WHEN DO PEOPLE BEGIN?

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The issue of when an individual human life begins is a test case for intellectual honesty regarding science in this century. From the foundation of embryology as a science in 1875 (when it was found that a single sperm, and not, as many thought until then, a large number of sperms, entered the ovum) until IVF gave the prospect of rewards for destructive experimentation on human embryos, every scientist who approached the question stated quite categorically that a new human life began at fertilization. Pure scientists still say the same. But some reproductive technologists are trying to avoid the issue or to confuse it. And they are seeking support among theologians and philosophers.

Fr Norman Ford, in his recent book **When did I begin?**,[1] rejects the scientists who say life begins at fertilization, as being uncritical minds, as being unconcerned about questions concerning individuals (117), as "fail(ing) to notice philosophically significant discontinuity" (129), and apparently, despite pictures similar to those shown today, as being ignorant even of the existence of identical twins (117). These are drastic charges to make against the great text-book writers in human embryology, and yet Fr Ford makes no effort at all to show evidence in their writings of these errors. In his detailed argument he also rejects a number of other well-established and otherwise undisputed scientific facts.

As proposed, the question before us is the beginning of each individual human life. When did any person, such as you or me, last receive, from outside of himself or herself, whether physically, biologically, or (as my friend Professor Singer seems to think) by magic, some notable contribution without which his or her present unity could not have existed?

Is there some discontinuity in the history of those parts and functions, some event (or short discernible series of events) before which that unity, and its corresponding set of powers, did not exist?

That is the question of the marker event, and the commonest answer is fertilization. The alternative claims put before the Senate Select Committee in 1986 for implantation were very tentative, with practically no suggestion from the reproductive technologists themselves. Nor did any of the fifteen IVF teams that made submissions to that Committee even think of proposing syngamy as the time of origin of the human life. Nor does Fr Ford propose any observable marker event. His argument is more radical, though without, I think, any support from the scientists.

So, in fact, I am taking as the central question Fr Ford's hypothesis that, while fertilization produces a single human individual, this is not the same individual as the adult that grows from it. That first single individual was the zygote, produced by the fertilization of the ovum by the sperm. He says that the subsequent processes of cleavage do not produce distinct cells within a single individual, but distinct individuals that cannot be considered together as a single whole. And in proof of that here he pointed to a large circle with two circles in it and asked you "How many?" Before you answer I ask you to add "How many what?"

About fourteen days later, according to Fr Ford, when a few thousand of these cells have been produced, they conspire to come together to form a

new whole, which is a new single individual quite distinct from each of the previous cells, and also from their parent zygote.

The question can, however, be given a simple and straightforward answer without having to rely upon the sort of drastic moves made by Fr Ford, namely:

(a) His contradiction of the main scientists.

He lists a fair number of the standard textbook writers (114-15), and they surely are no fools. They state, quite categorically that the life of every individual begins at fertilization. My first challenge to him is to take those scientists seriously. They are supported, right up to the present moment, by experts in the field, like Yanagimachi, whose contribution came out in 1988. Yanagimachi starts off his long review article with a similar statement, "Fertilization in mammals normally represents the beginning of life for a new individual."[2]

(b) His assumption that scientists never reflect philosophically.

(c) His use of philosophical jargon to reinforce this view. The term "ontological individuality," in particular, occurs an enormous number of times in the book, though you really have to turn to the glossary in the back to find what he means by it. He could have simplified matters greatly by spelling out that meaning within the text itself. The jargon could frighten away, or bemuse, scientific readers, by making them feel, wrongly, that they are out of their depth.

(d) His assumption that biologists have no concern about this "ontological individuality," as though the existence of "a single concrete entity . . . as a distinct being and not as an aggregation of smaller things, nor merely a part of a greater whole" (212) was not a central issue when dealing (as the embryologists and other biologists do) with organs, with colonies, with parasites, with symbiosis, with viruses, with membranes, with organelles, and the like. He says that "the scientists are not speaking philosophically about the concept of a continuing ontological individual" (117). True. But may they not be speaking about real things and objective numbers? May they not be **thinking** philosophically? May they not be reflecting on the same sort of issues as the philosophers are reflectiong upon? He seems to wipe any such possibility aside without even the most superficial examination of any of their writings.

(e) His neglect of positive criteria for individuality. He is claiming that certain things are not individuals, and he uses a lot of arguments in a negative way but never states what positive evidence would satisfy him.

(f) Hence his subjection of the embryo to criteria that few adult individuals would pass. He takes it for granted that each adult that we know is a distinct individual, but he makes no analysis of this individuality. Such an analysis is definitely called for if we are to have criteria to apply to any disputed case. This is my second challenge, that Fr Ford should state clearly his criteria for individuality as found in an adult, and then take this case as the paradigm.

In my own reflection on the matter I have found a key in a term that occurs very frequently in recent textbooks in the medical sciences, the notion of organization. For instance, in **Molecular Biology of the Cell** by Bruce Alberts and others,[3] and in Albert Lehninger's **Principles of Biochemistry.**[4] This notion of organization is a result of philosophical reflection by

these authors on what is going on. It is absolutely central to present day biology. And it is the secret of individuality. It fits in perfectly with the results of my attempt to analyse this issue.

Organization can be experienced in one's own life here and now. It can be recognized, at a low level, by common sense in many things or systems with which we are familiar, such as a bicycle, a motor car, a sewing machine, a school, a shop, a factory, a football team. And Father Ford mentions many of these in his book. Organization can be analysed intellectually as a complex set of parts whose functioning can be understood in a very simple overall way involving unified action by all those components.[5]

There are many different degrees or levels of organization, and so it is important to determine the level appropriate to an individual living thing, and especially to a person. Unless we do this, any reference to organization as the characteristic of a living individual can easily be caricatured as indicating nothing deeper than the unity of a machine or a factory.

The parts of a machine have visible connection, and function mainly by the transmission of mechanical or electrical forces, with occasional chemical forces like the explosion of petrol in a motor car.

The main parts of a school are people, and these function as a school through verbal or written communication. A factory has both people and machines, and functions through both forms of connection. And, of course, the people in schools and factories go home at night, and then live quite independently from each other.

A living being has a much deeper unity, so that it cannot properly be understood on more than a most superficial level as a mere cluster of cells or a mere aggregate of molecules. Its cells and molecules have a wide range of co-ordinated functions, all of which fit into the simple pattern of preservation and development of this organization of theirs that we call life. Such functions contribute to the broad headings of generation, growth, nutrition, and healing, phenomena which are strikingly apparent when contrasted with death, which means the cessation of the overall unity among them. An animal, as distinct from a plant, has a higher integration of these and similar functions through locomotion and sensation, and a human person can integrate his or her sensations more highly still through inquiry, understanding, affirmation and decision.

There are, of course, limits even to this unity, as every unity which we know in this life involves a considerable degree of multiplicity. Indeed unity is shown as the power to link diversity. Hence we must set a paradigm for our investigation. I propose the human adult. My second main challenge to Fr Ford, as I have said, is to accept this paradigm, and not to demand of the zygote or early embryo a greater degree of unity than can be found in any one of us here present.

The best recent textbooks tell us that "Almost every multicellular animal is a clone of cells" [6], and that applies to the adults, to you and me. And it includes our blood cells, with all their movement and apparent independence. Each one of us is a cluster of cells. So a claim that an early embryo is "a cluster of cells" (168, cf. 170, 173, 175) does not, without further argument, count against its being a human individual.

Each of us, too, spends a notable amount of time in sleep, and during that time our intellects are resting, so we cannot disprove the humanity of an

early embryo by showing that its intellectual powers are not actively functioning.

On the basis, then, of any ordinary adult, which I have taken as an example of an individual, we can establish a criterion of an individual--unity in a totality of aspects. Is the part serving some function outside that intelligibility? Or, on the other hand, when you examine the part do you find that nearly every one of its functions, along with its origin and its directedness can be properly understood as serving that individual as a whole. That is a good indication that you are dealing with a single thing.

It is a matter of focus. Are these activities, these functions, focused in just one way that is easy to understand? Or is the focus on something outside, as with the teacher in a school, who has a focus in his home, as well as in the school. In the latter case, we are probably dealing with a system, not a single individual.

The evidence for this unity of parts and functions must be global evidence. It must be got by running through a whole series of events, a whole series of functions, a whole series of stages of development from a single origin. But, unfortunately, there is an easy strategy for appearing to refute an argument that depends on running through a series--divide and conquer. You can give a convincing proof that a full-forward on his own doesn't make a football team. On another occasion you can prove that a full-back is not a team, on another you can prove that a rover is not a team, and so on until you can claim that you have refuted every argument that has been used to show that there is a football team. You never consider the possibility that there might happen to be a full-forward and a full-back and a rover as well, along with the other rucks and some forward and back pockets and a centre line and three half-backs and three half-forwards. This is the strategy that is applied very effectively by Fr Ford to convince himself that "there is very little evidence of intrinsic unity" (137).

1. Let us note some cases where a piece of evidence is rejected as insufficient without being considered as one part of a network of evidence supporting the notion of a focal unity.

1.1 Genetic information.

He insists that the genetic code in the zygote "does not **suffice**" to constitute distinct individuality (117), and "does not **guarantee**" it (125). The scientists, however, whose views he opposes, made no such excessive claims, nor did the philosophers who found support in such scientists (113-115).

1.2 Directedness.

When considering finality Ford not only isolates it from every other type of evidence of unity in saying that "purposefulness of living activities **alone** cannot determine if they are the activities of one individual or interactions between more than one individual," (126), and that "The purposefulness of mitosis in the zygote **does not resolve** the issue" (126). He isolates each instance of finality from other instances and so fails completely to consider any **unity of finality**, and ends up by ruling out every scrap of evidence of this most powerful type by stipulating that "Directedness and finality are said to be **intrinsic** [his emphasis] **only if** they appear within what is **already known** to be a definitely established given ontological individual and for its benefit." (149)

1.3 Cellular contact.

Though the photographs show the first eight cells pressed very firmly together, and the cells at even the four-cell and the two-cell stages quite firmly in contact, he says "their membranes **merely** touch within the zona pellucida," (137), dismissing not only this touching but the remarkably unifying function of the zona pellucida. He does not recognize the importance of this touching, even though noting the need to use "evacuated zonae" for the success of experiments in aggregating manipulated blastomeres (139).

1.4 Glue-like junctional complexes.

The "mere touch" of the cell membranes mentioned above hardly allows for what he goes on to say about the "**glue-like** desmosomes" (135) whose weakness is a factor that facilitates identical twinning, so that they are presumably stronger in all normal cases.

"Mohr and Trounson report that primitive junctional complexes have been seen as early as the eight-cell stage . . . . They would be referring initially to desmosomes, or glue-like junctions, that hold the cells loosely together" (137).

1.5 Analogy with forms of generation in plants.

The possibility, which he concedes, (120) that some type of asexual reproduction might well be a simple explanation of the origin of a new twin at the stage of the early embryo is rejected by a bias against any "theoretical solution" (120, 121), leading up to the unsupported assertion that "human individuals do not resemble plants in this respect" (121). The rejection of theory here is particularly inappropriate so soon after the admission of ignorance in this area: "Nobody knows the precise cause or real causes of identical (monozygotic) twinning" (119).

1.6 Analogy with generation in Protozoa.

Ford's reasonable suggestion that "The case of an amoeba or a bacterial cell becoming two by fission would be the appropriate analogy to employ in the case of identical twinning in human zygotes," (121) is hardly fed in to the total picture, and seems to be misused when extended as if such **complete** separation were required in the other ninety-nine and a half per cent of cases as well.

While his account of fission as the death of the previously existing amoeba and the generation of two new ones, (121) has, in the admitted absence of relevant empirical data, genuine "theoretical" plausibility, and is not in conflict with my view and that of the scientists that fertilization is the beginning of a new individual, nevertheless his treatment of this case is marred by his failure to recognize the equal plausibility of the alternative explanation, favoured by Occam's razor, that the original amoeba remains alive and only one new one needed to be generated.

2. Some evidence counting strongly towards unity of organization is rejected more directly by Fr Ford.

2.1 The zona pellucida is not considered by Ford as a genuine part of the zygote, but as a "protective shell" or "temporary external protector"(146) **within** which exists the zygote (117), or later, two or more distinct cells (119, 137, 146), so that the zona merely "gives **the appearance of** a single

organism or unity" (137). On the other hand, he is ready to claim that a cell membrane, whose appearance in the same diagram is very similar to that of the zona, indicates an "ontological entity" (139).

He even includes the word "noncellular" in his definition of the zona (213) as though, by not being itself a full cell, it had no function in preserving unity in the zygote or among a set of daughter cells. This despite the fact that it does help the "cells developing from the zygote to form junctions" (146).

Though admitting that the zona's "constricting **influence** . . . usually keeps the cleaving cells in close contact and thereby **prevents** twinning occurring at that stage" (120), he fails to consider it as an organ of the early embryo helping to ensure, in most cases, the preservation of its unity and individuality.

2.2 Fr Ford recognizes the negative implications for his thesis of allowing that the placenta might be an intrinsic organ of the embryo, and so argues strongly against such a concession (157). He makes out that such an opinion is an idiosyncratic view of one Bernard Towers and states, in reply, that the placenta "has always been regarded as extraembryonic **tissue**" (157).

Here again he neglects the explicit teaching not only of the standard scientific authors, such as Leslie Arey and Keith Moore, but even of M.B. Renfree and G.C. Liggins in their separate articles in Fr Ford's favourite reference book.[7]

His implicit demands that no organ can be found without being pervaded by another organ (157), that no organ can develop tissue in a pathological state without being connected with the whole organism, that an organ may never be shared between two individuals (as Siamese twins may share legs or other organs), that maternal organs are comparable to the fetal placenta in their degree of unity with the embryo (157), would come close to destroying the very notion of organ even in the normal adult. And these ad hoc arguments are not on matters that would have escaped the attention of any of the experts, referred to above, who have no hesitation in calling the fetal placenta an organ of the fetus.

2.3 Fr Ford's constant phrase "genetic or biological unity," (62, 63, 117, etc.) linking these two terms in apposition, as though no living being had any other biological constituents apart from DNA, and his frequent contrast between genetic individuality and ontological individuality, as though there were no biological factors other than DNA relevant to individuality, helps us to understand another serious omission in his book, a neglect of the contribution to unity that comes from the cytoplasmic constituents of the cell. This is shown also by his repeated downgrading of them to the status of mere "nutrients" (137).

3. Putting together the various types of evidence mentioned in the above two sections, while allowing for the appropriate corrections, we already have a considerable body of converging evidence for the individuality of the early embryo. And this is very similar to the sort of evidence needed if we wish to spell out, as Fr Ford neglects to do, the evidence for a reasoned belief in the distinct individuality of any adult human being.

But there is more evidence besides, where no correction is required, of which much is mentioned by Fr Ford (though without any indication of its contribution to intrinsic unity of organization).

3.1 The clear shapes and orderly stages shown in his pictures and diagrams on pages 106, 138, and 152, are signs of a highly unified and coordinated process, such as is hardly compatible with his thesis that the cells of the early embryo, right up to the formation of the primitive streak, are genuinely distinct from each other, so that they make up simply "a cluster or assemblage of a few thousand cells" (170).

3.2 The scientific regularity of the whole process from fertilization onwards is well illustrated by the full caption to Figure 5.4 (p.154), in a way that does not at all easily allow for the independence that would belong to distinct cells.

3.3 The organization that belongs to the early embryo is recognized indirectly in Ford's pointing to the **lack** of organization in parthenogenetic development that perishes or leads to an ovarian teratoma (151).

And his assertion that "both types of cell are so different and both trophectoderm and ICM influence and support each other's separate developmental pathways and growth throughout implantation in a **co-ordinated** way" (157), is hardly offset by his rather tentative opinion, "I do not **think** there is sufficient evidence (for distinct individuality)" (157).

If the conclusion from experimental manipulation with chimaeras is that "Trophectoderm alone, without any ICM cells, soon ceases to develop and cannot give rise to a living fetus: **together they harmoniously succeed**" (159), then surely the same must be even more true when no such disturbing external interference has been at work.

3.4 An intrinsic limit to the number of cell divisions implied in his discussion of the supposed 'clock' mechanism (156-158) indicates a unity of organization quite different from the unrestricted proliferation of tissue cells in vitro.

This clock mechanism is not easy to reconcile with the distinct and independent existence of each cell that Ford postulates. "It seems to be set from the time of fertilization, with each cell's 'clock' running in dependence on, and in co-ordination with, what is happening in its surrounding cells" (155). Since nearly all the cells start existence at quite distinct times, it is hard to see how they can be uncoordinated and yet have clocks synchronized, not at the moment each one starts to exist, but at fertilization.

3.6 The rarity of twinning (very close to one person in a hundred has an identical twin) surely suggests that the norm is union between the cells, not distinction. Yet he claims that **each** "zygote loses its ontological individuality when it first cleaves to give origin to two identical daughter blastomeres, **quite irrespective of** the eventuality of the phenomenon of identical twinning occurring" (125).

And, of course, the extreme rarity of identical triplets, and the non-existence of pregnancies with a hundred or a thousand fetuses, make it hard for us to take seriously his view that the cells are distinct individuals right up to those stages.

3.7 If the cells of the early embryo are really distinct from each other, one of the most obvious tasks of biology would be to find the mechanisms that start to bring them together about the time when the primitive streak is formed. Yet Fr Ford provides us with no evidence at all of any such new

coordinating factor. He passes over the issue blithely as a vague "transformation of a group or system of co-ordinated individual cells into a multicellular living individual human being" (159).

3.8 There is something breathtaking in the nonchalance with which Fr Ford relegates to a footnote the quotation from R.G. Edwards which counts so strongly against his own view, and in the simplicity of his comment that the following is "something interesting": "it becomes **magnificently organized,** switching on **its own** biochemistry, increasing in size, and preparing **itself** quickly for implantation in the womb" (206 n.36).

4. Perhaps the most central errors lying behind Fr Ford's thesis and strained argumentation are his misunderstanding of totipotentiality, with which he is completely fascinated, and his ignorance of the whole point of the philosophy of hypomorphism, which was introduced principally in order to deal with the empirical facts of "generation and corruption."

4.1 Totipotentiality is a property of each of the two cells after the first division of the zygote, and of each of the four or eight cells after the second and third divisions. It means that either **can** develop into a whole adult, **provided** something unusual happens to it, such as division from the cells near it. The separated cell then has the power to become distinct and develop fully.

But Fr Ford completely neglects this proviso, and assumes that each cell **must** so develop. In fact, of course, in some 99.5% of cases none of those cells **does** develop into a complete adult, but each such early cell develops into only one half or one quarter or one eighth of the fetus or into some even lesser part of it. This shows that **in fact** its development is limited by and coordinated with that of the other cells around it. Like those others, it has a very specialized and urgent task--to synthesize enough DNA and membrane material to cater for some thousands of cells, and to keep on being subdivided until the much smaller size of an ordinary somatic cell is reached. It is not just one completely individual cell waiting for a thousand independent cells to arise in its vicinity before being brought into some new and previously unprepared overall system with them.

So the totipotentiality of a cell at the 2, 4, or 8-cell stage is of itself, without some rarely-occurring further factor, no indication at all that any of those cells is distinct as an individual.

4.2 Fr Ford supports his argument with the philosophical system called hylemorphism, but misses the whole point of that theory. Hylemorphism accepts the facts of changes from one individual to two or many individuals, such as occur in all forms of generation and in the corruption of a body after death, and accepts also the facts of changes from two or more individuals to one, such as occur in eating and in grafting. The theory aims precisely at making such events intelligible. It does so by postulating a common material component at the moment of change and the emergence of new (or the submergence of old) organizing forms when the agent of the change operates. Fr Ford ignores all this and then takes the theory as showing instead that such facts as those mentioned are simply not possible. No wonder there are claims of decadence in neo-scholastic philosophy!

5. I will leave it at that for the moment though a lot more could be said. I just want to mention four other desperate strategies employed by Fr Ford.

5.1 His off-hand rejection of many standard scientific results, including the following:

That life begins at fertilization,
That reproduction occurs in many different ways.
That asexual reproduction is no argument against the individuality of the parent.
That Amphibia provide a useful guide to early embryology.
That the occurrence of twins, even identical twins, has been well known for years, indeed centuries.
That the fetal placenta is an organ.

5.2 His selectivity among those scientific results that are relevant to the issue, so that he neglects some completely. The facts, for instance, that:

Mammals are more complex and more highly organized than are amphibia.
Biology is more than genetics.
The cell is more than its genetic code.

5.3 His lengthy account of recent scientific observations which in fact do not advance the argument.

5.4 His grossly misleading "adaptation" of a chart from a scientific source, including his addition of inappropriate graphs to it, so as to suggest that the zygote is **not** a "cell from which will develop the entire embryo proper and fetus." (p.160)

5.5 His neglect of the history of the main genuine developments in embryology while spending a great deal of time on parts of the history of science that were of no use to us at all.

I conclude, therefore, that Fr Ford has failed to disprove the standard conclusion of the embryologists that fertilization is the beginning of the life of a new individual human being.

I am ready to admit that there may indeed be prospects of big financial gains to Australian Universities from the sale of IVF technology overseas. But such gains would never make up for the intellectual price paid in the denial of well-established scientific facts.

REFERENCES

1. Norman M. Ford, **When did I begin? Conception of the human individual in history, philosophy and science**, Cambridge: Cambridge University Press, 1988. All numbers in brackets in my text give page references to this book. The emphasis throughout is mine, except for one word which is noted where it occurs.

2. R. Yanagimachi, "Mammalian Fertilization," Chapter 5 of E. Knobil and J. Neill et al. (ed.), **The Physiology of Reproduction**, New York: Raven Press, 1988, p. 135-185, at p.135.

3. Bruce Alberts et al. (ed.), **Molecular Biology of the Cell**, New York: Garland, 1983, p.v, xxxiii-xxxiv, 62, 67, 75, 82, 84, and passim.

4. Albert L. Lehninger, **Principles of Biochemistry**, Worth Publishers, 1982, especially Chapter 1, p. 3-13. The notion has a respectable history. Thus L.A. Borradaile, **A Manual of Elementary Zoology**, London: Oxford University Press, 1912, has this in the Preface to the first of his many editions: "One general principle has guided me--that the organism should be regarded as a whole. Thus I have not adopted views which ascribe to certain morphological constituents of the body of an organism, such as cells and zooids, a mystical 'individuality,' based upon assumptions with regard to their history or potential independence. I have taken indivision, not indivisibility, to be the essence of individuality."

5. Bernard J.F. Lonergan, **Insight: A Study of Human Understanding**, London: Longmans, Green, 1957, discusses this notion at length in Chapter 8, "Things," p.245-270. His philosophical explanation of how an autonomous science of biology can be perfectly compatible with giving a full account of every biological event in chemical terms is particularly valuable. This approach has been expanded and applied by Philip McShane, **Randomness, Statistics and Emergence**, Dublin: Gill and Macmillan, 1970, and by William J. Danaher, **Insight in Chemistry**, Lanham: University Press of America, 1988.

6. Alberts, **Op. cit.**, p.813.

7. C.R. Austin and R.V. Short, Reproduction in Mammals, Vol.2, Embryonic and fetal development, Cambridge: Cambridge University Press, 2nd edition 1982, p. 46, 119, 120, 121, 123, 125, 126.