

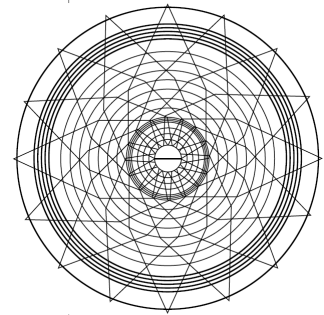
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How Can Using Familial DNA Data

Provide an Emotive Sense of Our Human Connection

Using Creative Transdisciplinary Practice



HOW CAN USING FAMILIAL DNA DATA PROVIDE AN EMOTIVE SENSE OF OUR HUMAN CONNECTION USING CREATIVE TRANSDISCIPLINARY PRACTICE

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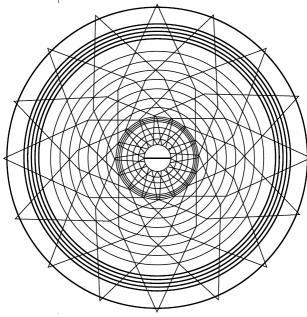
Abstract:

This research links three transdisciplinary threads of fashion, biology and technology looking at the potential of Science Art usage to highlight the importance of raw DNA data to human connection during and post the Covid-19 global pandemic. Using a postdigital human-centred methodology this paper presents self-reflexive practice based research into the question: How can using familial DNA data provide an emotive sense of our human connection using creative transdisciplinary practice? Insights from this work led to designing a six-meter high installation involving six mannequins, each wearing a garment printed with DNA data collected with consent. The garments were linked to each other using strips of LED lights, coded to the sound of heartbeats to represent the flow of ancestral DNA between generations. The work aims to deliver cutting edge contemporary research to a wider audience, enabling individuals to own their own DNA data and Science Art practices to be viewed away from scientific laboratories, opening up a discursive space to encourage further conversations on what it means to be human. The findings revealed the emotive ancestral embrace between generations and the comfort that we are never truly alone, connected through our DNA to every single individual on the planet despite restrictions being placed on us. Concluding, it questions the bioethical and humanitarian issues of DNA storage and ownership of life.

Keywords: connection, identity, human

Introduction

This paper is being written as the world engages in a desperate fight with a global pandemic. People have had to shield and isolate from each other for as long as 12 weeks before being allowed to form a 'bubble' with another person or family. Individuals have faced extreme isolation and loneliness. This has made for a focus on what is important; a need to find different ways to connect, feel close to distant friends, families and loved ones.



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As a reaction to the need for individuals to get outside and mix with each other, this paper focuses on enabling our individual genetic codes found within us to break free, mixing on the outside of our bodies, communicating with the wider population. This will bring what is inside, out; making the invisible, visible; using creative transdisciplinary practice to embody personal scientific data and display our human connection.

To begin to answer the research question, this paper will be using a human centred methodology combining three transdisciplinary threads of fashion, biology and technology. In addition, data visualisation techniques will be used to decode the scientific and quantifiable raw DNA data to make it more accessible and visually appealing to the reader.

Raw DNA data will form the medium of the research but as Jerome De Groot mentions within his paper DNA Art (2017), DNA is a:

...metonymic for a wider set of discussions about ethics, politics, migration, biopolitics and identity. DNA art becomes a way of thinking about much wider and more problematic concerns, a long way away from the hyper-commodified personal genetic portraits, but also, somehow, part of the same continuum.

(De Groot, 2017)

In cultural terms, DNA findings in 2021 are a really contentious subject. DNA analysis can connect individuals with members of their family so that family trees can be built and loving relationships made. However, it can also enforce socially constructed boundaries.

Dereka Purnell, a black American woman and social movement lawyer who writes for the British newspaper, The Guardian, talked about DNA analysis from her own perspective:

Black people are particularly vulnerable: our DNA is disproportionately collected, stored, planted, and used against us in criminal proceedings. Handing over such intimate information heightens the risk for abuse. (Purnell, 2020)

With the horrific death of George Floyd just three months after this article was written, Purnell's concerns are clearly valid.

Drawing from the works of Michael Foucault (1978) and Giorgio Agamben (1998) there is no such thing as a 'true' race. We are all connected. Due to the contentious nature of biological surveillance with privatised companies owning our DNA, (companies which have high stakes in health insurance), we are only realising now the huge impact DNA has as a cultural commodity.

This paper draws on the expertise of Dr Gabrielle Wheway, lecturer in functional genomics at Southampton University to answer queries relating to DNA and patterns of

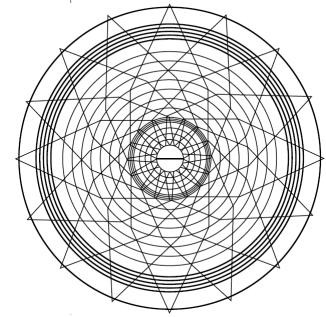
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sequencing. This cements the transdisciplinary nature of this practice, discovering a common language to produce ‘...fertile ground for innovation [and] new perspectives on important questions,’ (Schnugg, 2019, p. 2)

Individuals who constantly cross-disciplinary boundaries can build bridges, use the experience from different fields for their own work, foster the exchange of information between them, and initiate valuable experiments or extraordinary projects. (Schnugg, 2019, p. 86)

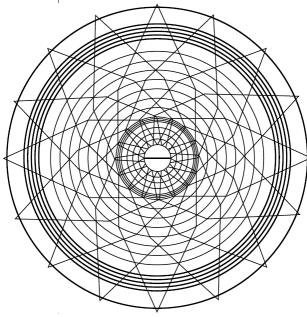
The research places ‘postdigital’ research in the form of a six meter installation which combined the three transdisciplinary areas at the centre of an exploration into how we read the body and how new forms of classification develop. The term ‘postdigital’ has been taken from Mel Alexenberg’s book ‘The Future of art in a postdigital age: from Hellenistic to Hebraic consciousness’. (2011). It is a term which addresses the fact that transdisciplinary art practice has become more concerned with what it means to be human than what it means to be digital. Our identity is written in the molecular text of DNA and with the rapid, fast-paced technological advancements, society is reevaluating its role in what it means to be human.

The Human Genome Diversity Project, an international plan to collect DNA from indigenous peoples, was built around a concept of DNA as an ‘immortal’ text that can reveal the history of ancient civilizations and ‘immortalize’ vanishing populations. (Nelkin, 2001, p. 557)

This paper aims to pattern a creative narrative with DNA, using the DNA iconography as a storytelling text, enabling the audience to ‘read’ the body without the body being present. The intention was to design an emotive sense of belonging to our ancestors, having their DNA passed down and living within us as a form of postdigital embalming. ‘...biology reduced to bodily characteristics, in the forensic analyses as patterns of absent presence...’ (M’charek et al., 2020).

The words ‘hereditary’ and ‘inheritance’ had only recently taken on biological meanings. (Cobb, 2016, p. 1)

As our biological cartography, DNA is the result of, (and in emotive terms); the cultural human narrative and embrace of our ancestral history. This paper aims to remind readers of their own uniqueness as individuals yet to join in celebration of how similar our DNA patterns are to each other as a human race. The reader will be able to view the connections with the data shown between familial members amongst the practical piece (figure 1 below) as well as understand that we connect in some way to every



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single human on the planet deconstructing the socially constructed boundaries we are often placed in.

Scientists involved with genetics have also become more outspoken than ever in recent years and are more determined to place biology in the centre of human social order. (Nelkin, 2004, p. xiii)

The aesthetics of DNA are revealed here as a form of self and familial portraiture within this research. The resulting sculptural installation piece is a conceptual representation of biological ties within a stereotypical nuclear family. It is important to note that this in no way discounts the importance of non-biological family ties which can be just as vital.

The importance of representing this research as a sculpture paid homage to Crick and Watson, the Nobel Prize winning scientists awarded for their discovery of the DNA structure in 1962. The pair presented their findings to the world as a sculpture which can still be seen today at The Science Museum in London. This paper aims to declassify previous modes of display, drawing on inspiration from works of additional contemporary transdisciplinary practitioners.

This paper aims to develop two main points. The first will be looking at how familial DNA influences the aesthetics of the design practice. The research reveals the common language developed from the convergence of art and science, using the findings taken from familial DNA to explore connections. Concepts of sameness and difference were explored incorporating the works of Donna Haraway and Gilles Deleuze to help underpin these ideas.

Secondly, this paper explores the ethical implications of exposing data and the potential for new forms of classification. In 2021, we do not know how long the natural unaltered line of hereditary will continue before it is modified and genetically altered losing the 'authentic' connections. Biohacker Heather Dewey-Hagborg and 'The Face of Litter' campaign in 2015 were used as case studies to help inform this topic; looking into the dangers of exposing the fundamental building blocks of life as the research questions exposing identities as wearable artforms within creative practice. The work of theorists Michael Foucault and Giorgio Agamben was used to inform the research and practice into biopolitics.

The paper aims to increase awareness that although DNA surveillance may create positive familial connections, it also embraces inadequate socially constructed boundaries that are often used to categorise and exploit.

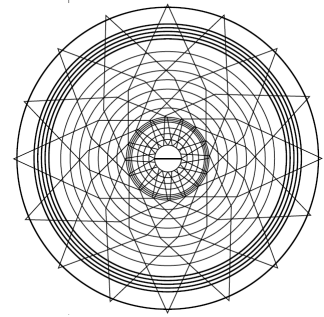
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How familial DNA influences the aesthetics of the research

This section illustrates how the presented postdigital sculptural piece reflects familial DNA and influences the design characteristics of each garment produced within it. This research presents a new way of visualizing DNA data, which is a step away from the more common aesthetic representations commercially available through websites such as DNA11 and geneticphotos.

Representing data is always a matter of aesthetics and transdisciplinary methodologies. Suzanne Anker further defines the relationship between science and art within her book, 'The Molecular Gaze (2004). Science and Art:

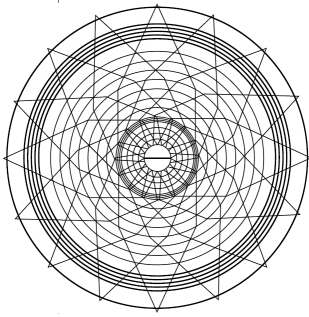
...represent quite distinct ways of knowing the world. Whereas the discipline of science aspires to detachment and objectivity, the practice of art is embedded in personal and emotional interpretations. (Anker & Nelkin, 2004, p. 189)

Both disciplines are heavily entwined within this research, communicating facts that can be both socially and culturally defined in a personally emotive, immersive way.

Researching ancestry, it was fascinating to discover how much familial members connect. A mother and daughter for example can connect, 3438cm across 83 segments. An aunt may connect to that same daughter, 1927cm across 86 segments. To give a bit of background to these figures, a parent or child will share around 3275 cm of DNA with an individual, 2400-2800 for a full sibling, 1450-2050 for a half sibling / niece / nephew / grandparent / grandchild / aunt or uncle. An individual could also share between 680-1150 cm of DNA with a great grandparent / grandchild (AncestryDNA, 2020).

Analysis of the rest of this family revealed the considerable variations between them. For example, the subject's children are not as genetically close to each other (sharing 2266cm of DNA) as she does with her own sibling, only sharing (2373cm). The subject also shared 5cm more DNA with her youngest son than her eldest and is closer by 24cm to her father than her mother. It is these figures that really inspired the research to question the advancements in the debate between biological essentialism and social construction.

The research accumulated in a series of interlocking garments, creating a hanging sculptural installation, demonstrating familial connections. The potential to wear garments exposing the DNA of a much loved relative and feel the embrace of the clothing on the skin after their death, could be found really comforting. The aim of this paper is to give the reader a sense of security and belonging in these unprecedented times. We are all connected, effectively embodying the genes of our ancestors making us feel embraced, safe and secure. After all, 'The work of art is a being of sensation.' (Deleuze, 1994, p. 164)



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Due as much to the limitations of space as well as issues of security against biohacking, only a small section of raw SNP DNA data was printed onto the fabric used to create the garments. To put in context, when a DNA profile is downloaded, there are 12,554 PDF A4 pages per familial member. Only 3 pages of this data can fit on each garment at this scale. The biological connections are shown by each thousand centimeters of DNA being represented by a strip of connecting LED lights, (please see Figure 1 below).

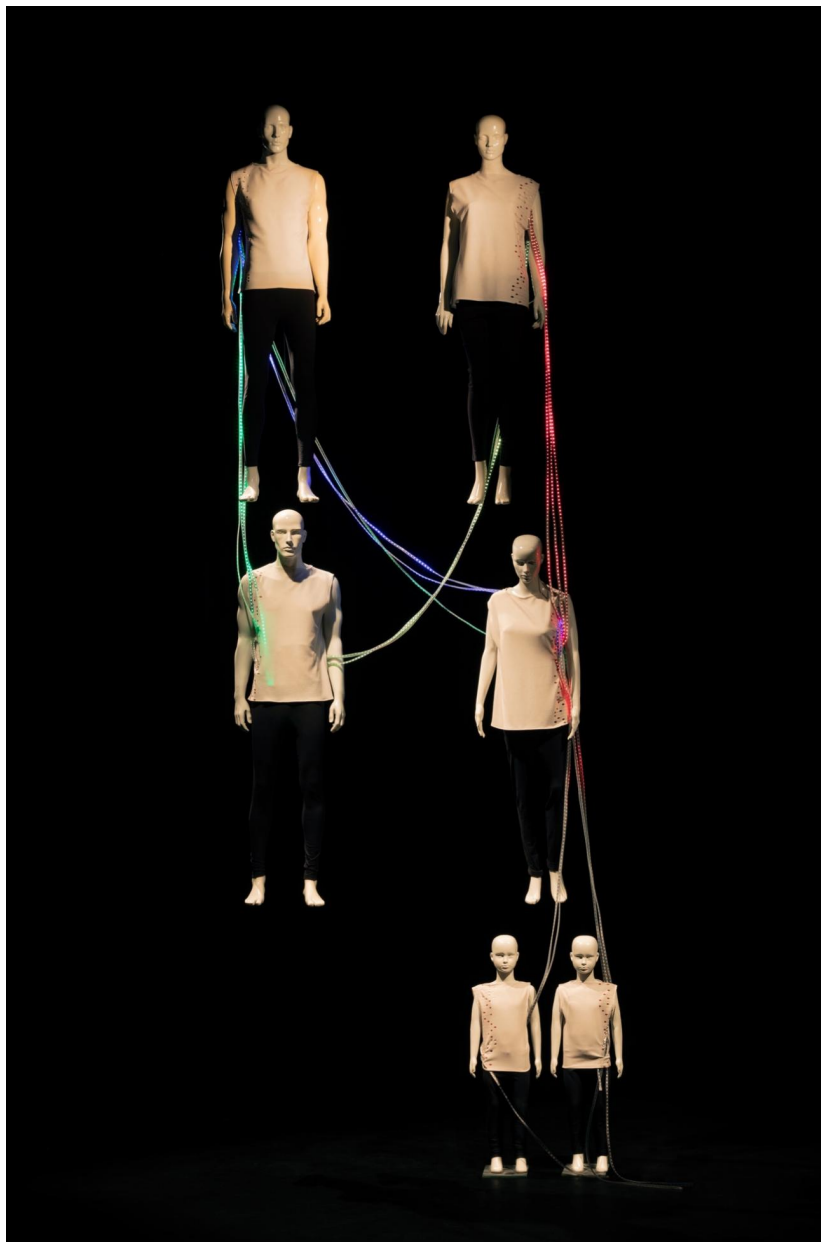


Figure 1.

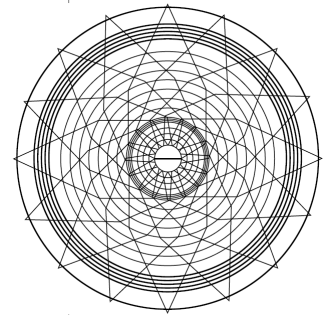
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Applied to the sculptural design were 3 strips going from the father to the subject, one 'stopped' at the subject, then one wove through the 'familial ties' to the youngest child of the subject and another the same but to the eldest. Three strips also went from the father of the subject to their brother. The subject's mother's side is slightly different. The mother shares over 2000cm of DNA with the subject's youngest son and less with their eldest. Therefore, in addition to 3 strips going from the subject's mother to their brother, she had three strips going to the subject, weaving through the 'familial links', then separating, 2 to the subject's youngest son and one to their eldest.

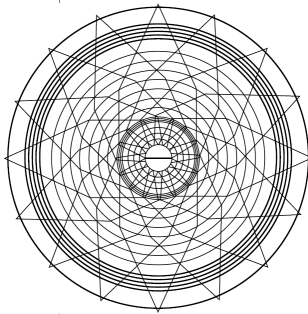
To explain 'familial links', the subject's family 'linked' across the same RS locations 70 out of the possible 112 locations on the first 3 pages. The printed red 'markers' representing SNPs on that line remained, demonstrating how they connected whereas the SNP positions where they differed were 'cut out', leaving a hole within which the LED strip lights were woven through, highlighting the familial connection and demonstrating the passing down of ancestral DNA.

Downloading individual SNP sequences from Ancestry meant that responsibility was taken for that data now it had left the company. It was no longer secure. Consent was acquired by the subject and their family for this research. 86 individual SNP's were printed onto each garment. This is less than 0.013% of the DNA data needed to correctly identify an individual. This paper aims to explore the idea of embodied data in addition to wearable identities in an emotive and transdisciplinary way.

It has been suggested that the popularity of genetic DNA research to visual artists has stemmed from the fear that as humans, technology will modify us and that over time we will become less 'human' and more genetically and technologically streamlined. Roland Barthes' (1987) theory on semiotics was used within the aesthetics of the installation piece providing the audience with 'signs'; a new visual text in which to attach cultural, social and personal meanings. Donna Haraway looks at the body as '...a blank page for social inscriptions', (Haraway, 1998, p. 591). In this postdigital context, within this practice, the installation became a signifier for human connection and which in future, may pattern a new form of classification.

Genetic findings

The image below (Figure 2) shows the first page of the subject's mother DNA SNP printout on the left and the subject's on the right. Comparing the DNA SNP sequences ready to create the designs, the subject's mother has had her DNA sequence starting two SNP's before the subject, (in addition, consequently the subject's father, brother and her two children). This meant that to do a direct and 'true' comparison, the



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subject's mother should have her first two lines 'deleted' so that they could all be compared from the same position.

rsid	chromosome	position	allele1	allele2	rsid	chromosome	position	allele1	allele2
rs369202065	1	569380	G	G	rs3131972	1	752721	A	G
rs199476136	1	569400	T	T	rs114525117	1	759036	A	G
rs3131972	1	752721	A	A	rs4040617	1	779322	A	G
rs114525117	1	759036	G	G	rs141175086	1	780397	C	C
rs12124819	1	770340	A	A	rs115093905	1	787173	G	G
rs4040617	1	779322	G	G	rs11240777	1	798959	A	G
rs141175086	1	780397	C	C	rs6681049	1	800007	C	C
rs115093905	1	787173	G	G	rs4422948	1	835499	A	A
rs11240777	1	798959	A	A	rs57494724	1	837192	A	G
rs6681049	1	800007	C	C	rs4475691	1	846808	C	C
rs4422948	1	835499	A	A	rs6657440	1	850780	T	T
rs57494724	1	837192	A	G	rs4970461	1	852964	G	G
rs4475691	1	846808	C	C	rs7537756	1	852964	T	T
rs6657440	1	850780	T	C	rs13302982	1	861808	G	G
rs4970461	1	852964	T	G	rs2880024	1	866893	C	C
rs13302982	1	861808	G	G	rs74047407	1	866938	G	G
rs2880024	1	866893	T	C	rs1110052	1	873558	T	T
rs74047407	1	866938	G	G	rs7523549	1	873558	T	T
rs1110052	1	873558	T	T	rs2272756	1	882033	G	G
rs2272756	1	882033	G	G	rs3748597	1	888659	C	C
rs3748597	1	888659	C	C	rs13302957	1	891021	A	A
rs13302957	1	891021	A	A	rs13303106	1	891945	G	G
rs13303106	1	891945	G	G	rs13303010	1	894573	A	A

Figure 2.

The image above shows the first page of the subject's mother DNA SNP printout on the left and the subject's on the right. Comparing the DNA SNP sequences ready to create the designs, the subject's mother has had her DNA sequence starting two SNP's before the subject, (in addition, consequently the subject's father, brother and her two children). This meant that to do a direct and 'true' comparison, the subject's mother should have her first two lines 'deleted' so that they could all be compared from the same position.

Another finding was that although the subject's father, brother, children in addition to the subject themselves, were all sequenced along the same RS positions, the subject's mother had extra positions which the others did not have and vice versa. Sadly, Ancestry could not comment on this. Therefore, SNP's were 'deleted' from each individual's DNA code to ensure they were being compared along the right lines. To link practice to theory, Donna Haraway talks about the 'splitting' of the self, (Haraway, 1988), and how we can only view the world from partial rather than wholly objective perspectives. It questioned the aesthetics of the design and how in order to judge it 'equally' along the same positions; neither individual would be totally 'whole.'

The split and contradictory self is the one who can interrogate positionings and be accountable, the one who can construct and join rational conversations and fantastic imaginings that change history. (Haraway, 1988, p. 586)

Interestingly by designing the SNP sequence in this way, the design looks like the iconic DNA double helix structure with its twists like the spiral staircase of life.

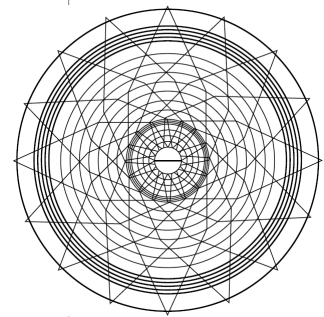
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Within the sculptural installation, the females are shown down the right-hand side of the sculpture and the males down the left. It finishes at the bottom with the subject's two sons side by side beneath the subject, (one on the right and one on the left). This means that the designs are created on the right-hand side for the subject's mother and the subject in addition to her younger son. On the left-hand side will be the subject's father, brother and her eldest son.

The methodology to create these designs was very scientific. The subject's father's design was looked at (see figure 3, below left), while creating the subject's eldest son's design, (Figure 3, below right). Analysing patterns within the subject's father DNA effectively meant that certain sections of the design could be 'cloned' to replicate the subject's eldest son sequence. Figure 3 below demonstrates the section of DNA that was able to be replicated. This was the largest section of familial DNA replicated within this family. Mostly only two or three SNP sections were able to be copied across at a time.

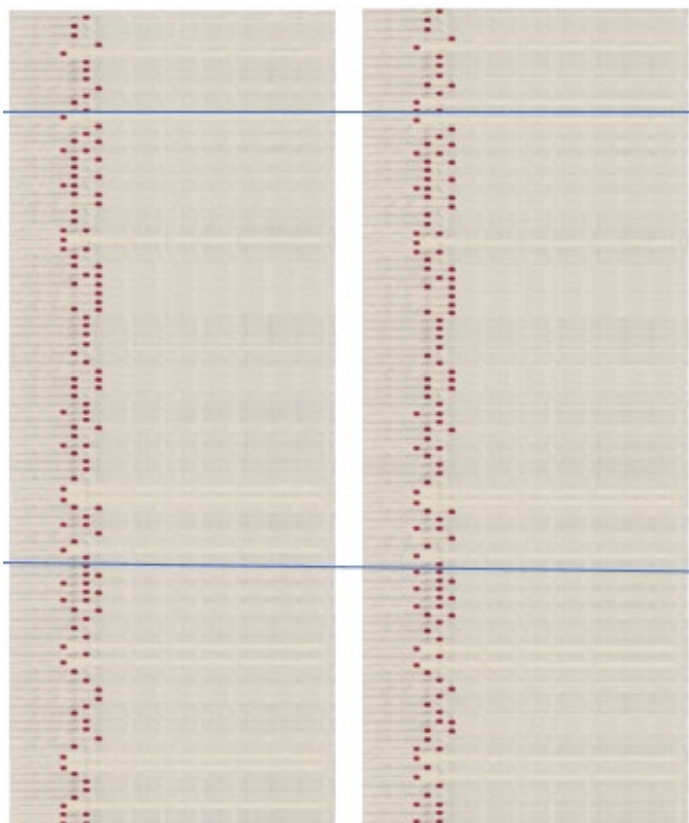


Figure 3.

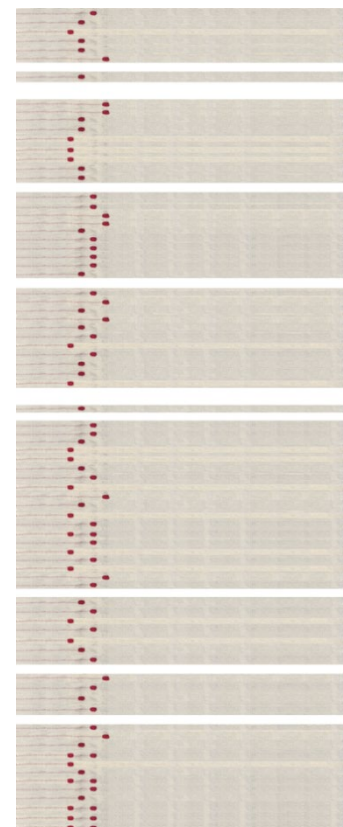
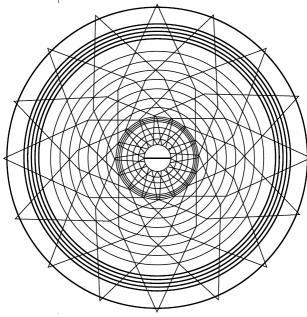


Figure 4.



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To make a further reference to Haraway, Figure 4 was the DNA sequence subject's brother having to be sliced and 'split', becoming a 'partial' representation of the self. This is due to the fact that the subject's mother did not have those positions within her DNA sequence and the research wanted the patterns to be judged on the similarities and differences from equal positions. Here the SNP's were shuffled down to fill the gaps and further SNP's were added on to the sequence from further down the page which matched all familial members.

What does a DNA profile "say?" And who is doing the saying? Who is made visible and who has the privilege of invisibility? How are bodies being classified? And what predictions are being made about these bodies?

(Dewey-Hagborg, 2016, p. 164)

The ethical implications of exposing data and the potential for new forms of classification

This research did not involve biohacking. However, there is a concern about the long-term usage of raw DNA data taken for aesthetic and artistic reasons. Even by obtaining consent, it is hard to feel comfortable about obtaining long-term rights to have even the small (0.013%) percentage of the subject and her familial DNA shown like a visual fingerprint. Their DNA data will no longer be solely within them but will be a permanent exposed feature, having its own 'afterlife' that has the potential to last long after the research is finished, until the time when the material decomposes naturally, and the genetic code is lost.

One aim of this research was to enable the subject and her familial members to claim ownership of their DNA out of private commercial ownership and display it in a creative immersive way bridging the gap between privately owned, cold, statistical, scientific, unique and personalised data with creative, emotive public display.

In sympathy with the works of artist and biohacker Heather Dewey-Hagborg discussed below, it is the role of the artist to always push boundaries, ask questions and continue to challenge the status quo. It is work like this, at the forefront of scientific developments, which start local, national and global connections, and conversations, making public what is kept secret, exposing contentious ethically suspicious practices.

No one can ever tell what will be learned from our personal and unique genetic data as time progresses. In the future, looking back at the present day, we may question what was revealed. This links to Foucauldian biopolitics on the subject of power and control. 'Methods of power and knowledge assumed responsibilities for the life processes and undertook to control and modify them.' (Foucault, 1978, p. 142).

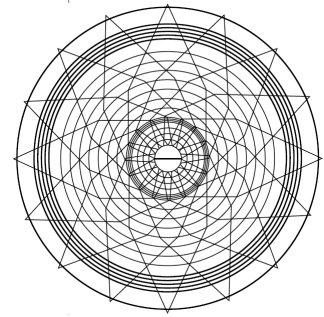
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Bioart as a definition pushes boundaries and starts conversations on traditional definitions of canonized practices. During research conducted within critical creative practice at Solent University, the cross pollination of disciplines enabled development of a common language where designing with DNA data can be manipulated producing altered visual representations of an individual's personal identity. Even the acronym SNP is pronounced 'snip', bridging the disciplines between biology and fashion.

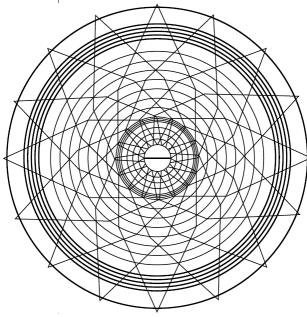
This section looks into the pros and cons of genetic testing discussing the work of biohacker Heather Dewey-Hagborg, and Biotech company Parabon's 'Face of Litter' 2015 campaign to highlight the contemporary issues surrounding using DNA to classify people. The research also discusses the positive aspects of genetic testing and how it can be used to find familial connections to those who have never had any biological roots.



Figure 5.

Dewey-Hagborg picks up discarded items such as chewing gum, cigarettes or coffee cups and extracts the personalised DNA in a lab. The DNA is then analysed. Using what can be found out through websites such as 23andme, Dewey-Hagborg was able to find out the ethnicity, eye colour and hair colour of the individuals. Using a 3D printer armed with that information, Dewey-Hagborg was able to create a series of portraits using data derived from these discarded items.

We live in an age of biological surveillance. It is unnerving how easy it is to know so much about someone who discarded a cigarette or a piece of chewing gum. Or less



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critically, someone who placed their litter in the bin only to have the wind or an animal expose it. It used to be that if people did not want to be traced, they would take cash out and leave their credit cards at home but now so much can be found out about someone if they just tested a fallen hair. Looking forward, this research has the potential to do the same, enabling the installation to grow indefinitely by connecting individuals around the world with consent. Consent is essential to this research. It is a fear that the more exposure biohacking gets, the more it will become normalised by society. Our world will become more dystopian as our genetic data becomes commodified and even our personalities become quantified.

Dewey-Hagborg's portraits do not account for age, environment, scarring or any deliberate body modification. Who is to know that it wasn't a child discarding that stick of chewing gum or a vulnerable profile being analysed without consent? Producing a portrait using a biotechnology company such as 23andme or Ancestry.com categorizes individuals based on the ethnic markers found within the genomic sequence. Producing work in this way invites the audience to cast judgements on the face, forgetting that it is not a 'true' representation.

It is worrying that one could potentially line up a series of 6 garments each printed with an individual's unique DNA code and judgements could be made according to the pattern. In a world where it is becoming more and more likely that humans may be represented by avatars, (such as fashion brand Ralph and Russo (Assomull, 2020) using the avatar 'Hauli' for their Paris couture show July 2020 or within beauty campaigns such 'Estée Lauder's for Christmas 2018), there becomes a risk of creating generic skin tones based on these ethnic markers. In the future perhaps we will be judged on our genetic code. Who has more CC combinations than AG for example and will they be divided into hierarchal groups? Is this to be a new form of classification? Who owns life?

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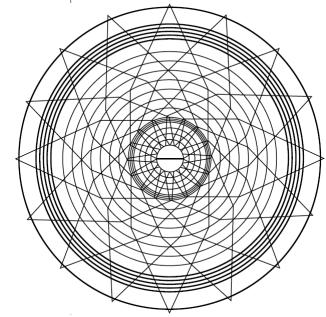
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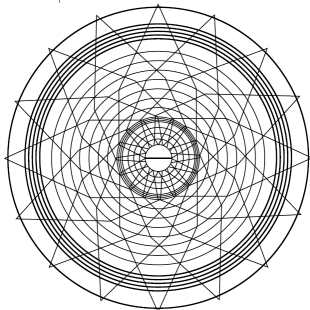
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[Scientific Articles]

Merrifield S.

*How Can Using Familial DNA Data
Provide an Emotive Sense of Our Human Connection
Using Creative Transdisciplinary Practice*

КАК ИСПОЛЬЗОВАНИЕ ДАННЫХ СЕМЕЙНОЙ ДНК ПОСРЕДСТВОМ ТВОРЧЕСКОЙ ТРАНСДИСЦИПЛИНАРНОЙ ПРАКТИКИ МОЖЕТ ОБЕСПЕЧИТЬ ЭМОЦИОНАЛЬНОЕ ОЩУЩЕНИЕ НАШЕЙ ЧЕЛОВЕЧЕСКОЙ СВЯЗИ

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Аннотация:

В этом исследовании пересекаются три такие трансдисциплинарные направления, как мода, биология и технология. Рассматривается потенциал использования научного искусства, чтобы подчеркнуть важность необработанных данных ДНК для связи между людьми во период глобальной пандемии COVID-19 и после её окончания. Используя методологию, опирающуюся на принципы антропоцентризма, в этой статье представлено основанное на саморефлексивной практике исследование следующего вопроса: как использование данных семейной ДНК посредством творческой трансдисциплинарной практики может обеспечить эмоциональное ощущение нашей человеческой связи? Выводы, полученные в результате этой работы, были использованы для создания инсталляции высотой шесть метров, состоящей из шести манекенов, каждый из которых был одет в одежду, на которой были напечатаны данные ДНК, собранные с согласия их владельцев. Предметы одежды были соединены друг с другом с помощью полос светодиодных ламп, закодированных в соответствии со звуком сердцебиения, чтобы представлять поток наследственной ДНК между поколениями. Цель данной работы донести передовые современные исследования до более широкой аудитории, позволяя сами людям, без участия научных лабораторий, владеть собственными данными ДНК и практиками научного искусства, открывая дискурсивное пространство для поощрения дальнейших разговоров о том, что значит быть человеком. Полученные результаты показали эмоциональное родовое принятие поколений друг другом и нахождение успокоения в том, что мы никогда не бываем по-настоящему одиноки, будучи связанными через нашу ДНК с каждым отдельным человеком на планете, несмотря на накладываемые на нас ограничения. Выводы, полученные в

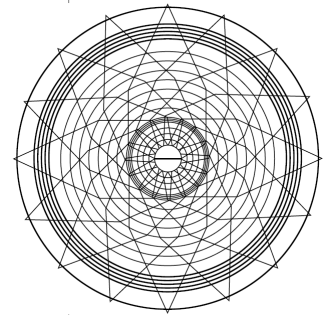
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результате данной работы, ставят под сомнение биоэтические и гуманитарные проблемы хранения ДНК и права распоряжаться собственной жизнью.

Ключевые слова: связь, принадлежность, человек