THE 'NEW MEMORY-CRITERIA' OF IDENTITY

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Abstract: Opponents of germline intervention often argue that fundamental ideas of human identity are under threat. This paper argues that the fundamental ideas of human identity are not under threat because of germline intervention. This paper presents the idea of 'genetic-continuity' as a new form of human identity which is retained through the consistency of the individual's genome and argues that this new idea of identity is not sufficient to explain the human experience and that human identity is not determined by genes. As such, this paper concludes that germline intervention does not harm the fundamental ideas of human identity.

Opponents to germline intervention (GI) often argue that fundamental concepts of human identity are under threat through interventions into the genome, claiming that those edited will be 'inauthentic' or will lose their 'origins'. I argue that our fundamental concepts of identity need to be updated and in turn this refutes the claim that GI causes the decline in human identity.

The fundamental concepts of identity can be understood through two competing theories: the physical-criteria and the criteria of psychological-continuity. Both have a genetic component, but the genes do not define 'identity'. Identity is attained through our actions, thus is based on psychological-continuity. I do not believe there is much need in discussing the benefits and limitations of GI here, but I will show that the physical-criteria is a weaker construction of identity, and with it so is constructing identity on the grounds of genetic continuants. As such, the claim that identity will 'decline' because of GI is false. I will conclude this by arguing that the criteria of psychological-continuity has a stronger claim to identity regardless of the genetic basis of the individual.

That said, I also argue that the criteria of psychological-continuity needs to be updated and I will propose 'the new memory-criteria' to include modern understandings of the brain and through the influence of neurosciences to show that our identity is imprinted through our experience and action and these make significant changes to our epigenome and neural networks. Ultimately, we are in control of ourselves on top of our genes. As such, I refute claims of genetic determinism that suggest we *are* our genes and thus claim that identity is *not,* to a fair degree, affected by limited GI.

Firstly, I will outline the terminologies used in this paper. Secondly, I will outline the 'new memory-criteria', both its genesis through psychological-continuity and its differences to the physical-criteria and argue that psychological-continuity is the best candidate to be the continuant of human identity. Lastly, I shall introduce *the Alexa Problem* where a human and machine both have the same genes and comparable brain to expose the weaknesses and strengths of the competing criteria of identity for comparison.

TERMINOLOGIES

I will adopt some specific terms in the paper, for expediency I shall explain the meanings to attach to these here.

Identity theories: Theories of identity relate to how the 'same person' remains this 'same person' over time and by what continuants. The common interpretations are the physical-criteria and the criteria of psychological-continuity. The physical-criteria suggests that the person will have the same body or brain at $t2$ as at $t1$. Whereas, psychological-continuity suggests that P2 at $t2$ is the same person as P1 at $t1$ *if and only if* P2 at $t2$ is psychologically continuous with P1 at $t1$. I will also propose, and reject, the interpretation of 'genetic-continuity' that argues P2 at $t2$ is the same person as P1 at $t1$ *if and only if* P2 at $t2$ is has the same genes as P1 at $t1$.

Identity and identification: As I will argue, my concern with the construction of the physical-criteria is that it outlines the necessary circumstances for identi*fication* but falls short on describing ident*ity* as it removes any semblance of personal control or growth for that individual to develop *their* identity.

The physical-criteria focuses on the retention of physical features. I believe that these only describe how one individual recognises another and that this is 'identification'. Our identification is retained in the physical-criteria through 'enough' of the body or brain being continuous through time. However, the body and brain are treated as objects solely based on being physical organs and not what they do. For example, Gorbachev's identity is only as a man with a distinctive birthmark.

Whereas identity should be how we explain ourselves, our tastes, and our aspirations and these relate to actual changes in our lives. I argue in favour of psychological-continuity and argue that we develop through living and the necessary experiences we attain, and this describes who we are. And I also argue that this is less likely to be changed through genetic intervention as we build on top of our genes but our experiences imprint on us our 'being'.

Genes and the Genome: The genome has 23,000-34,000 genes and is the entire DNA sequence. A gene is the basic unit of biological information and is a specific segment of DNA in a chromosome and encodes a particular protein which may regulate traits.[1] It seems intuitive to imagine the genome like a rulebook, the reality is more complex and a gene by itself can only suggest what a person might be like.[2] The phenotype is the observable form of a trait that an individual expresses (also referred to as dispositions). But relying on genetics to explain *who* we are could be problematic. For example, 98% of the genome is 'junk DNA', such as non-coding RNA which influence cell connections in the brain which are intrinsic to our neural networks.[3]

For the purposes of discussion, I will use 'gene' as a term comprising both the gene and the phenotype as the objections to GI do not make this distinction, but identity would likely seek to retain the continuation of the phenotype as the genome.

Genetic determinism: is the idea that we are, at least at its extremes, totally a result of our genes. This can stretch to the claim that our fundamental idea of identity is either heavily genetically influenced or provided by the genes. The genetic-continuity theory of identity is reflected in genetic determinism. It is a rejection of genetic determinism, as well as an adherence to the values of gene expression that I will now turn with the 'new memory-criteria'.

THE 'NEW MEMORY-CRITERIA'

The 'new memory-criteria' enlarges the fundamental continuants of psychological-continuity, Locke's memory-criteria, by incorporating the imprints of experience on cell memory and the neural networks and the effects on their genetic expression caused by environmental experiences as necessary features of retaining one's identity. As such, one does not have to rely solely on their memory for the continuants as a natural 'digital signature' will imprint onto the individual as a necessary consequence of being that individual, no matter the genes.

The genesis: psychological-continuity

[1] Ostensibly, the gene encodes the information to build a protein that allows a function to regulate a gene

[2] 'Heritability describes *what is* in a particular population at a particular time rather than *what could be*'. Robert Plomin et.al., *Behavioural Genetics* (NY: Worth, 2001) p.89.

[3] Nessa Carey, *Junk DNA: A Journey Through the Dark Matter of the Genome* (London: Icon, 2015) p.110.

Psychological-continuity argues that our identity is formed on the persistence of experiential contents through life and experience.[4] In agreement, I argue that identity is not held by the retention of the same genome but on how a person builds their own life from what they are provided. They achieve this through developing psychological continuants that are a necessary aspect of living.
But firstly, we shall turn to Locke:

> *'Let's suppose the mind to be, as we say, white paper void of all characters, without any ideas. How comes it to be furnished?...To this I answer in one word, from experience!'*[5]

Locke argued the individual is a 'thinking intelligent being that has reason and reflection and can consider itself as itself, the same thinking thing in different times and places' whose identity is drawn from the consciousness.[6] The continuants for identity are developed through our 'sensibly continuous'[7] memories and experiences. Locke's memory-criteria operates in bursts, such as the retired judge who remembers being a trial lawyer in their 40's, a paralegal in their 30's and a student in their 20's. But memory is not the end of the story for Locke, there is also his implication that we require rationality and reason for identity.

And indeed, we do want to be rational, but this is not how identity is formed. With the help of modern neuroscience, we need not take Locke's view literally or rely on rationality to make sense of memories for our identity. In lieu of an extensive interpretation of consciousness, I will use the model that consciousness uses the muscle of the brain and its neural networks to process our consciousness.[8] The impacts of 'experience' needs to be fleshed out further so a 'new memory-criteria' can be forged by looking at the other effects' memory has on each individual. I shall defend psychological-continuity against physical-criteria next before moving to an elaboration of the 'new memory-criteria'.

In my defence of psychological-continuity I accept that a body is the product of our genes and that we use *a* body to be identified, but we enter and experience the world and those experiences shape our identity. Genes are important, but they do not necessarily guide us into the experiences that develop our identity. The physical-criteria is not responsive to experience as experience has no bearing on the continuation of a physical presence. Thus, the body only explains 'identification' as it requires 'enough' or the 'same' body to survive from $t1$ to $t2$. Indeed, this raises pertinent questions regarding what the 'same' body is and what is 'enough' of a body, and indeed, why should this matter to one's identity.

In the case of the 'same body' we would feel repugnant if we claimed a person is now a different person because a virus or attack changed their appearance. And indeed, unless something makes the body animated that 'same body' loses all meaning as it is just an object. Indeed, a dead body can be mimicked to appear alive though electric impulses and breathing apparatus, but the continuation of that 'same body' is not the same anymore *only* because it is not animated and *not* because the physical features are the different (as they are not, until decomposition). As such, the only guiding criteria appears to be that the body must be 'living'.[9]

But without the brain stem driving our autonomous or conscious operation the body is as good as being 'alive' by machinery. The body is not continuous because there is nothing compelling it into action and I argue that it is the brain stem taking instruction from our neural networks, where our consciousness manifests, that animates the body. Changes to the body do not matter against the ability

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[4] Thomas Nagel, *The View from Nowhere.* (Oxford: OUP, 1986) p.40.
[5] John Locke, *An Essay Concerning Human Understanding* (Cambridge: Hackett, 1996 [1690]) p.224.
[6] Locke, p.221.
[7] Francis Crick, *The Astonishing Hypothesis* (NY: Scribner, 1994) p.14.
[8] The brain is likely the basis of consciousness and can run even in stages of unconsciousness, it stores our language, memories, and from these functions to process our judgements, and possibly, our choices. Robert Plomin, *Genetics and Experience* (California: Sage, 1994).
[9] Wiggins argued 'bodily continuity is not enough without life'. David Wiggins, *Sameness and Substance* (Oxford: Basil Blackwell, 1980) p.162.

to animate that body, which is through the brain stem and when the brain stem no longer functions the body can no longer be naturally animated. Indeed, we are not close to understanding identity, as *who* we are. Thus, we care more about what give action to the same body than the same body itself, which is a psychological-continuant.

The material view of the physical-criteria stands in contrast to psychological-continuity because the physical-criteria does not touch on what makes the body operate. However, the construction of 'enough' as the continuant of the physical-criteria owes more to the psychological and my interpretation of consciousness as a manifest of our neural networks because the effect on the person becomes central. To better understand this difference, I will look at how the brain is understood in each theory.

The brain-criteria as part of the physical-criteria, where 'enough' of the brain must survive to *t*2, to the brain as a centre of our consciousness in psychological-continuity. A clarification of the brain, as a term, is also necessary. The conscious action that animates the body is a result of our consciousness through our neural networks, as such the brain under the 'new memory-criteria' is an expansive idea, not only the object itself. Whereas, in the physical-criteria the brain is an organ, a physical object, of which if enough is retained over time it is continuous for that individual's identity. However, the brain-criteria has several problems, specifically what is 'enough' of the brain, and why are the important functions of the brain an afterthought?

The brain-criteria requires, as part of the physical-criteria, 'enough' of the brain has to survive at *t*2 from the 'same' person.[10] This description can be described through the infamous story of Phineas Gage who was struck through the left frontal lobe with a tamping iron, survived, and sparked modern neuroscience. The frontal lobes affect temperament and the injury affected how his brain manages emotions and information.[11] Gage lived, and the object of his body was retained for his continuity, but the question is what of his brain? Is it the case that a certain percentage of the brain must be destroyed to not be 'enough', or is it based on the specific part of the brain, and should the same should be applied to genes?

This can be understood genetically if 'enough' *only* regards the amount of the brain. The brain has more long non-coding RNA expressed than any other part of the body and these influence how the cells in the brain form connections with each other and it is speculated that they are responsible for our complex cognitive functions, but this refers more to what the brain does than just the physical object.[12] Together, the understanding of the body and the brain under the auspices of the physical-criteria are similar to the claims of genetic-continuity and the repugnant idea that an individual loses their identity if they do not retain 'enough' of the brain or the body (and that they stay alive) is similar to a restrictive view of human genetics – that of genetic determinism.

Opposition to GI on grounds that it will fundamentally change human identity largely reflects genetic determinism because if changing a gene changes the person then our identity is intrinsically linked to the genes. This may take many guises, but I shall focus on the idea of the President's Council on Bioethics, under Bush Jr., that GI creates 'inauthentic people' where 'new biotechnological powers promise (or threaten) to transform what it means to be an individual'.[13] Equally, Habermas laments 'genetically manipulated dispositions' which effects 'the ethical self-understanding of humanity as a whole'.[14] Fukuyama agrees, arguing that our human functions are our 'genetic endowment', which, if lost, will 'disrupt…the continuity of human nature'.[15]

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[10] Harold. W. Noonan, *Personal Identity* (London: Routledge, 2003) p.6.

[11] The frontal lobes are significant in guiding our behaviour, planning, strategy, intention, long term control and scheduling, and motivation. Patricia. S. Churchland, *Braintrust: what neuroscience tells us about morality* (Princeton: Princeton University Press, 2011) p.119.

[12] Carey, (2015) p.110.

[13] President's Council on Bioethics. *Beyond Therapy.* Washington, D.C., 2003) p.300.

[14] Jurgen Habermas, *The Future of Human Nature* (London: Polity, 2003) p.14-15.

[15] Francis Fukuyama, *Our Posthuman Future: Consequences of the Biotechnology Revolution* (New York: Farrar, Straus and Giroux 2002) p.172.

Lewontin, at his 1990 Massey lecture, argued that modern genetics overestimates how far an individual is genetically determined.[16] And whilst we are *a* result of our genes as dominant genes were passed from each parent and these make up part of the genome. The deterministic argument that 'we *are* our genes', which is that we are heavily guided solely by genes, is more problematic, both on our ability to develop ourselves and our understanding of identity as opposed to identification.[17]

Genetic determinism cuts both ways, the fear of it stops GI and the obsession of it promotes GI, but in both cases the implication is that we *are* our genes. The problem is, in this context, that it would hold an individual to strict identification standards *as if* these standards are their identity. In the case of the Judge referred to earlier, he is the same as it is the same body built from specific genes. But the expression of these genes is developed through his life and action and guided by his aspirations (which is why he became a judge). In that time, and between those experiences, cell memories are formed which condition his being as his own and draws a narrative between the paralegal and the judge in a more profound way than just the body.

The views of the President's council, Habermas, and Fukuyama suggest a sanctification of the genome as an entity that must remain untouched or the individual is in some way harmed or their nature is 'lost'. For the purposes of discussion this could stretch to an argument that human identity could be fundamentally breached by the change of a single gene, whichever it is. The implication, and one refuted by psychological-continuity, is that we are pre-determined and may not be able to develop ourselves in our own way should our genome, or genes, be touched. But like the brain focusing on the composition, and not what it does, genetic determinism regards the retention of 'enough' of the genes and not what they do. As such it misses the bigger, and more important, issue of gene expression.

The retention of the genome means little against the value of the expressive qualities of the genes, and we have more influence over the expressive qualities of the genes than we have over the genome (where we have no control over the composition of the genome).[18] If changing a gene changes the construction of the genome and the individual's identity is changed or lost then there is little road for GI, even for a necessary intervention.

Identity is better understood by the functions within the body and how they help the individual develop themselves *as* themselves. This is important for both the proponents and opponents of GI in terms of identity as this provides the landscape to understand the impact of which genes are being changed on the individual, and how they effect the individual. For example, if a genetic edit implants memory from a computer into the person then we can argue they have a 'pre-loaded' identity, but if the edit does not stop the person from attaining the capabilities where they can receive experiences, then there is no claim against GI on the grounds of identity.[19] A person develops their identity through their psychological continuants and this causes changes in genetic expression. It is unlikely that a genetic change can cause an individual to lose the ability to experience, develop cell memory or develop genetic expressions, nor is it likely to cause large-scale damage to these psychological continuants that the person loses identity and the ability to attain their identity, as I will suggest through the 'new memory-criteria'.

'New memory-criteria'

In line with my defence of psychological-continuity and the use of cell memory to update the continuants, Plomin argues that Gene expression depends 'inextricably' on environment to influence

[16] Lewontin retorted: 'They say that when we know the sequence of the molecule that makes up all our genes, we will know what it is to be human'. In Richard Lewontin, *Biology as Ideology: The Doctrine of DNA* (Ontario: House of Anansi Press, 1991) p.18.

[17] As the claim 'we *are* our genes' would hold, technically, for identification as hox genes develop what we will look like and our general features.

[18] If it is changed in composition it will be by other people, such as by the permission of the parents.

[19] That does not rule out other objections.

the necessary traits and capacities.[20] Lewontin supports this claim, stating 'genes affect how sensitive one is to environment, and environment affects how relevant one's genetic differences may be'.[21] Thus it is intuitive to focus on expression as the only fair way to discuss GI and the effects on identity.[22] Another consideration needs to be made, which is the effect of the environment on lasting changes to the epigenome.

A form of expression, epigenetics, suggests that when an organism encounters an environment, this environment marks a behavioural change, and importantly, this behavioural change modulates gene expression.[23] As Ward explains, '*Epigenetics* is the study of heritable gene functions *that are passed on* from one reproducing cell to another…which does not involve a change to the original DNA *sequence*'.[24]

It was previously thought that when a cell divides the cell memory is wiped clean. It now appears that the cell is replicated and produces daughter cells with the same epigenetic message[25] which can direct gene expression and even remain in longer lasting cells like neurons. And the epigenome is our original genetic code with 'markings added by events in life'[26] and 'when the epigenome is changed, so too is the evolutionary 'trajectory' of the organism experiencing the profound environmental changes during its life.'[27]

The value of epigenetics regards how expression is modulated by what we do and what we expose ourselves to. Gene expression reacts to DNA methylation, which turns genes off, and histone acetylation, which turns genes on.[28] Although, this is not a simple on/off switch. Epigenetics modulate the variation of expression like a soundboard where the output can be set between +10 and -10.[29]

As such, the argument that we *are* our genes is also challenged by the effect of epigenetics and the claim diverts attention away from the important gene expression to just the gene itself. Identity is largely a philosophical discussion and genes are not good carriers of philosophical information to base our understanding of identity on. It must be held that identity is *not,* to a fair degree, affected by limited GI. The value of epigenetics, in the context of identity and the concern that editing changes human identity, suggests that we are not strictly genetically pre-determined, but that we are different phenotypically during life than we were at the start of life.[30] Genes provide the necessary grounds for us to develop from, including the development of a body, but these require other influences to

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[20] The usual interpretation refers to how much a genetic trait refers to the extent the differences of a trait in a population can be shown to be accountable by a genetic difference among individuals. Plomin et.al., p.85.

[21] Lewontin, p.30.

[22] Partially because there will be changed caused by aging, virus, and environment. Alan Colman, 'Why human cloning should not be attempted', in *The Genetic Revolution and Human Rights,* ed. By Justine Burley (Oxford: OUP, 1999) p.16; Hans Bjonsson, Martin Sigurdsson, M. Daniele Fallin, 'Intra-individual change over time in DNA methylation with familial clustering', *JAMA,* 299(24) (2008), 2877-2883.

[23] Peter Ward, *Lamarck's Revenge: How Epigenetics is Revolutionising our Understanding of Evolution's Past and Present* (London: Bloomsbury, 2018) p.72.

[24] Ward, p.62.

[25] Tim Spector, *Identically Different: Why you* can *change your genes* (New York: George Weidenfeld and Nicholson, 2012) p.222.

[26] Ward, p.79; Alexis Willett and Jennifer Barnett, *How Much Brain Do We Really Need?* (London: Robinson, 2017) p.43.

[27] Ward, p.83.

[28] The methylated gene, the result of epigenetic modification, is present in the sperm or the egg of the child and passed on when they reproduce. Carey, (2015) p.128.

[29] Histone modifications allow the cells to 'try out' patterns of gene expression. Nessa Carey, *The Epigenetics Revolution* (London: Icon, 2012) pp.68-73.

[30] A 'trajectory' of life as pre-set is problematic, but there are grounds to make these assumptions in science. The CoRest protein in Floridan carpenter ants is a molecular switch moved by environment which changes the ants that were 'fated to be soldiers' to be reprogrammed as a forager. Jake Buehler, 'Flipping a molecular switch can turn warrior ants into foragers', *ScienceNews,* 12th November 2019, <https://www.sciencenews.org/article/flipping-molecular-switch-can-turn-warrior-ants-into-foragers?utm_source=Editors_Picks&utm_medium=email&utm_campaign=editorspicks111719>

perform,[31] and in doing so necessarily develop experiences and expressions on that individual, as I will argue the 'new memory-criteria' allows.

The focus is with the workings of the brain, and not the brain as just an organ. With regards gene expression, the brain is still being understood. As highlighted earlier the brain has more long non-coding RNA being expressed than any other tissue. This helps our cognitive functions and I believe reduces any deterministic claim that identity is 'pre-loaded' in the brain because of our genes. Indeed, the organ of the brain still needs to exist and be retained, but the psychological continuants are drawn from what it does, and what is done to it, specifically the imprinting of a digital signature through our experiences.

Damasio, completing his research on Gage's accident, concluded that reason does not remain purely in the brain and that there is a separation between reason and emotion, which is important to reduce the assertion of the necessity of rationality for identity.[32] The story of Gage is less about 'enough' and more about 'what' the brain does. After the accident, Gage's acquaintances said that he was 'no longer Gage'[33] as he went from happy and alert to grumpy and bothersome, but he led a productive life for many years after.[34] However, he retained his logic and his aptitude to enter new experiences and these are important factors to construct a link from who he was to who he is.[35] Indeed, the percentage of damage in another area would have killed him which suggests we care about what manifests from the brain, rather than just 'enough' of the brain. In Gage's case he cannot necessarily remember being the Gage who applied for that job or the Gage that got a promotion, but the living effects of these changes were shown psychologically and through his cell memory. Gage was still able to experience the world and add to his already established cell-memory and epigenetic cues.

The 'new memory-criteria' is not hinged on the person displaying rationality as Locke suggests because the psychological imprinting and related expressions are automatic on the person, and thus I separate with Locke. Through influences from neuroscience, the 'new memory-criteria' can be developed on the effects on the neurons from an experience and the resulting epigenetic or neurological imprinting. Sigman argues that this is our 'digital signature' where the experience or event makes an imprint that 'is profoundly linked to consciousness',[36] and yet, Sigman also asserts that consciousness is developed in the unconscious as that is where most mental activity takes place. As such, there are resultant 'unconscious sparks' inherited by the conscious mind to 'take charge' of these sparks.[37] As such, we can remember, but we can also add cell-memory and gene expression for the physical and mental effect of an experience.

This imprinting is natural after exposure to an environment and is tied to our consciousness. My objection to Locke's memory-criteria was that the individual should not have to rationally make sense of their memories to justify their identity, considering potential mental tricks like fusion or confabulation.[38] And as stated earlier, it is a goal of all people to be rational, display independent thought, and be autonomous, but if genes react to the environment, just being alive is enough to develop an identity through psychological-continuants through the 'new memory-criteria'. There are

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[31] Robert Plomin et.al., *Behavioural Genetics* (NY: Worth, 2001) p.85.

[32] Cecil Anthony John Coady, 'Reason, Emotion, and Morality: Some Cautions for the Enhancement Project', in *The Ethics of Human Enhancement*, eds., by Steve Clarke, Julian Savulescu, C.A.J. Coady, Alberto Giubilini, Sagar Sanyal (Oxford: OUP, 2016) pp.30-31.

[33] Robert Whitaker, *Mad in America: Bad Science, Bad Medicine, and the Enduring Mistreatment of the Mentally Ill.* (New York: Basic Books, 2010) p.108.

[34] Willett and Barnett, p.136.

[35] Coady, p.30; Willett and Barnett, p.135-136.

[36] Mariano Sigman, *The Secret Life of the Mind: How Your Brain Thinks, Feels, and Decides* (London: Little, Brown and Company, 2017) p.111.

[37] Sigman, pp.98-99.

[38] Fusion is where many memories merge. Confabulation is where a person refers to one of their 'memories' wrongly. Kathryn Schulz, *Being Wrong: Adventures in the Margin of Error* (New York: Harper Collins, 2009).

two foundations for this, firstly, the effect of genetic expression and epigenetics, as discussed above. Secondly, the necessary impact of psychological imprinting onto an individual.

Consciousness may not be the 'genuine author' of our actions, but it may be what we do that modifies our 'digital signature' to explain how we develop an identity.[39] This is likely true. But the question is whether the consciousness reacts to our actions, which it likely does, and what impact this has on developing the long trajectory of our human identity? Adopting the 'digital signature' reduces the need to focus strictly on rationality as the memory-criteria suggests and recognise just be being a 'being' one will have genetic expression and epigenetic imprints as a necessity of being a member of a community. This does not refute that we do remember along with the recognised the epigenic effect of memory,[40] and that we add to our 'digital signature' through the imprints from our experiences on top of what we remember regardless of whether we actually can pull up the memory itself. The resultant 'imprinting' is necessary for genetic expression and how we have some control on what we do with our genetic endowment, whatever it is. And indeed, the memory process is a biological function which uses the hippocampus to determine what we remember and the cortex for long-term storage of memories and both cause changes in DNA methylation.[41] Indeed, due to the options between memory recall, expression, and cell-memory, the damage to the hippocampus, although terrible, would not necessitate identity loss as *that* individual.

The DNA methylation that would occur in a person's life, and the subsequent imprints, would be different if the person were able to exist in two places simultaneously. The genes would be exposed to new environments, challenges, and stresses and these cause necessary changes to gene expression. Thus, our interest is the expression, not the gene itself. The core character of the split person may have similarities of which we could compare, which may have a genetic basis, but what the individual does with the characteristic is largely controlled by him and would likely manifest differently in the two scenarios. The 'new memory-criteria', by accommodating both the Lockean connections of actual memories and the genetic expression that are caused by the imprints on our psyche, would explain the differences. We are interested in the event happening and the concurring expression, which is part of the memorisation, only expanded through neuroscience.

In sum, the 'new memory-criteria' suggests that a conscious living entity, like a human, necessarily develops an identity because of its experiences. Focusing on 'actual' memory, and that the person is rational, should not be what beholds the individual to their psychological-continuity. In the 'new memory-criteria' I suggest that 'actual' memory recall is not as important as the person actually experiencing something (yet, memory recall is a useful ability as well as the related ability for reason to make sense of memories, but the 'imprinting' of an experience to the expression of the genes does not require a rational person or that they actively remember the event to cause the gene expression). I will now turn to a puzzle to expose the weaknesses of grounding identity in physical or genetic continuants by exposing an individual to competition to their identity and how that individual can retain his identity against other challenges as the individual owns their psychological continuants.

The Alexa Problem

[39] Sigman, pp.98-99.

[40] The recollection of memory has an epigenetic root. A 2020 MIT study encoded memories in engram cells, which are cells in the hippocampus and are considered neurons that are activated when an individual experiences something, is controlled by large-scale remodelling of the proteins ad DNA that make the cells' chromatin. An epigenic mechanism was discovered that recalls memories through the engram cells which develop when a new experience occurs and are reactivated when the memory is recalled. The experiment showed that right after a memory is formed, many regions of DNA underwent chromatin modifications. The chromatin became looser which allowed the DNA to become more accessible and nearly all of these regions were in stretches of DNA where no genes are found, but that contain noncoding sequences called enhancers that interact with genes to help turn them on. Susumu Tonegawa, Mark. D. Morrissey, Takashi Kitamura, 'The role of engram cells in the systems consolidation of memory', *Nature Reviews Neuroscience,* 19, (2018) pp.485-498.

[41] Carey, (2012) p.256. Spector adds that experiments have shown that painful memories can be erased in rats by using chemicals that block methylation. Spector, p.70.

The *Alexa problem* sees a physicist provide his full and unchanged genome to an inert machine. The aim is to refute the sole use of genetic continuants as a basis of human identity by isolating the genome to strip away all other identity factors. The foundation of the problem is thus:

> A1: A physicist is hopeful of a Nobel prize and decides he will reach his goals quicker if there were two of him. He makes a complete copy of his genome and his brain. He loads the genome and attaches his actual brain into an *Alexa*. The physicist installs a silicon copy of his brain into his skull. The silicon copy is not 'scrubbed clean' and replicates exactly the functions and neuronal behaviour of his actual muscle of the brain. Thus, we have a biological body without a biological brain and a non-biological presence with a biological brain and both have the same genes.

Alexa has a claim to the physicist's identity on the basis that it has an original genome that existed in *t*1 (the birth of the physicist) and continues to the day to *t*2 and now the *Alexa* has the same genome as the physicist. As such, there is multiple occupancy of the physicist's identity based on genetic continuants of identity because the same genes 'live' in two entities and we cannot justify branching identity, nor to say a physical human should lose out to a machine. And so, we move the puzzle on a step:

> A2: The physicist gets sick and undergoes genetic therapy which keeps him within normal parameters for health and capabilities, and defective genes are removed.

Alexa now has the genome as it was at *t*1 and the brain as it was at *t*1, which, under genetic-continuity and the physical-criteria suggests that the *Alexa* has a claim to the physicist's identity based on the genome (which develops the body) and the brain. I will now look at the puzzle against the two established criteria of identity, the physical and the psychological, and then draw on why genetics are a poor form for grounding identity.

Alexa and the physical-criteria

As a reminder, the physical-criteria argues that the person will have the same body or brain at *t*2 as at *t*1. Whereas, genetic-continuity suggests that P2 at *t*2 is the same person as P1 at *t*1 *if* P2 at *t*2 is has the same genes as P1 at *t*1.

The need for consistency of the body or brain through a lifetime in the physical-criteria causes a confusion in the *Alexa problem* because if we are focusing only on physical presence and physical presence is only identification and not identity, then the question of whether the *Alexa* has identity should not be raised. I argue that 'identity' should not be raised through the physical-criteria or through the related criteria of genetic-continuity.

Whilst the *Alexa* does not have a body for the continuants for what is conceived of as 'identity' under the physical-criteria, it could also be argued because the *Alexa* has the building blocks of a human body (the genes), that any physical body could be reduced to, *Alexa* could make a claim for the continuation under the physical-criteria on this reductive view. This would fail as there is no fooling that the plastic body of the *Alexa* is not a human one and thus the genes have had no bearing on the body in the physical-criteria in this case. But this is only pointing to identification, where is the identity? Alternatively, the *Alexa* could make a claim to an identity, in the context of the physical-criteria, by way of having a human brain. It is conceivable to provide precedence to the brain in the physical-criteria because if an individual is brain-dead they lose the capabilities of the muscle of the brain and there is no muscle for the consciousness to direct the neural networks to act. But it is the breakdown of the consciousness that is ending the action of the body and the brain. In the case of the brain-dead, the

body can still be operated, but the organ has no power, thus we are referring again not to enough, as was referred to with Gage, but on what the brain does. Specifically, that the brain is the centre of consciousness and how this relates to actioning the body. If the person underwent genetic editing to change their appearance then they would end genetic-continuity and the related continuity of the body-criteria, but if they retain their brain they should retain identity, which leads to a conundrum between the genes, the body, and the muscle of the brain, of which no identity is found.

In sum, an individual could have the same body or brain, but it is also possible to have significant changes to composition of these organs. It makes little logical sense to remove identity for a change in the composition, but that this also necessarily leads to a focus on what the organ that is changed does. The problem is that this implies a fixation on the object, and thus the physicist can put himself in a bind as he has one part of the physical-criteria for identity but not the other, and the same goes for the *Alexa*. The physical-criteria cannot resolve this as there is no primacy for body over brain or vice versa. And even so, we are learning nothing about why (or what makes) the physicist the physicist. We need to go deeper for identity through psychological continuants, and this provides protection for the physicist.

The physicist and the 'new memory-criteria'

Let us first remind ourselves of psychological-continuity suggests that P2 at *t*2 is the same person as P1 at *t*1 *if and only if* P2 at *t*2 is psychologically continuous with P1 at *t*1.

It was concluded that the *Alexa* and the physicist have some grounds for identification under the physical-criteria as the *Alexa* has the continuous organ of the brain and the physicist has the continuous organ of the body. But as neither the body nor the brain have precedence over each other they each struggle to claim identity under the physical-criteria. But the larger problem is that the physical-criteria does not actually discuss identity. This is because a body means little unless there is something to compel it, and I do not believe that this is solely by the genes or necessitated only by the retention of the same genes. Rather, I contend it is the consciousness that compels the body, and that is something that both the physicist and the *Alexa* could attain through the object of the brain and their neural networks. As such, the body is not a continuant of identity.

Up to now the discussion to this point between the *Alexa* and the physicist's identity has been adversarial, largely due to the rigidities of the physical-criteria and the criteria of genetic-continuity. But it need not be. Psychological-continuity is non-adversarial and both the *Alexa* and the physicist can develop identity as they both have genes that can express on the psyche and system for consciousness (as far as we can tell with *Alexa)* to develop their psychological continuants. The *Alexa* could develop its own identity on top of the foundation it was given by the physicist, and the physicist will retain his continuants and develop further regardless of the genetic change. To discuss this, I shall refer to my two objections to grounding identity through genetics: (1) the genome is sacred and must never be touched; (2) we *are* our genes.

I have argued that identity can be formed upon any construction of genes. It would be unlikely that GI would harm the ability of a person to be able to generate memories, recall them, or develop their own genetic expressions, partly because GI would occur before birth, and secondly it is not conceivable that a genetic change could be developed to stop all the types of continuants of the 'new memory-criteria' and that the person would actually be alive. Gage's ability to attain new experiences and add to his already developed cell memory and genetic expressions were not harmed by his neurological accident.

I argued that we cannot hold the identity of an individual to the sanctity of the genes. This 'sanctity' suggests if one has their genes changed, they also change their identity. The physicist can lose 'genetic-continuity' and retain identity unless the genetic change effects his ability to process new experiences, and if that were the case opposition to GI would be justified. As such, the competition for

his continuants, both genetic and psychological, by the *Alexa* that the physicist created has no bearing on his ability to retain and develop his identity as he is not in competition for a set identity but is continually developing it in his own way.

By contrast to my view is Habermas' argument that once the physicist edits his genome he becomes 'unnatural' as he has lost genetic continuity. Habermas is tying human functions and human nature quite strictly to the genome and concludes that the edited will lose their freedom. The edited lose their freedom because they lose a sense of 'being' as freedom requires the individual to know 'the irreducible origin of her own actions and aspirations'.[42]

Habermas' point of 'irreducible origin[s]' implies that everything we do is fed by, determined, or controlled, by our genes. Thus, he refutes both the *Alexa* and the physicist's identity. *Alexa*'s because its own actions and aspirations do not have an irreducible point of origin that include the *Alexa*. And the physicist because he is no longer authentic, even though he can trace the point of origin of his action and aspiration. However, the physicist still has a genome and is still a person who operates like a human and who can enter the world and different environments. And importantly, his psychological continuants were not scrubbed clean from him by the genetic change, as they are not scrubbed clean from him when a gene expresses differently. It is also of no consequence that the *Alexa* has the genome as it was historically, and the physicist has a 'changed' genome.

Rather, Habermas' enjoining of 'unnatural' to GI highlights a fundamental misunderstanding of nature by suggesting that the terms of the life are (now) unnatural because of the editing. This is a claim which makes neither philosophical nor scientific sense, predominantly because the genetic mass of the physicist remains 'natural,'[43] but also because his ability to obtain a 'digital signature' is unharmed. Habermas ought to show how the consciousness is revoked by genetic-continuity, and I have argued that this cannot be satisfactorily done. No less because the 'new memory-criteria' reduces the claims that one must have reason to have identity but also because the origin of actions are from the consciousness. What occurs is more foreboding, by using genetics to ground identity Habermas makes the implication that the physicist was a 'being' but is now a 'doing'.

More distinctly, neither the *Alexa* nor the physicist would not have had the original genome as it was at its 'irreducible origin'. The *Alexa* has the genome as it was on the day the physicist made the copy, with the expressions and methylations he had already developed and that are related to it. And the physicist developed on top of the genome from birth with any losses and expressions due to epigenetic impact attained through the different environments and experiences he put himself in or was subjected to. As such, the *Alexa* could conceivably develop its own psychological continuants separate from the physicist, despite the same beginnings, they will express differently over time.

In sum, the *Alexa* did not develop the continuants itself as the brain and genome were donated with the existing neural networks and expressions at that time. However, in *t*2 the *Alexa* can continue to develop its own identity through experiences where these develop changes in the neural networks that were received. Similarly, the physicist need not worry about the existence of the *Alexa* as at *t*2 he also continues to develop upon his 'digital signature' he had developed at *t*1. The physicist also retains a copy of his neural networks and he has the social value of having a body (compelled by the consciousness via the brain stem) allowing him to enter new experiences. If anything, the *Alexa* is in the weaker position as it has to 'unlearn' the expressions of the physicist to completely separate its identity from the physicists, but ostensibly as soon as the *Alexa* has a new experience that the physicist does not have then it has developed towards its own psychological-continuants, it may just take a while to distance itself from the influence of the physicists past.

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[42] Habermas, p.58.

[43] Lisbeth Witthofft Nielsen, 'The Concept of Nature and the Enhancement Technologies Debate', in *Enhancing Human Capacities*, eds., by Julian Savulescu, Ruud ter Meulen, Guy Kahane, (Chichester: Wiley-Blackwell, 2011) pp.21-24.

Conclusion

I have presented a case that the physical-criteria should be rejected because it is both inconclusive and fails to branch from identification to identity. I also assert that identity grounded in genes is closely related to the physical criteria, both in the construction of the physical-criteria, but also in how genetics are discussed in terms of identity which relates to the problem of 'enough'.

Genes are important but the point of this discussion, as identity is based on psychological-continuity, is that discussions on genetic change should not be based on blanket statements but on how that specific gene changing affects the continuant of interest. As identity is psychological, a genetic intervention must stop a continuant, which would mean that all the abilities to create new expressions, enter new experiences, or create new memories must cease. For example, Gage's brain damage did not affect his ability to create new experiences as it was only damage to a part of his brain, not his full neural networks and his being through his consciousness. He did not stop being Gage even if he acted differently. Rather, he took the shock, and adapted (that is not to say that he necessarily adapted well).

One of the main objections to GI cited was that those who are intervened become 'inauthentic'. Gage had a significant accident and lost a part of his brain, but he was still authentically Gage as a developing individual. In the *Alexa* puzzle the physicist remained authentic despite the genetic change because his being, through his expressions and consciousness, allowed him to continue in his trajectory of gaining new experiences and related cell memory. Gage's story highlights why it matters what is changed as does the physicists story as the majority of genetic changes cannot affect the fundamental idea of identity.

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