Who am I? When do "I" become another? An analytic exploration of identities, sameness and difference, genes and genomes.

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Abstract

What is the impact of genetics and genomics on issues of identity and what do we mean when we speak of identity? This paper explores how certain concepts of identity used in philosophy can be brought together in a multi-layered concept of identity. It discusses the concepts of numerical, qualitative, personal and genetic identity-over-time as well as two rival concepts of genomic identity-over-time. These are all understood as layers in the multi-layered concept of identity. Furthermore, the paper makes it clear that our understanding of genomic identity and the importance attached to genomic sameness-over-time matters for the ethical questions raised by certain new gene technologies.

Key words: identity-over-time, multi-layered identity, genetic identity, genomic identity, genes, genome, germ-line gene therapy, genetic diagnosis, sameness, difference

Introduction

Even before the Human Genome Project was completed, Nobel Prize winner Walter Gilbert suggested that genetic knowledge would provide us with answers to the question of who we are (Sylwan 1992: 59). Since then, various often contradictory links have been made between concepts of identity and concepts such as "genes" or "genomes" in political, legal and ethical texts (see Hauskeller 2004).

This paper explores how certain concepts of identity used in philosophy can be brought together in a multi-layered concept of identity. It explores different kinds of identities such as numerical, qualitative, personal and genetic identity and two rival genomic identity concepts. These are understood as layers in the multi-layered concept of identity. A distinction between the concepts of gene and genome is necessary: "gene" will be used to refer to a particular DNA sequence with a certain ascribed function, and "genome" will be used to refer to all the genetic information in a cell (Hauskeller 2004).

Three genetic examples will be used. The example of paternity testing is used in order to highlight the difference between genetic and genomic identity. The example of pre-implantation genetic diagnosis is used in order to discuss the special case of the identity of embryos.[1] The example of germ-line gene therapy is used in order to highlight the question of whether it matters, to one's genomic identity and one's multi-layered identity, how much of one's genome is the same before and after this kind of gene therapy. The examples will be described in detail later on.

Though different, the examples evoke the same questions as regards genes, genomes and identity. What kind of changes in particular genes or in one's whole genome make a difference to one's multi-dimensional identity? What does it take for someone to be not only different at a certain time t and a later time t' as regards a particular layer, but to be so different that s/he has become another? And, what do we mean by identity?

In order to discuss the last question, a distinction needs to be made between the concepts identity-over-possible-worlds, identity as certain properties of the person, and identity-over-time.

What Identity?

Identity-over-possible-worlds is at stake if I wonder if I would have been different from who I am now, if my parents had married other people. Some claim that the answer to this question is simple: "I" would not have been different from who I am now, since I would not have existed (Parfit 1986:351). *Identity as certain properties of the person* is at stake when I claim that I am me since I have a certain sex, ethnicity or personality. It is at stake when someone claims a certain identity by focusing on certain physical accounts of the person, on certain self-awareness or other coherent properties. *Identity-over-time* puts the focus on whether I am, in a particular respect, the same at time t and a later time t'.

I will work with the concept identity-over-time. My focus is on whether X is, in a particular respect, the same at time t and time t'. This means that the question of the possible essence or core of the person become less important than has been the case in much philosophical discussion of identity-related issues. Here, I claim not that we should abandon the language of essences, since "identity is performatively constituted by the very

'expressions' that are said to be its result" (Butler 1999:33), or that there are no essences. My claim is more modest and, also, pragmatic: a shift in focus, from identity as a set of properties or identity-over-possible-worlds to identity-over-time, can prove helpful in the discussion of certain new medical technologies. However, in the discussion of pre-implantation genetic diagnosis and germ-line gene therapy, we need both the concept of identity-over-time and the concept of identity-over-possible-worlds in order to understand what is at stake.

Feminist philosophers, among others, have claimed that the moral agent need not be a congruent, homogeneous self (Meyers 2002). I will apply this to the discussion of identity. I will use a *multi-layered concept of identity-over-time*, where personal identity-over-time is understood as one layer, genomic identity-over-time as another layer and so forth (we may also, for example, speak of gender or narrative identity-over-time, though these will not be discussed here).

This concept has the benefit of allowing grades of difference. Someone or something *A* may be identical-over-time as regards certain layers and not others. *A* may also be more or less different as regards a particular layer of its identity, at time t and time t'. Assume that *A* is a person. This being the case, I hold that the different layers of identity need not be fully transparent to this individual, nor need they carry the same weight psychologically speaking to the individual at time t and time t'. Psychologically, genetic sameness as regards particular genes may be more important to the individual at certain times than other kinds of sameness. Furthermore, the concept of layer should not be understood as implying that a changed identity in a certain respect never has an effect on other layers.

The strength of the multi-layered concept of identity can be highlighted by means of an example. Assume that I encounter an old friend. At first, I don't recognise him. This may not be very surprising, since he has undergone genital surgery and hormone treatment. She is now a woman. After having had some time to talk, I get the feeling that though her life-situation has changed, though she has undergone life-changing experiences of different kinds, she is still – in certain regards – very much the same. At some layers of her identity she remains the same as she was so many years ago. Or, within a particular layer, though she is different from who she was earlier, there may be certain elements that remind me of who she was.

I consider this to be a human experience that philosophy needs to be able to explain. A multi-layered concept of identity can do this. In the multi-layered concept of identity, certain layers can be more prominent at a certain time and others at another time. I may be different at certain layers of my identity without being so different that I am no longer me.

Which Identities-Over-Time?

In the following, I will use the concept of identity when I mean identity-over-time. I will also distinguish between *qualitative* and *numerical* identity. Such is also done by Parfit (1986:201) when he suggests that qualitative identity means that two persons or objects are "exactly

alike." In order to clarify the difference between these concepts, I will also use some examples that are not genetic.

Imagine that it is possible to make a copy of a person A that is qualitatively identical with person *A*. This copy is called person *A*'. In Parfit's reasoning, though the two persons are qualitatively alike, they are not numerically identical. They are two, not one. If this distinction is applied to the medical context, two embryos can result as qualitatively alike (though with different spatial positioning, as needs also to be the case with the two persons) but numerically different. This is the case of twinning that results in two identical twin embryos. At time t there is one zygote, this zygote develops and at time t' it becomes two separate entities.

Qualitative identity can be an issue in many health-care scenarios. There is also, I suggest, a distinction to be made between *qualitative identity* and *personal identity*. Imagine that I experience a life-changing event which makes me reconsider past experiences and thoughts. This can result in changed views in a number of areas of my life and possibly a changed life-style.[2] If it does, I am numerically the same, but qualitatively different. Imagine, also, that something happens to a person that makes her/him unable to remember past experiences, reflections and feelings. Such may be the case if someone loses her/his memory after a severe accident. If this happens, the individual in question is again numerically the same and qualitatively different; however, her or his personal identity is *also* different.

If person *A* at time t is personally identical with person *A* at time t', I suggest, this requires that s/he remembers at least some previous experiences and is able to reflect on them. If s/he cannot do so, s/he has lost her or his previous personal identity (at least temporarily, until s/he regains memory). If this reasoning is accepted, a change in qualitative identity need not, but may, imply a change in personal identity.

Futhermore, *genomic identity* needs to be distinguished from *genetic identity*. In order for someone *A* to be *genomically* identical, the total genetic information in her or his cells needs to be the same at time t and time t'. The total genetic information in human cells comprises both the complex nuclear genome and the simple mitochondrial genome. If *A* is *genetically* identical, *A* is the same as regards a certain gene or certain genes (and not necessarily the whole genome) at time t and t'.

Most persons have a unique genome. Exceptions include the case with identical twins. Furthermore, two genes are "identical-by-descent" on a particular locus when these two genes are inherited from a single common ancestor, without new mutations (Gagnon *et al* 2005:1). Such can be the case with siblings. Whereas parents and children share exactly half of the genes on autosomal loci, two siblings share this proportion only on average. On a particular locus, they may share both alleles, if each parent transmitted the same allele to both children. They may also share no alleles, if both parents transmitted different alleles. Or they may share one allele, if one parent transmitted one and the same allele to both siblings. This being the case, we can have more or fewer genes in common with our siblings.

Consider now the paternity-testing scenario. Though the quality of such testing depends on issues such as management of laboratory, personnel, technical performance, reporting and quality systems, it has been stated that it is now possible to obtain "very

high weights of evidence" if multiple polymorphic, genetic systems are being investigated (Morling 2003:1; Morling *et al* 2003). While methods for paternity testing vary, the basic idea is to establish whether certain of the child's DNA sequences are identical to those of the alleged father. This is a special case of identity-over-time. In the ordinary case, the issue is whether *A* is the same at time t and t'. In the case of paternity-testing, the issue is rather whether a particular DNA sequence z is identical-over-time in person *A* and person *B*. The focus on whether there is an unbroken line, through time, is the reason I consider this to qualify as a very special case of identity-over-time, though we do compare a particular DNA sequence in two different persons. Furthermore, and this is important, at stake here is *not* whether father and child are genomically identical (they are not), but whether they are genetically identical as regards certain particular DNA sequences.

Paternity tests highlight that *genetic sameness-over-time* need not imply numerical sameness-over-time. The case of the zygote that developed and became two embryos highlights that *genomic sameness-over-time* need not imply numerical sameness-over-time. Furthermore, genetic and genomic sameness are specifications of in what sense someone can be qualitatively the same.

Which Concept of Genomic Identity? The Special Case of Mutations

The view that the total genome needs to be the same at time t and time t' if someone shall be said to be genomically the same, will be labelled *exact genomic identity.* Since mutations often occur during a lifetime, exact genomic sameness at the time of birth and the time of death as regards all cells in someone's body is probably rare. This need not be a reason to reject the concept: why should genomic sameness be an ideal?

Still, some may prefer the notion of *approximate genomic identity.* According to this notion, I shall suggest, someone is genomically identical at time t and t' even if certain mutations occur, as long as most of the genes of the genome are the same at time t and t'. This notion allows the kind of genetic changes that can during under a life-time as a result of new mutations that are not a direct result of human action. Someone can be genomically identical in the approximate sense, at time t and t', even if she is not genetically the same as regards all genes.

The benefit of the exact genomic identity-over-time is that it allows a simple answer to the question of genomic identity. If my genome is changed I am genomically different. The concept of approximate genomic identity-over-time leads to more difficult issues such as how much of my genome needs to be the same for there not to be a changed genomic identity. Furthermore, if approximate genomic identity means only that *A* is genomically similar at time t and t', it could be argued that the concept becomes so vague that it becomes pointless. Even if I develop cancer, as one example, much of my genome will remain similar to what it was before this. Still, the concept has the benefit of opening up the debate concerning what kind of changes take place. In this sense, it can enable a nuanced discussion of changes and grades in changes of the genome.

Does it matter which notion of genomic identity one prefers? As will soon be shown, it matters with regard to how we understand what takes place in germ-line gene therapy. First,

however, it should be noted that the case of mutations is a different scenario from the often-discussed scenario of the ship of Theseus. This ship is gradually repaired by replacement of parts, until no original part remains. As the discussion goes, the removed parts are retained. A ship is then built, with all the retained parts in their original places. Is this now the original ship – or is it the other ship? The question may fool us into believing that sameness always means originality. This need not be the case: it depends on how we understand sameness. If something/someone *X* consists of parts, it is not true – in general – that "*same X* implies *X consisting of the same parts*" (Williams 1990:168). I can be genomically the same even if cells die and new cells replace the old ones.

Another distinction may also be useful: the distinction between *functional* and *sequential genomic identity-over-time*. Functional genomic identity-over-time is present also when the exact genomic identity is changed over time by point mutations (which may have severe effects) *as long as* these mutations do *not* result in changed functions of the genome as a whole. Sequential genomic identity-over-time is present when the order of the constituents of the whole genome remains the same over time.

What Is the Impact of Genetics and Genomics on Issues of Identity?

If we use the multi-layered concept of identity, genetic and/or genomic difference may but need not matter to other layers of my identity. I may still be the same, in some other layers, though I am genomically and/or genetically different. *Neither* g*enetics nor genomics determine the whole of my identity*. Still, though the importance of genetic knowledge to identity is less than suggested by Walter Gilbert, a change in certain genes or in the genome can matter to other layers of my identity. Furthermore, if the implications of the multi-layered concept of identity are (more or less) straightforward when applied to living persons (as in the example of the meeting with a long-lost friend), the case of the identity of embryos raises special questions.

The Special Case of Embryos

Consider first the scenario of pre-implantation genetic diagnosis (hereafter referred to as PGD). PGD involves genetic testing of embryos and it allows selective transfer of embryos. It is most often performed after *in vitro* fertilisation for the purpose of identifying the presence of DNA sequences that will or might result in genetic disease. Since PGD is "only" a deliberate choice of which embryo – if any – with what kind of genome will be implanted out of a number of alternatives soon to exist, genetic and genomic identity-over-time is quite easy to apply. The genome of embryo *A* selected for implantation, before implantation, is *the same* as that of embryo *A* if it is implanted. No changes in the genome take place; each embryo is numerically, qualitatively, genomically (also in the exact sense) and genetically the same in terms of identity-over-time.

Consider also the scenario of germ-line gene therapy (hereafter referred to as GLGT). GLGT has been discussed as a means of treating certain mitochondrial diseases, i.e. diseases due to DNA sequence deviations in genes in the mitochondrial DNA sequences, *in an egg cell*. The idea is to exchange the cytoplasm, so that the cell nucleus of one egg cell is transferred into an egg cell of another woman (whose

cytoplasm contains no deviant mitochondrial DNA sequences) from which the cell nucleus has been removed.[3] The egg is then fertilised and implanted into a certain woman's uterus. This is the first scenario. In the second scenario, GLGT takes place at a later point in time, at the stage of the fertilised egg/the embryo. GLGT is then, possibly, used in order to insert certain missing genes in the embryo. After insertion the embryo is implanted. It should be noted that the first scenario is the one that is considered the more likely, from a medical point of view.

If medically possible, what identity-changing consequences would GLGT have? The answer to this question depends on how GLGT is performed, on which of the rival genomic identity conceptions one prefers and on what importance one attaches to genomic sameness in the embryo's multi-dimensional identity.

In the first scenario, GLGT takes place before there is an embryo. If the genome of the embryo before implantation is compared with that of the embryo after implantation, there are no changes in the embryo's genome that matter to identity-over-time. The embryo is genetically as well as genomically the same, in the exact as well as approximate sense. This is, instead, a question of the material origin of the different germ cells that form the embryo; and in this regard, this scenario resembles that of PGD.

In the second scenario, GLGT takes place on an embryo. Certain genes of the embryo, at time t before GLGT and at time t' after GLGT, are changed. The embryo is genetically different-over-time. In order to decide whether the embryo is genomically the same as regards identity-over-time, it matters what view of genomic identity-over-time we have.

According to the exact genomic identity view, identity-changing consequences are present if GLGT implies a change in the embryo's genome. Since GLGT does implies such a change, after it has been performed the embryo is as regards its genomic identity-over-time a different embryo. It is also a genetically different embryo as regards certain genes.

Then, we need to ask whether these changes are so profound that the embryo has become *another* embryo. If we apply the multi-layered concept of identity to this scenario, we need to ask which the other layers of identity are, whether they have changed as well, and what sameness is required if the embryo is to be understood as the same in the multi-layered sense.

The embryo has no personal identity in the sense described earlier on. It has at most a potential, future personal identity (and while the future parents may tell stories of the embryo and its possible future as a child and they may create identifying descriptions of the embryo, it has no narrative identity in the sense that it tells stories itself).

Possibly, the embryo has fewer layers of identity than has a living person and – if so – this may be a reason why genetic information is afforded so much consideration in embryo discussions. *If* embryos have fewer layers of identity than living persons have, then fewer layers may need to be changed in order for the embryo to become another embryo.

This matters for the ethical questions involved in GLGT. After GLGT, the embryo is genomically different in the exact sense and it is genetically different as regards certain genes. It is genetically the same, however, as regards some other genes and it is

numerically identical. Do the numeric and the genetic sameness as regards certain genes imply that the embryo remains the same? Or are the genomic and genetic changes so profound that the embryo is no longer the same embryo? In the latter case, GLGT would not qualify as treatment of one and the same embryo. It can be seen as a selection between embryos, in the same sense as is PGD; the embryo that resulted after GLGT cannot be harmed by being implanted. If it had not been implanted, another embryo (the embryo before GLGT) would have been implanted. Had this other embryo developed into a child, this child might have had worse or better health but it would have been a different child.

However, if one holds an approximate genomic identity view and if one considers that the changes that take place in the genome because of exchange of the cytoplasm are not enough to change the embryo's genomic identity in the approximate sense – though it is genetically different as regards certain genes – then the embryo would be numerically, genomically and genetically the same as regards certain other genes. Is this enough for the embryo to remain the same? What importance shall be given to genomic sameness? Possibly, it could be held that GLGT does qualify as treatment of embryos if one harbours the approximate notion of genomic identity. If so, the future child born *can* be morally wronged when GLGT is performed; the child can also benefit from the treatment.

The heart of the matter is whether my whole multi-layered identity is changed to the extent that "I" no longer exist in the sense that "I" have become a different person.

It should also be noted that in the scenario of PGD, a comparison is often made between embryo *A* and embryo *B*. One egg and sperm has formed embryo *A*, another egg and sperm has formed embryo *B*. When we compare embryos with each other, *identity-over-time is not an issue*. What is at stake in a comparison is the difference between two entities. In the case of embryos, what matters is their material origin: this is the heart of the matter for *identity-over-possible-worlds.*[4]

Assume that the resulting child, after the use of PGD, asks whether she could have been different, had another embryo been implanted. It has been claimed that she would not be different since she would not have existed. Another child would have existed (Munthe 1999). It has also been held that this question has no answer (Parfit 1986:352). Here, we need to ask why the child that results from embryo *A* is assumed to be a different child than the child that results from embryo *B*. One way to argue would be to claim that embryos *A* and *B* are genomically, genetically (as regards certain genes) and numerically different when compared with *each other* and that these differences are so profound and important that we cannot do otherwise than speak of different embryos.

This second scenario in which GLGT takes place on an embryo can also be further discussed related to the distinction functional and sequential genomic identity-over-time. Assume that GLGT takes place on an embryo through replacement of mitochondrial DNA, for the sake of avoiding a certain disease. This could have effects on the functionality of the embryo's genome rather than on its sequence. Therefore, the embryo could be the same as regards sequential genomic identity-over-time, but not as regards functional genomic identity-over-time. Still, and as stated above, the heart of the matter in

the present discussion is whether the whole multi-layered identity is changed to the extent that the embryo has become a different embryo.

Conclusions

Knowledge of the fact that my genes were changed, when "I" was only an embryo, can matter to my understanding of who I am. I am someone whose genome has been modified, I am someone whose genome has been changed so that I will not develop a certain disease; whatever my evaluation of the event is, it can matter for my self-understanding as a human being – and for at least certain aspects of my identity. However, the multi-layered concept of identity makes it less evident that genetics and/or genomics matter for the whole of my identity. There are many layers involved in this identity; some of them matter more to me at a certain time than others. This is not a problem. It is a strength: a multi-layered concept of identity is flexible. Furthermore, distinguishing between different concepts of identity – and particularly between two rival concepts of genomic identity – matters for our understanding of what takes place when new medical technologies such as PGD and GLGT are used.

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Notes

[1] I use PGD and not prenatal diagnosis and selective termination of pregnancy as an example, since PGD better clarifies that one chooses between the implantation of an embryo with a particular genome into a certain woman's uterus or the implantation of another embryo with another genome. In prenatal diagnosis and selective termination of pregnancy, the choice is instead a choice of whether to continue the pregnancy and give birth to a child with a particular genome rather than no child at all.

[2] If I ask myself "Would I have been different if this had not happened?", what is at stake is identity-over-possible-worlds. For an interesting discussion of genetic interventions and personal identity, see Chadwick 1998.

[3] This scenario is often called somatic cell nucleus transfer. Transplanting the cell nucleus from an aged woman's oocyte into a younger woman's oocyte has also been proposed as a way to reduce the incidence of oocyte aneuploidy, i.e. one or more extra or missing chromosomes in the immature egg cell (Takeushi *et al* 2001, Hansson and Wahlström 2003).

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