

May 1995

The Origin of Humans

Helen Watt

Follow this and additional works at: <http://epublications.marquette.edu/lnq>

Recommended Citation

Watt, Helen (1995) "The Origin of Humans," *The Linacre Quarterly*: Vol. 62: No. 2, Article 7.

Available at: <http://epublications.marquette.edu/lnq/vol62/iss2/7>

The Origin of Humans

by

Helen Watt, Ph.D.

The author is Research Fellow, Linacre Centre for Health Care Ethics, London.

It can be claimed that the human moral subject — the “human being” or “human person” — is to be identified with something more or less familiar: the living human organism. The aim of this paper is not to defend this claim, although I think it can be defended. The aim is rather to establish what is required, assuming this claim is accepted, for it to be the case that a human person — a human organism — has come into existence. I will begin, however, with a brief description of a theory on which the human person is the organism, before seeking to establish what the organism is, and when it first comes into being.

What I will call the “organic” theory does not presuppose an addition, or substitution, of which there is no sign. It does not presuppose that the living body is joined by a separate soul or person. Rather than the embryo or fetus being joined or replaced by such another entity, the embryo and fetus is the person at an early stage of his or her existence. The same person — that is to say, the same human animal — is first unable, then able to move, feel, think, and so on. These are abilities *acquired* by the *animal*, not ascribable to some alternative entity.¹ Such abilities are therefore not essential to our being here at all.

The organic theory confirms the intuition held by many that our human moral status is *inalienable*. That is to say, there are no humans existing with some inferior status, but every human has human moral status for as long as he or she exists. We have objective interests in certain benefits — both short — and longer — term — which are morally important between our conscious moments, and before any such moment can occur. The result is not that all human beings — any more than all adults — have the same set of *rights*, but is rather that all human beings have their own (though overlapping) *sets* of rights, as moral subjects of importance. As the entity which lives, grows and (eventually) thinks and talks, the human organism is, *prima facie*, the obvious candidate for human status. In view of this, we should identify the organism as accurately as we can.

Potential and Human Fertilization

An organism — human or non-human — cannot be described without reference to “potential”: a term often used, though in widely differing senses, in the context of human reproduction. It should be noted that the potential most characteristic

of an organism is not a *passive* potential, of the kind a stick has to be split, or a cell to be cloned. Rather, it is an *active* potential of *that organism*² to initiate changes in itself in the appropriate environment. Active potential refers to continuity between not doing, and doing, on the part of an individual. It is with reference to active potential that we distinguish the living from the dead, and living parts such as skin cells (which have *some* active tendencies) from living wholes or organisms (which have others). All living wholes have the active potential, which they retain throughout their existence, to direct their own activities in ways relating to their own well-being.

Fertilization, in the sense of sperm entry, is often singled out as the point of departure for the life-cycle of a higher animal. However, this view has, of course, been contested, in relation to humans in particular. During sperm entry, when the sperm has passed within the *zona pellucida* enveloping the ovum, the sperm and ovum membranes open to each other, and the inside of the sperm is released into the cytoplasm of the ovum.³ Stephen Buckle, Karen Dawson and Peter Singer⁴, among others, have argued that there is no "moment" of fertilization during the process of sperm entry. The sperm, they say, remains identifiable even after entering the cytoplasm. The genetic material in the head of the sperm remains intact, forming the male pronucleus. Just as Siamese twins are two distinct entities contained within one body, so, they say, the male pronucleus is distinct from — although contained within — the ovum. The ovum before the lining-up at syngamy of the male and female chromosomes is not, these writers claim, *genetically* unified, however else it is unified.

Theories differ over whether human beings come into existence by degrees. There are, of course, entities which do this: for example, aggregates, such as piles of sand, and artifacts, such as cars. Living things, which are self-directing, are more than aggregates of other things. And one of the differences between organisms and artifacts is that while the latter are characterized with reference to the end-product — that is, to the aims of the producer — the former are characterized with reference to current active tendencies (which may relate to longer-term developments) and corresponding *internal* goods. The presence or absence of the defining tendencies of a being of *this* kind at *this* stage of development is what makes such a being either present or absent. An organism is a living whole, as opposed to a living part, and for this reason cannot come into existence by degrees. With regard to syngamy, it is not easy to link the appearance of such a living whole with any stage in the lining-up of chromosomes present in the cell since the entry of the sperm.

The single-cell embryo has, before syngamy, and the previous disintegration of the nuclear envelopes, not one but two genetic centers: the male and female pronuclei. The co-ordinated activity of these genetic centers, within the one cell membrane, prepares for later activity which must in any case be ascribed to the organism itself. The male and female pronuclei work within one cell for common ends; for the good of one organism. (In the case of Siamese twins, in contrast, two brains — two centers of control — give directions of which many relate to parts not shared by the twins: for example, their separate faces.) The formation and activity of the two pronuclei, together with previous signs of

activation, are indications that the cell is working as a living whole geared towards further development.

Moreover, whether or not a living whole comes into being on completion of sperm entry, it is not possible to claim that the *sperm* remains identifiable on completion of sperm entry. For during sperm entry, the sperm is broken up, not simply *enveloped* by the ovum. The inside of the sperm, in entering the cytoplasm, leaves the membrane behind to be absorbed in due course, as the incorporated portion of the tail is absorbed, while the male pronucleus forms from the nucleus of the sperm. The sperm cannot be identified with its contents. Even should we want to deny that the contents of the sperm turn at once into parts of a new living entity, we must acknowledge that the sperm has been dismantled in delivering material to the ovum.

If sperm entry is regarded as involving at least the destruction of the sperm, we should ask if we can identify a decisive point of discontinuity during the process of sperm entry. I would place this at the point at which the inside of the sperm has passed entirely into the cytoplasm of the ovum⁵, and has separated entirely from the membrane of the sperm, which remains embedded in what is now the membrane of the zygote. We should follow our normal practice of singling out a new (sub)entity when some part of the old is disconnected from its (sizeable) neighbor, and is not now behaving as if it were the pre-existing entity. As for the zygote, it is *spatially* more continuous with the ovum than the inside of the sperm is with the sperm. Discontinuity is, however, quite dramatically signalled in the case of the zygote by the advent of developmental powers.

An Origin After Sperm Entry and Syngamy

Some writers, while admitting that the zygote is a separate individual from the ovum, deny that the organism can be traced to the appearance of the zygote, whenever this takes place. Norman Ford⁶, for example, has argued that a new individual comes into existence at syngamy, but that this individual is not continuous with the later human organism. The zygote, after all, splits into two: a process which it cannot survive. Then again, can we see as an *individual* the dividing group of cells within the *zona pellucida*? And can we claim that the group of cells is continuous with the body of, say, the 14-day embryo, if sites are not yet marked out for parts of this body, and if cells are not yet differentiated, and can be used to form any part of the "embryo proper", the accessory tissues (the umbilical cord, the placenta) or can indeed be separated off to form new embryos, or combined with other cells to form chimeras?

With regard to Ford's claim that first cell division marks a break in continuity, it can be objected that the cells resulting from division are neither spatially nor functionally separate, but rather work as parts of one whole, pressed together within a single *zona pellucida*.⁷ It is by reference to functional unity that normal mitotic division can be contrasted with early twinning, giving rise to two independent organisms, still within one *zona pellucida*.⁸ In the case of a *single* embryo not only is there co-operation between constituent cells of the organism⁹, but developments such as cell differentiation are only possible because the cells of the early embryo act in such a way as to give rise to these developments.

“Totipotency” of cells is, in fact, a precondition of later differentiation, which does not arise accidentally, but is prepared for by the activity of the early embryo.

To Ford’s further point that parts of the early embryo are not spatiotemporally continuous with corresponding parts of the later organism¹⁰, it can be objected that parts *are* continuous with those which immediately precede them, so that the later whole is continuous with all stages of the earlier whole. The change in form should not be seen as decisive; elsewhere in biology we are prepared to countenance significant variations both of bulk and of form under the relevant covering concept.¹¹ Such tissues as the placenta should be included in the later whole into which the earlier whole develops, since these tissues, like the milk teeth after birth, are a temporary body part of immature humans. The placenta can, of course, be shared by twins — as other organs can be shared by Siamese twins. The placenta can be genetically different from the rest of the embryo — as can other parts of the embryo.¹² The fact that many cells of the early embryo will give rise to so-called “extra-embryonic” tissues is evidence for, not against, the continuous existence of an organism which first grows and then discards what is needed for a phase of its development.¹³

With regard to the point that totipotent cells can be separated off to form new embryos or chimeras, it can be argued that the fact that a part of a whole might contribute material to another whole does not mean that this part is not now a genuine part of the original whole. If an ovum is a part of a woman before contributing material to an embryo, something similar can be said about an embryonic cell which may be isolated and activated in some new direction. If such a cell were activated so as to give rise to (rather than contribute to) an embryo, the tendency after activation to develop as a separate individual could be seen as indicating a substantial change from the cell to the embryo. The earlier *passive* potential of the cell to be isolated by outside intervention does not mean that the embryo it comes from has the *active* potential to *produce* a new embryo, much less to *be* a new embryo. The mere possibility of twinning or combining does not suffice to show that the embryo is not a human organism: that is to say, an entity with human self-directive tendencies, or (as some describe it) a human “life-principle”, or soul.¹⁴

Twinning Tendencies and Twinning Propensities

Where twinning casts more serious doubt on the previous existence of a human organism is where there seems to be an inherent tendency — or, at least, an inherent propensity — to symmetric twinning. If the early embryo is defined by tendencies which include the tendency to form some later type of body, then what are we to say if there are embryos with the tendency to form not one but two of this type of body? Twinning may occur so early that any potential, for example, to differentiate cells along a certain pattern will be carried out by two and not by one. We may be unable to identify the original individual with one twin rather than its sibling. Are we, then, to suppose that this individual dies in giving rise to two descendants?

For the zygote which does not twin, first cell-division does not involve

disintegration of the zygote. Rather, a constituent cell produces new constituent cells, working in the interests of the whole. In contrast there is evidence of twinning if two segmentation cavities appear within the *zona pellucida*, or if at some later stage there are two inner cell masses, two amniotic cavities or two embryonic discs. It should be noted that monozygotic twins may develop within a single *zona*, and then together in one blastocyst — as indeed *non-identical*, dizygotic twins may sometimes develop within a single *zona*, and then together in one blastocyst, after the dispermic fertilization of two cells resulting from division of an unfertilized ovum.¹⁵

Where there is evidence of *symmetric* twinning, it would appear that the dividing individual has ceased to exist, giving rise to two physically distinct (though perhaps adjacent) organisms. In such a case there is radical disruption of the original organism, such that neither resulting individual can be spatiotemporally continuous with that original organism. If, on the other hand, one cell is removed by a scientist from a multi-cell embryo, as in embryo biopsy, it would appear that a new entity has been generated — an embryo or not, depending on its tendencies — without sufficient disruption to entail the death of the original embryo. In the same way, if an adult cell of mine could be cloned to produce another person, this would not mean that in losing *this* part of my body I ceased to exist, nor that prior to cloning I was more than one person. The case of symmetric twinning can be compared, in contrast, to a case in which I am split into *all* my component cells, each one of which is then cloned.¹⁶ Clearly, in such a case I cease to exist as an organism: an individual living whole. My remains, like those of the dividing embryo, do not constitute a normal corpse, but the bodies of my living descendants.

Ford suggests at one point that all zygotes have the “natural active potential” to twin.¹⁷ However, this does not appear to be the case; if it were, *all* zygotes would eventually make themselves twin, unless deprived of the appropriate environment. The fact that all zygotes could be *made* to twin (for example, by researchers) does not show that all zygotes have an *active tendency* to twin. Even in the case of an atypical conceptus, we should be careful not to misidentify an active tendency to twin.¹⁸ For example, we can imagine an embryo, or apparent embryo, with some acquired or inherent weakness such that in some environments it would be made to twin, while in others it would not. A mere inherent *susceptibility* to environmental pressures is not enough to constitute an active tendency — though if there is *no* environment in which “development” could take place after a certain point without being interrupted by twinning, then the entity certainly lacks the tendency, which may be decisive, to produce a single line of development after that point. If, on the other hand, it were known (as it is not) that symmetric¹⁹ twinning in certain rare cases were part of some internal *program*²⁰, then we might have to postulate the existence in such cases not of a real human organism or person but of — to use a term of Warren Quinn’s²¹ — a “proto-organism”. Such an entity would survive until such time as the program were carried out, or alternatively, until such time as the program, having been thwarted, could no longer be carried out, at which point the advent of *developmental* tendencies would signify the advent of a genuine human

organism. The program to twin would in some sense give rise to the program of the embryo to develop; however, these programs would be different enough to mark their bearers off as different things. If an embryo is defined by its active tendency to produce its own development, it would be wrong to call anything an embryo which tended rather to produce its own early destruction.

Just as an embryo might arise from what was not an embryo, developmental tendencies can be absent in an entity arising from an embryo. We can imagine a situation in which an embryo was subjected to some outside intervention, so that the resulting entity was placed on the point of twinning, which it would do without further intervention. If the entity were unable to develop, not just in its actual environment, but in any environment, then this would not be a living human embryo, but the remains of an embryo. Adult humans, of course, remain alive and human at times when they have only very short-term active tendencies: that is, when their imminent death is guaranteed by their physical condition. However, the organizational tendencies which characterize very immature human beings include their *developmental* tendencies: the tendencies which link their current stage of life to every later stage, and which they cannot lose and survive.

The implications for identity of any active tendency to twin in what appeared to be an embryo would depend on what active tendency, to produce what form of activity, is required for the presence of an early human. We will return to this question shortly. In the meantime, we should note the suggestion sometimes made that if an embryo has the tendency to twin then it consists in reality of two individuals, temporarily occupying the same space.²² The dualist implications of this view are surely sufficient to exclude it. For since the same piece of space-time would be "occupied" by each person, the two would originally be *physically* indistinguishable. We would have to imagine two life-principles which somehow animate one body in unison, before moving on to animate two separate bodies, when these are eventually produced. Nor is it possible to claim that twins resulting from one zygote share one initial history — as opposed to one precondition of their coming into being. For this would be a violation of the transitivity of identity: the twins, not identical with each other, cannot both be identical with something else.²³ Different problems would arise if twins were present "together" from the outset, but separate development could somehow be prevented until a stage at which it was no longer possible. In this case, we would have to say either that one or other twin had died — without there being any *physical basis* for the death of one rather than the other — or worse, that *both* twins were present as before, although they would *never* be physically distinguishable.

If a human is an organism each human must be a separate self-directing entity. The presence of a single set of twinning directions (or twinning propensities) in the conceptus would not be enough to indicate the presence at that point of two separate foci of control. Rather, it would indicate the presence of an active tendency (or passive liability) on the part of *that conceptus*. For evidence of the presence of two individuals we will need to find evidence, as in the case of Siamese twins, of separate physical activities directed by separate foci of control.

The phenomenon of identical twinning indicates that it is not, as is sometimes claimed, the genome itself which is the unique, essential constituent of the person. Nor can this even be said of an instance of a genome; say, that of one of a pair of identical twins. For it is counterintuitive that *any* alteration to the genome — any more than to some other part of the body — would bring about the destruction of the original individual, and the generation of a new one. Even a major alteration to the genome would not entail the destruction of the original individual if there were present after the alteration a living being who retained the relevant human tendencies.

Human Offspring and Human Products

What would be a genetic aberration of a kind incompatible with the existence of a human? For clearly, we must distinguish between human *offspring*, and what are no more than human *products*. Examples of the latter are complete hydatiform moles, formed with no maternal genetic contribution and producing extraembryonic tissue; and teratomas, which can produce a jumble of disorganized tissues (teeth, skin, etc).²⁴ Both these entities are genetically unique and, in a sense, alive and human. Neither, however, is human offspring. Why is this?

Some would say that what they lack is rational potential; that is, in the context of early development, the tendency to organize themselves in such a way as to develop rational abilities. In other words, if one precursor of rationality, such as the fetal or infant brain, can be said to suffice for personhood, then an earlier precursor in the embryo can equally be said to suffice.²⁵ The normal embryo, fetus and infant has, at every stage, the active tendency to develop rational abilities, when appropriately cared for. Is this tendency essential to — or merely typical of — the immature human organism?

As yet it is not clear what causes anencephaly: the condition due to which infants are born with a working brainstem but with a badly disorganized upper brain. It has been claimed that rather than anencephaly resulting from a failure in neural tube formation, it may result, at least sometimes, from degeneration of a previously normal neural tube.²⁶ Should this be so, it would not alter the fact that anencephalics are born without an active tendency to develop rational abilities, whether or not they once had the epigenetic primordia of a healthy human brain. In view of this fact, should we regard anencephalics, despite the features which they share with normal infants, as human products, like hydatiform moles?

To return for a moment to the hydatiform mole, it is clear that such an entity can be no more a human being than can a culture of skin cells. One indication of this is that it seems odd to say that a hydatiform mole, any more than a culture of skin cells, *ought* to have, by any stage, a healthy human brain. A hydatiform mole, as a normal hydatiform mole, could not be expected to have any such thing. In contrast, the anencephalic baby, though sharing its features with other such babies, is not a normal, or healthy baby. We have some idea of what the anencephalic is missing; we are able to say what tendencies *ought* to be there, and are not. Moreover, we are able to say what tendencies *ought* to be there by referring to tendencies which *are* there. A severely damaged infant (or fetus or

embryo) will nonetheless have tendencies relating to the organization of many features shared by other species members.

Moreover, such an infant will have some, though not all, of the tendencies it needs to develop to maturity. For example, an anencephalic infant has some, though not all, of the tendencies it needs to develop adult features. The active tendencies it has by virtue of some of its parts cannot form part of a wider active tendency to develop adult features, in view of the fact that these active "subtendencies" are frustrated by defects in other parts — for example, by defects in the control of the cardiovascular and respiratory systems. Not only is the adult stage appropriate to the kind to which the infant belongs, but the infant has parts by virtue of which it has active tendencies which would have helped it reach that stage, were it not for other parts which are blocking or frustrating the action of the first. We should distinguish between the active tendency of all humans first to develop, and always to integrate their parts; missing "wider" tendencies due to one sub-tendency being frustrated through lack of another; and absent tendencies where there is and should be no such active sub-tendency. For example, a normal male, unlike an infertile woman, has neither the tendency to give birth to a child nor any of the specialized sub-tendencies (for example, to produce the relevant hormones) which make up this wider tendency.

What, then, are the tendencies essential to the existence of a human being? I have been assuming that the organizational tendencies essential to the existence of an *early* human being include the tendency it has to organize its own development. The active tendency to differentiate cells is at least a necessary condition for early human life. Mere cell multiplication, without a view to later differentiation, would not be *human development*. If, on the other hand, cells will be differentiated to form a head, trunk, and so on, arranged as parts of one body, then the conceptus would appear to be a human, at an early point in its developmental path. In a case of doubt after some harmful intervention — for example, the introduction of non-human cells — we should decide by reference to the part of the *mature* human organism which we would take as sufficient evidence of human organization. Those who would accept as sufficient evidence the presence of a working human brain might then conclude that an *active tendency to produce* a working human brain would be sufficient to show that the conceptus was a human. If a working *part* of the brain — for example, the brainstem — is thought to be sufficient in the case of older human beings, then a tendency to form this working part might be taken to show that a conceptus was an early human being.

The active tendency to differentiate cells in an orderly fashion and then to form a working human brain, is, I would argue, sufficient indication of the presence of an early human being: a living organism which directs itself in characteristic human ways. Not only is the human brain the organic "control centre" of the mature human organism, but the presence of a human brain, or the tendency to produce one, is evidence that the organism is the kind of being which ought, by a certain stage, to have rational abilities. A being with a human brain, or the tendency to produce one, is a rational *kind* of being. It is a rational kind of being, in one sense or another, whether or not it is the case — if the human "life-principle"

is something subsistent²⁷ - that such a being has a *non-material* basis for many if not all the tendencies required for rational behavior.

The profoundly mentally handicapped can only be described as such because they are members of our kind. We believe we have duties to enable, or at very least, to permit those not currently rational to attain what we see as their rational fulfillment. If we cannot do this, our respect and sympathy — a response appropriate to damaged members of our kind — can be shown in other ways. The moral and biological class of human beings, which includes normal and damaged, mature and immature, is the class not of those with current rational abilities, nor even of those with “wider” rational tendencies, but of those whose active tendencies constitute them members of our rational kind.²⁸

Conclusion

Various areas have been touched on in this paper, without their being given the attention they deserve. One final question should however, be raised before concluding, which concerns the grounds for the widespread reluctance, even on the part of those who think that we are organisms, to accept the embryo's claim to be a human organism, and a human being, or person. If we leave aside emotional pressures which implications of this claim may well create²⁹, the most likely cause of our reluctance is arguably the sheer unfamiliarity of at least the early embryo. Very little was known about the embryo in previous generations, and even now, many of us find our first sight of the embryo puzzling, or even alarming. How is it possible, we may ask ourselves, that an entity which *looks* so unfamiliar is *one of us* - a human being?

Arguments from the “inhuman” appearance of the embryo need to justify their central assumption that this is not what human beings look like, at one stage of their lives.³⁰ We do, of course, begin the enquiry into our origin with a mental picture of the paradigmatic human person: someone with eyes, face, limbs, and so on; someone of adult form and appearance. Our enquiry should not focus on such features, which are not obviously essential, but should rather focus on what persisting entity might underlie these and other features. Biological entities, such as we are, are defined not by static but by *self-adapting* structures and tendencies. And while it is true that we trace a human being through time by identifying one stage as similar to the next, we should not expect to find greater similarities between *disparate* stages in the case of human beings than we find in the case of other animals.

It may be objected that a familiar appearance is part of our social reality: part of what we normally relate to in relating to a human being or person. It is undoubtedly the case that we find it easier to relate to those who look like the human beings to whom we are accustomed. However, we should not refuse to recognize what we have reason to believe is a stage of human life, simply on the grounds of unfamiliar appearance, or lack of emotional appeal. After all, a child or adult of normal appearance may have much wider emotional appeal than does a child or adult with a serious disfigurement. Nonetheless, those with serious disfigurements do not have lower *status* than those without; they merely find it harder to have their status recognized by other human beings. The interests of

such people in their possible fulfillment, and the rights they have relating to those interests, do not depend on these interests and rights being recognized by anyone at all.

This paper has taken as its premise the organic theory of the person. Whether this theory is accepted or rejected, it must be remembered that one of its features is the proposition that a human being has *objective* interests which are morally significant. If, as some claim³¹, there are objective "human goods" — objective modes of human flourishing — our interests will not depend on our *taking* an interest in the goods we may enjoy. A human being will not need to develop this or that level of mental or physical ability for his or her fulfillment to have moral significance. What is essential will not be the actual *possession* of such features as rationality, but the existence of a being who would be fulfilled in acquiring such features. Clearly, our origin as living beings is significant on this view of persons, for later abilities will not create, but fulfill, the living person who acquires them.

References

* I am grateful to Alison Davis, Norman Ford, Luke Gormally, Birgit Jentsch and Agneta Sutton for helpful comments on this paper.

1. Stone, J. Why Potentiality Matters. *Canadian Journal of Philosophy* 1987; 17: 824-25.
2. Wade, F. Potentiality in the Abortion Discussion. *Review of Metaphysics* 1975; 29: 239-255. See also Stone, *op. cit.*, and Watt, H. Potential and the Early Human, forthcoming.
3. Tonti-Filippini, N. Further Comments on the Beginning of Life. *Linacre Quarterly* 1992; 59: 77-81.
4. Buckle, S., Dawson, K. and Singer, P. The Syngamy Debate - When *Precisely* Does a Human Life Begin? In *Embryo Experimentation*, ed. P. Singer. Cambridge: Cambridge University Press, 1989.
5. It is *this* penetration, not the earlier penetration of the *zona pellucida*, which creates a diploid zygote from a haploid ovum. Even if the *zona* is thought of as part of the embryo (see note 7) the presence of one or more sperm in the perivitelline space does not suffice to form a zygote. If more than one sperm is present within the perivitelline space, it will not be possible to date the formation of the zygote from the entry of either sperm into the perivitelline space, since in principle it may be the other sperm which penetrates the inner membrane - an event which makes the penetration of the *zona* by the first sperm superfluous. In contrast, if one sperm penetrates the inner membrane, releasing its genetic material, it is then that the zygote is formed with developmental powers. Any subsequent penetration by a second sperm and release of *its* genetic material will be responsible not for the formation of a zygote (unless, for example, a polar body is fertilized) but for damage to an existing zygote.
6. Ford, N. *When did I begin?* Cambridge: Cambridge University Press, 1988.
7. Germain Grisez describes the *zona pellucida* as an organic part of the embryo (When do People Begin? In *Abortion: A New Generation of Catholic Responses*, ed. S.J. Heaney. Braintree: The Pope John Center, 1992. p. 25 n. 50). Whether or not the *zona* is a part of the embryo, it appears that the *zona* may not be essential for early *human* development (Martin Evans, personal communication), although it is useful in preventing the formation of chimeras where there is more than one embryo present. If the *zona* is not essential for early human development, it would appear that activated cells from an early embryo are themselves embryos with active developmental potential - whether or not they are put in surrogate *zonas*, as in the recent "cloning" experiment (see Kolberg, R. Human Embryo Cloning Reported. *Science* 1993; 262: 652-653), and whether a *zona* is a (natural or synthetic) part of an embryo, or a part of the embryo's environment.
8. McLean, J. The Early Human Embryo. In *The Human Embryo: Science, Law, Ethics and Public Policy*, ed. L. Gormally and H. Watt, Forthcoming.

9. Hill, D., Strain, A. and Milner, R. Growth Factors in Embryogenesis. In *Oxford Reviews of Reproductive Biology*, ed. J. Clarke. Oxford: Clarendon, 1987, pp. 403-404, 411.

10. Ford, *op cit*, p. 162.

11. Holland, Alan. A Fortnight of My Life is Missing: a discussion of the status of the human "pre-embryo". *Journal of Applied Philosophy* 1990; 7:27.

12. Grisez, *op cit*, p. 17

13. Sutton, A. *Prenatal Diagnosis: Confronting the Ethical Issues*. London: The Linacre Centre, 1990. p. 108.

14. See Braine, D. *The Human Person: Animal and Spirit*. London: Duckworth, 1993. pp. 480-545.

15. The organization of the oocyte and embryogenesis in twinning and fusion malformations. *Acta Geneticae Medicae et Gemellologiae Roma* 1987; 36 : 421-431, cit. McLean, *op cit*.

16. In the case of chimeras, where a change takes place through aggregation rather than division, it seems most likely that one individual survives while the other is radically disrupted - "eaten" - by the survivor. More elaborate explanations would be that both are simultaneously destroyed, or that one "takes over" the other and is then taken over by a newly formed third. It may not always be easy to determine which individual if any, survives; however, a non-dualist approach to the human individual will see death or survival as an outcome of *physical changes to that individual*: changes which are discernible in principle, if not in practice.

17. Ford, *op cit*, pp. 119-120.

18. By "active tendency to twin" I mean an active tendency to *initiate* the twinning process. Since an active tendency refers to continuity between not doing and doing on the part of an individual, it cannot extend to the *end* of a process, such as symmetric twinning, which involves the destruction of that individual.

19. In the case of an active tendency to twin asymmetrically, the problems seen here would not arise, since one of the individuals present after twinning would be the original individual. An active tendency to reproduce asexually would be no more a threat to human identity than the normal active tendency of adults to reproduce sexually.

20. It may be asked what the difference would be between a genetic *propensity* to twin in some environment and a genetic *program* to twin in some environment. We may feel some reluctance to define the difference in terms of a distinction between teleological and accidental developments. In other contexts, however, we are happy enough in practice to use teleological terms to describe a selection of natural phenomena (for example, "blueprint", "function", "health", "repair", etc.).

21. Quinn, W. Abortion, Identity and Loss. *Philosophy and Public Affairs* 1984; 13: 27.

22. Sutton, *op cit*, pp. 109-110.

23. Holland, *op cit*, p.33.

24. See Suarez, A. Hydatiform Moles and Teratomas Confirm the Human Identity of the Preimplantation Embryo. *Journal of Medicine and Philosophy* 1990; 15: 627-635.

25. Grisez, *op cit*, p.11.

26. McCullagh, P. *Brain Dead, Brain Absent, Brain Donors*. Chichester: John Wiley, 1993. pp. 112-114.

27. See Braine, *op cit*, pp. 480-545.

28. If there are other such organisms, these too will be moral subjects of particular importance. However, *human* persons - the kind with which we are familiar - have conditions of existence specific to themselves.

29. On the implications with regard to abortion see John Finnis (The Rights and Wrongs of Abortion. *Philosophy and Public Affairs* 1973; 2: 117-145) and Stephen Schwarz (*The Moral Question of Abortion*. Chicago: Loyola University Press, 1990). I discuss these implications briefly in Watt, H. Abortion and Shelter: Beyond Thomson's Violinist. *Ethics and Medicine* 1992; 8: 9-10.

30. Fisher, A. *IVF: The Critical Issues*. Melbourne: Collins Dove, 1991. p. 138.

31. See, e.g. Grisez, G., Boyle, J. and Finnis, J. Practical Principles, Moral Truth and Ultimate Ends. *American Journal of Jurisprudence* 1987; 32: 99-151.