausible that non-normal development in terms of these components leads to a creature that is not identical with the embryo?²⁸

Consider first the familiar causal process. Suppose we discover how to speed up the human gestation period in the mother in such a way that the infant still has the properties we consider standard for humans. Is this a case in which identity is not preserved because development is not

28 As a bare formal possibility one could wonder about a disjunction of these two criteria. Against this I would suggest (a) Why would the disjunction be necessary to preserve identity when neither disjunct is? We would need an elaborate explanation. (b) This is supposed to be an explanation of a creature's nature. A disjunctive nature seems unconvincing.

normal? That would be absurd. And what of freezing an embryo and completing the developmental process centuries later? Surely this, too, would not be normal, yet it would seem to preserve identity as much as more ordinary paths.

Such examples show that we cannot maintain (NI) while defining normal development strictly in terms of biological processes common today — for humans that would be unaided fertilization and gestation in the womb of a female possessing a physiology considered standard today. They also suggest that it is the outcome, not the process, that is dominant. One might try to accommodate the examples by describing the required processes as those that allow the prenatal organism to develop through stages in the same order as a typical fetus does today. But isn't such development normal because of the end result?

The possibility of correction of birth defects through genetic alteration or causal intervention (GA and DA cases) argues that it is the outcome that matters to us. We might indeed imagine a whole range of cases in which results we consider standard could only be achieved by extraordinary patterns of development. (Recall example GA [iii] above.)

Can we therefore define 'normal' in terms of the outcome, and if we do, will (NI) be plausible on that reading? For starters, the potentialist would not want to define the proper outcome in terms of probability.²⁹ Any simple equation of what is normal with probable outcomes, will not do the job the potentialist wants done. As Singer and Dawson point out, latest estimates put the probability of birth for the embryo before implantation (within fourteen days of fertilization) at 25 to 30 percent.³⁰ Hence normal development for the early embryo would lead to an aborted embryo.

The potentialist is most likely to think of 'normal' development as that development which leads to what we currently consider the standard set of adult characteristics. This is surely one obvious understanding of normalcy. One problem with this concerns justification. Recall that this definition of normal development will determine the organism's nature. But what non-circular justification can be given for identifying the organism's nature with the standard outcome? Appeals to teleology, either built in or not, beg the question. What determines what the goal of the process *ought* to be? The process on the molecular level is going to work

29 If we were forced to say that the embryo has a probabilistic nature, wouldn't this by itself undermine potentialism?

30 Singer and Dawson, 100

according to the same principles whatever happens — thus spontaneous abortions are normal too — even if a new species is created.³¹

Moreover, using this notion of ‘normal’ in (NI) would have the awkward consequence that those born with ‘birth defects’ due to causes in the process (as well as those with flaws in genes) are not identical with their earlier stages. Under such a definition identity would be preserved in GA cases in which a genetically defective embryo is genetically altered to lead to ‘standard’ adult characteristics. But if there is any genetic alteration that leads to non-standard adult characteristics, then identity is not preserved. This is a perfectly arbitrary distinction; no reason, other than teleology, seems possible to narrow thus the IP paths.

Consider a more fanciful DA case to show the contextual relativity of what is standard. Suppose there is a Planet of the Apes on which a super-chimp ‘naturally’ develops from what on earth would be an ordinary chimp embryo, and suppose we were to bring a super-chimp embryo back from the Planet of the Apes. *That* embryo would be harmed, robbed of its conscious goods, according to potentialism and (NI), if it were not developed into a super-chimp by duplicating the causal environment of its planet. A similar embryo, originating here would not be harmed if it were not developed in that way, according to (NI), if normal development is defined in terms of customary outcome. Or consider this realistic example: after a genetically viable mutation becomes widespread it determines what is standard. Until that time organisms with this gene go out of existence if they express the gene and it significantly alters their phenotype. In all of these cases (NI) gives perfectly arbitrary answers.

I conclude that there is no reasonable definition of ‘normal development’ that makes (NI) a plausible principle.³² If ‘normal’ is going to mean anything like ‘standard’ or ‘usual,’ (NI) becomes implausibly restrictive.

31 Nor does evolution privilege ‘normal’ outcomes in the way required by potentialism. ‘Evolution’ is merely the name of a set of explanatory principles that account for the historical development of species; it doesn’t specify a force that intends an end or prevents a change in the characteristics of species or individuals.

32 Gareth Matthews has suggested (in correspondence) that we could define normal development as that development that tends to be species preserving. This may be a useful definition of normal development, but it would be too restrictive as a principle of identity preservation in (NI). Not only would (NI) under that definition beg the question against the sorts of counter-examples I have offered, but it would rule out as identity preserving such obvious examples as organisms born with serious birth defects, mutations leading to new species and sterile hybrids such as mules.

It is simply not plausible to limit IP paths to those that only lead to familiar results, nor to those that only use accustomed processes of gestation (nor to those that do not alter DNA). And once it is granted that environmental and genetic manipulation can alter embryonic development and yet preserve identity the notion of a nature has been stretched too far to support the original intuition of an established future inherent in the embryo.

VI Conclusion

It is only by oscillating between various explications of a creature's nature that Stone's position is persuasive. An embryo has no biological nature such that its future is guaranteed to go in just one certain developmental direction; our sense that it does is a holdover from older biological thinking, itself a result of our limited ability to understand and control the developmental process. Without a successful argument for the narrow, potentialist limitation on identity preserving paths, Stone has only shown why potentiality matters to those who accept common sense biology, not why it *really* matters in light of a more modern theory based on molecular biology.³³

Received: February, 1989

Revised: November, 1990

Revised: March, 1993

33 I wish to thank Marc Bekoff, Dale Jamieson, Gareth Matthews, and Christopher Shields, as well as an anonymous editor and an anonymous referee for the *Canadian Journal of Philosophy*, for helpful comments on earlier versions of this paper.