

Grasping the Liquid

On the Analogies between
the
Materiality of Gelation
and
Essentialist Biases in Scientific Research

Jannis Neumann
Written component of Master Thesis

Submitted in partial fulfilment of the requirements for the degree of
Master of Arts (MA) at the University of Applied Arts Vienna,
Institute of Fine Arts and Media

Registration Number: I 1849353
Vienna, Winter semester 2022/2023
Programme Number: S 066 776
Study Programme: Art & Science
Supervisor: Univ-Prof. Virgil Widrich

THX. Acknowledgements

Firstly, my thanks to Virgil, Martin, Valerie, Brishty and Gerda from the department of Art & Science for their ongoing support.

As well as to my friends from the class – Chris, Naoki, Els, Ivonne, Mila, Helen, Marton, Lindsey, Klara, Margit and Francesco + Silja, Natalia and Lotti for sharing their thoughts and helping me with my thinking. It would have been way less exciting without you.

To all the people who helped me along the way of developing my ideas including my fabulous jam session partner Barbara, to Jörg for sharing his fantastic book collection, to Mario and Nina for their theoretical knowledge, to Asher and Peter for being so helpful with my lecture performance, to Liesl, Roman and Maria for teaching me mould-making, and to Anna for good talks and good food.

Thanks to my family and especially my mum Heike for all their encouragement, and lastly to my partner Alex for all his affection.

ABB. Abbreviations

DNA	Deoxyribonucleic acid
DZ	Dizygotic
GWAS	Genome-wide association study
MZ	Monozygotic
SNP	Single nucleotide polymorphism
UK	United Kingdom
US	United States

ABSTRACT

In comparative examinations of the process of gelation and the way in which essentialist biases are influencing scientific research, various analogies can be observed. The research focuses largely on gelatine, a gelling agent that derives from collagen, which is abundantly present in the human body. Secondly, it engages with sexual orientation, which is regularly studied with the purpose of identifying biological determinants of nonheterosexual behaviour as examined with a study by Ganna et al. (2019). Key aspects that were found to overlap between both phenomena are (A) the extraction of a single component out of a larger context, (B) this component's application to solidify a liquid state into firm matter, (C) the large influence of external forces – which are characterised in the study as the *mould* – on the formation of the hydrogel/ research data, and (D) the sensational way they are presented to a wider audience. Finally, the consequences of forcing a body into translucency by essentialist biases with its high risk of tilting into eugenic thinking are examined alongside various counterstrategies such as bum-shaking.

TOC. Table of Contents

X. Grasping the liquid	9
A. Formations of Gel	12
A1. Gelation	12
A2. Diving into jelly landscapes	14
A3. Gelatine - Godmother of semi-solids	16
B5. Boiling the human body down	18
A4. Jelly Moulds	19
B6. Ideological Moulds	24
B. Knowledge-making and hard facts	26
B1. Analysing DNA through wet bodies	26
B2. A quick ride through past research on sexual orientation biased by biological essentialism	27
B3. The construction of a gay genetic architecture	31
B7. Splashy desserts	34
A5. Translucent matters	35
B8. Forced translucency	36
C. How to conclude	40
List of Illustrations	52
Bibliography	53



X. Grasping the liquid

If you want to understand the sea, you cannot simply dissect it and analyse the parts. When you fill it into a bunch of containers and canisters, buckets, and pools, what you remain with cannot be called an open water anymore. Rather you remain with little portions of extracted water, maybe with residue of sand, rock, or organic material – materials which once before defined what the sea was by confining it, yet simultaneously belonging to it. As we see, things got slippery and not easy to comprehend very quickly, and the chances are high that it will continue like this. These small quantities of water keep certain qualities of their formerly state such as being liquid or wet or consisting of hydrogen and oxygen molecules, but even if you will study them for a long time there will be no chance, that you get an understanding of the sea, but only of the notion of seawater in a bucket.

Generally, humans tend to be rather dissatisfied when something slips their full understanding. When trying to grasp water, you can form a bowl with both of your hands by pressing your fingers together tightly, so when you draw some from the bucket, nothing is running through your fingers. The water appears even as steady. However, when giving up this particular shape, it will start to flow again, taking on a new form by following gravity. Besides using your body or another container to enforce a somehow stable state onto the liquid externally, a gelling agent can be added to solidify the liquid from within. After the liquid has gelled in a vessel, it can be removed from it, while keeping its shape. The gelling agent forms a gel, the container provides the material with a form and the gel becomes a container, contained in itself.

No more flowing through one's fingers – the liquid becomes tangible, easier to grasp, wobbly and solid at the same time. The external support structure becomes obsolete, as the external becomes internalised.

Especially in statistical analyses of data sets, similarities to the scientific process of knowledge making can be observed. To perform such an analysis, the data needs to be collected in the first place, as it does not exist naturally. Initially, there is only a liquid phase of a vast number of objects with different attributes, behaviours, relations, and relationships towards each other. To make them accessible for data processing, scientists take these attributes and operationalise them into particular variables, they seek to observe, measure, and ultimately explain. To make this procedure more comprehensible, the following explanations will be approached with the example of the ongoing scientific research still obsessed with finding biological determinants for sexual orientation.

The American Psychological Association describes sexual orientation as “a person's sexual and emotional attraction to another person and the behavior and/or social affiliation that may result from this attraction”.¹ In another guideline they explain that “An individual's sexual orientation may be lesbian, gay, heterosexual, bisexual, queer, pansexual or asexual. A person may be attracted to men, women, both, neither, genderqueer, androgynous or have other gender identities. Sexual orientation is distinct from sex, gender identity, gender role and gender expression.”² However, most sexual orientation labels also include a person's gender identity. The term lesbian, for example, refers not only to an attraction towards women, but also to the person as self-identifying as a woman. Sexual orientation, thus, can be understood as a certain directionality of sexual and emotional attraction.

Figure 1 - Microscopic image from agarose-hydrogel, 2022

1 American Psychological Association, “Guidelines for psychological practice with transgender and gender nonconform ing people.” *American Psychologist*, 70(9) (2015) p862

2 American Psychological Association, “Key terms and concepts in understanding gender diversity and sexual orientation among students”, 2015

The expression *vom anderen Ufer sein* is a phrase in the German language, which illustrates the common binary thinking when envisioning categories such as sex, gender and sexual orientation. It describes being gay literally as being from the other shore, and therefore draws on the traditional dichotomy of hetero- and homosexuality. Even though it seems fairly outdated, pop-science articles employ similar expressions such as “[something seems to] flip the sexuality switch before birth”³. It declares two locations, here and there: Here as the norm and as the standard, and There as the other place, in which someone cannot simply be, but needs to have moved to at one point in time.

Eventually, this thinking could also be represented as two different buckets. Yet, as mentioned afore, sexual orientation defies these binary categories, so another common concept is imagining it as a gradual continuum between the two. The notion stays with the idea of two opposing shorelines, which represent the poles of being solely attracted to one of two sexes and between them runs the river of varying degrees of bisexuality.

Yet again, things are not that easy. Mapping a phenomenon like sexual orientation, is a task which actually comprises mapping out a multitude of phenomena. As there are more than the two commonly reported sexes male and female, and an even larger diversity of gender identities, the possibilities for locating a sexual attraction immediately potentiates and might be better described as a directionality. One can be attracted to people identifying as men, but also to attributes like masculinity, which is not necessarily linked to maleness. As conceptualizing a phenomenon so highly complex seems like a hopeless endeavour, it could be imagined not as a fixed topography but rather as charting individuals, who drift in the sea. Instead of locating them on a cartesian grid, identifying proximities, directions and relations between the people seem to be a more promising attempt. A desire is not merely a coordinate, but needs to be understood as well as a relationship, interwoven into actions and processes of communication.

Who floats next to you? In which direction do you tend to turn your attention, your gaze, and your presence? Will you decide to swim over to them and invite them to splash around together? The drift might carry you around a bit, bringing you close to different people over time, or you might cling onto another person like two dancing seahorses. You might fancy deep dives to encounter the dimensions that lie under the surface, or to take skinny dips in the sunset. Submarine streams in the deepest oceans and shallow waters, where ripples hit the firm land.

But back to scientific thinking – what to do with such a messy map? If sexual orientation is envisioned as the dynamic relations within a group, it becomes quite difficult for scientists to make any quantitative propositions about its constitution. This is usually changed by converting individual persons into quantifiable data, by assorting each of them to a certain category. Certainly, there is a multitude of different labels people identify themselves with, however, they are not feasible for many research questions performed by a heteronormative research apparatus. Thus, many research designs are built upon the construction of a dichotomous classification system for their data. The binary categories have been called heterosexual/homosexual for a long time⁴, and only recently changed to heterosexual/nonheterosexual.⁵ This common practice implies that people are either allocated to one of the groups by the operating scientists on the basis of a predefined protocol, or in case of probands self-reporting their sexual orientation, all data which deviates from this dichotomy is cut out from the data set prior to the processing. Why scientists consider this to be a proper method will be examined later.

3 Robert Kunzig, “Finding the Switch: Homosexuality may persist because the associated genes convey surprising advantages on homosexuals’ family members.” *Psychology Today*, 3 (2008), p90

4 LeVay S., “A difference in hypothalamic structure between heterosexual and homosexual men”, *Science*, 253(5023) (1991) p1034–1037

5 Ganna, Andrea et al., “Large-scale GWAS reveals insights into the genetic architecture of same-sex sexual behavior” *Science*, 365(6456), eaat7693

What already becomes apparent, is the methodical procedure of how a liquid state becomes transformed. A situation which is defined by the relation of its subjects and that is hard to describe, is gelled into easier graspable objects. By applying the two categories to this drifting in the sea, their bodies and desires become manageable for statistical inquiry. Consequently, all varieties of possibilities to experience pleasure with each other, gazes and touches, plays, and fights, swimming, snorkelling, riding, and diving, splashes, paddles, splatters, and squirts – they all get contained into the notion of an either/or. As scientists pass on the strange desire to identify determining factors for sexual orientation for the last two centuries, they eventually use this method to prevent their research subject from uncontrolled flowing. Two containers in which the jelly sets, two terms, which already preceded scientific research as a part of everyday understanding, and which operates with the same linguistic categorisation systems. By using jellification, solid data is received and statistical analyses can be conducted, whereby the data's firm qualities are associated with objectivity, reliability and truth. These considerations often disregard the cast form, in which the initially unprocessed information has set. To become a scientific fact, the fluid phenomenon is mingled with a gelling agent, and ultimately consolidates into a hard fact – the heteros are, the homos become.

The material qualities of gel-making serve as a metaphor, a netting of associations in the attempt of understanding, translating, and making scientific research and knowledge-production physically graspable. The process of gelation involves the three components fluid, gelling agent and – to obtain shapes other than a puddle – a moulding container. Fourth, an operating person or group of people is needed to perform the task of gel preparation. Take a deep breath, as the following approach might become a longer dive.

A. Formations of Gel

A I. Gelation

Gelation is a process, which many are probably familiar with from cooking with gelatine, starch, or agar. When boiling a liquid and adding one of these household gelling agents, the mixed solution sets when cooling down and obtains a consistency somewhere between wobbly and rubberlike, depending on the actual recipe. The initially runny substance thereby takes on the form of its surrounding container. The negative space of the mould is transformed into the positive jelly, leaving its imprints on the surface, and constituting its shape. It is quite astonishing how such a small amount of gelling agent can change a liquid phase so tremendously. Usually, only between 2-5g of agar are needed to gel one litre, which means that it can trap up to 500 times the amounts of water compared to its own weight. Regardless of consisting of a natural or synthetic polymer, all gelling agents all have a high liquid retention capacity in common.⁶ This capability is also utilised by putting small sachets filled with silica beads into packages to secure the contents from unwanted moisture.

When making a gel, most often, a gelling agent in powder form is dissolved in a liquid phase. Together they form a colloidal mixture.⁷ To initiate the gelation process, a gel point specific to every gelling agent must be exceeded. In most procedures used in the household, this means passing a certain temperature, pH value or salt concentration.⁸ The dissolved molecules begin to form a large viscoelastic network system throughout the liquid by building crosslinks, which ultimately pervades the solution. However, the relation amongst its components becomes suddenly reversed. Now the liquid phase is dissolved in this three-dimensional scaffolding structure, creating a complex system of micro-capillaries. By this, the liquid's fluidity declines until its flow becomes very little, and with the exceedance of the gel point the viscosity abruptly increases. The solution with polymerizable components transitions into a semi-solid, which's physical state lies between solid and liquid.

The liquid becomes stuck and trapped in the meshwork; wobbly and squishy, also a bit adhesive and tacky – finally, the gel is born.⁹

Finding a scientific definition seems to be similarly slippery compared to the material itself, which might be why there are two different ways of determining what a gel is. Rheology, better known as fluid mechanics, focuses on the observation on how gels behave under the influence of mechanical stress. On its own, gel is a system that does not flow, although it shows viscoelastic properties in response to exterior force. It strains when stress is applied, but also has the ability to return to its original state, when the stress is removed.¹⁰ In other words, when gently squeezed, petted or tapped, the deformed gel bounces back into shape, but might break or tear apart when getting pinched or punched.

The structural definition travels into the microscopic realm and describes gels as a three-dimensional

6 Yiping Cao and Raffaele Mezzenga, "Design Principles in food gels", *Nature Food*, 1 (2008), p106

7 Mousumi Kar et al., *Current Developments in Excipient Science: Implication of quantitative Selection of Each Excipient in Product Development*. In: Rakesh K. Tekade, *Basic Fundamentals of Drug Delivery* (Academic Press, 2019)

8 Yiping Cao and Raffaele Mezzenga, "Design Principles in food gels", *Nature Food*, 1 (2008), p106

9 ibid

10 Hoda Khalesi et al., "Fundamentals of composites containing fibrous materials and hydrogels: A review on design and development for food applications", *Food Chemistry*, 364 (2021) p1

network expanded throughout its whole volume by a fluid.¹¹¹² The common classification depends on the encased substance and distinguishes mainly between hydrogel for retaining water, aerogel for air and oleogel for oil.¹³ Once transformed into a semi-solid, the gel cannot dissolve in the solvent anymore, though it can continue to swell to a certain extent by taking in more of the fluid.¹⁴¹⁵

Reversely, a gel can also get smaller, as it ultimately shrinks over time. Its decrease in volume is associated with the exudation of the encased fluid. In the gel aging process chemical or physical structures might change due to alterations in the polymerization, crystallization, coarsening, ripening and phase transformation.¹⁶

Hence, no gel is forever, they break apart, dry out or vanish under a blanket of mold. When working with them artistically, it is always a time-limited joy, a farewell that starts with their production and a liberation from the need to store them.

In contrast to that, temperature-induced gelation as used in agar and gelatine has the advantage of being thermo-reversible. It holds the potential to be melted and recast and be done over and over and over and over and over again.¹⁷ A great chance for deconstruction, reversals of states, re-moulding, re-shaping, liquidation of what is formed, and beginning of re-flow.



Figure 2 - Jeff Wall, *Jell-O*, 1995, Transparency in Lightbox, 143,5 x 180 cm

11 ibid

12 J. Alemán et al., "Definitions of terms relating to the structure and processing of sols, gels, networks, and inorganic-organic hybrid materials (IUPAC Recommendations 2007)", *Pure and Applied Chemistry*, 79(10) (2007), p1806-1829 p:1806

13 Yiping Cao and Raffaele Mezzenga, "Design Principles in food gels", *Nature Food*, 1 (2008), p106

14 Manas Chanda, *Introduction to Polymer Science and Chemistry: A Problem-Solving Approach*. (Boca Raton: CRC Press, 2006) p vi

15 J. Alemán et al., "Definitions of terms relating to the structure and processing of sols, gels, networks, and inorganic-organic hybrid materials (IUPAC Recommendations 2007)", *Pure and Applied Chemistry*, 79(10) (2007) p1826

16 J. Alemán et al., "Definitions of terms relating to the structure and processing of sols, gels, networks, and inorganic-organic hybrid materials (IUPAC Recommendations 2007)", *Pure and Applied Chemistry*, 79(10) (2007) pp1823-1825

17 Yiping Cao and Raffaele Mezzenga, "Design Principles in food gels", *Nature Food*, 1 (2008), p106

A2. Diving into jelly landscapes

When planning an exploration into a jelly, you need to consider some basic aspects of the terrain's morphology. Endless micro-currents run through the rigid scaffold, making it not only a disorienting but also dangerous system of tunnels. Besides the usual scuba diving gear of oxygen tank, neoprene wetsuit and flippers, additional gear for navigation is needed. A compass, depth gauge and a watch to keep track of the remaining air capacities are indispensable. Apart from that a long cord comes in handy, to mark one's own trace into the endless watery labyrinth. With all the junctions, crossroads and curvatures within the gel geography, not to get lost is central to an expedition, particularly since they branch out into all three dimensions of space. When entering an uncovered terrain, it is vital to stay close to the surface layer to get an overview of the conditions, before diving into it more deeply. Getting to know the area by mapping it thoroughly step by step is a key procedure, in preparation for more profound and far-reaching field trips later on. When entering the gel, the light coming from the outside is diffracted by the first layers into fascinating patterns that wander in various colours over the ceiling of the cavities and create beautiful shadow plays. As soon as moving further away from the surface, the brightness declines continuously as the light rays get swallowed by the walls, and after a zone of dull gloom the interior ultimately becomes pitch-dark. Thus, in-depth dives for studying the gel's stratigraphy require strong light sources and powerful battery packs; an extra weight that should not be underestimated. Numerous low chambers, diverging pathways, and passages flown through by smaller currents follow each other monotonously.

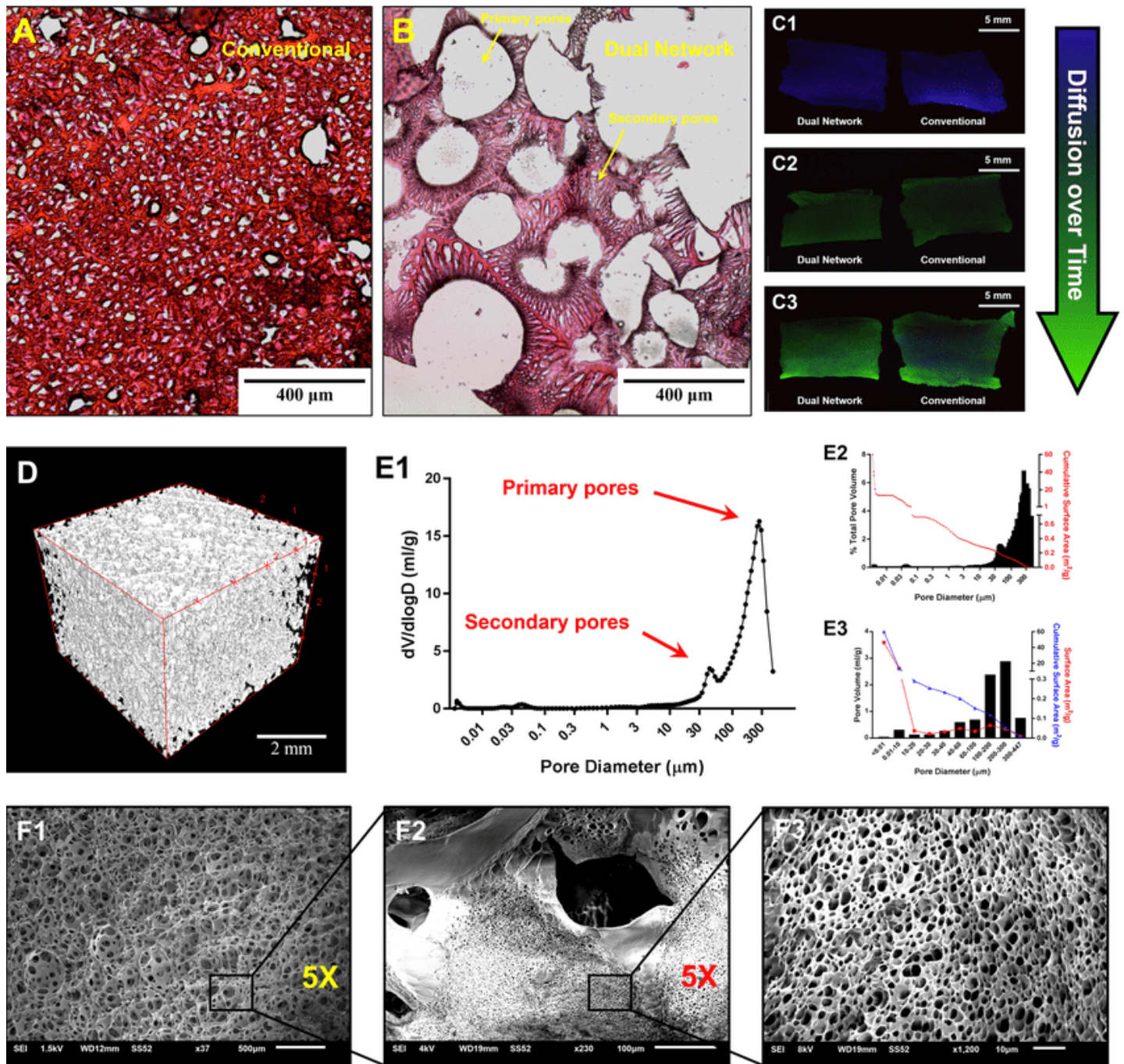


Figure 3 - The light microscope images of the cross-sections of conventional (A) and dual network (B) scaffolds prepared and stained using standard histology/tissue processing protocols. The diffusion of fluorescein sodium salt as the model substance into the conventional and dual network scaffolds after 0 (C1), 0.5 (C2) and 1.5 (C3) h immersion in 10 $\mu\text{g}/\text{ml}$ aqueous solution. Micro-CT 3D image of the dual network scaffold (D). Pore size distribution profile of the dual network scaffold (E1), % total pore volume and cumulative surface area as a function of pore size (E2) as well as pore volume, surface area and cumulative surface area for different ranges of pore size (E3) obtained by mercury intrusion porosimetry. The SEM images of primary pores (F1), porous wall of a primary pore (F2) and the opening of the secondary pores (F3) of the dual network scaffold, 2018

A3. Gelatine - Godmother of semi-solids

Soften the required number of gelatin sheets individually in cold water (about 5 minutes).

Remove gelatin sheets from water, and drain.

Following either the “hot” or “cold” preparation directions below.

Hot Preparation: Heat the liquid to be set. Add drained gelatin sheets.

Stir until gelatin sheets are dissolved.

Cold Preparation: In a small saucepan, over low heat, gently stir gelatin sheets until completely dissolved.

Fold into recipe, before gelatin begins to set. Chill recipe until set.¹⁸

What was first, the gel or the gelatine? After having already been used as a natural glue for millennia, the first documented recipe containing gelatine dates back to the 10th century. The Arabic cookbook *Kitab al-Tabikh* includes many aspic dishes mostly made from fish, made by boiling fish heads.¹⁹ The first known use of the word gelatine in the English language, however, occurred only in 1800 and derives from the Latin *gelare*. The verb, which describes the process of freezing, travelled in form of the Italian *gelatina* and the French *gelatiné* towards the North, before it reached the British Isles.²⁰ About a century later in 1899, the Scottish chemist Thomas Graham clipped the second part of the word gelatine, to describe a semi-solid substance as a gel.²¹

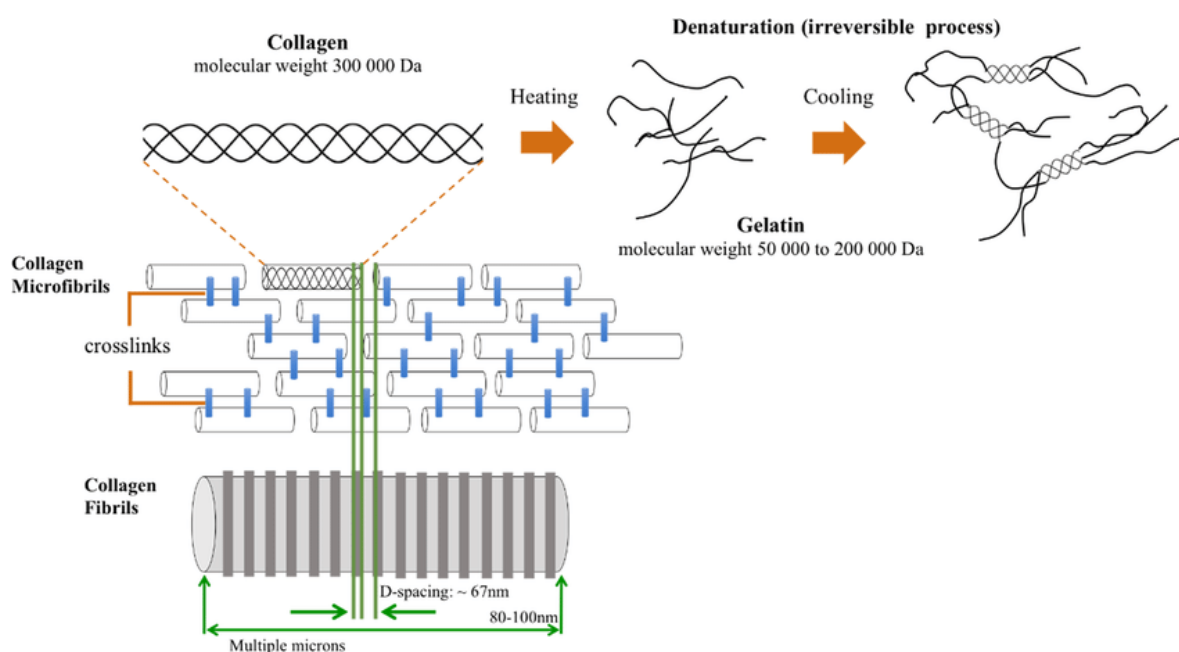


Figure 4 - Schematic representation of the process of collagen denaturation and gelatin production. Collagen molecules self-assemble in a quarter-staggered array into microfibrils to form fibrils with characteristic periodic D-spacing, 2019

18 Dr. Oetker, “Dr. Oetker Gelatine Sheets”, oetker.ca, n.d. <<https://www.oetker.ca/ca-en/our-products/baking-ingredients/dr-oetker-gelatine-sheets>> [Accessed 13 September 2022]

19 Nawal Nasrallah, *Annals of the Caliphs’ Kitchens: Ibn Sayyār al-Warrāq’s Tenth-Century Baghdadi Cookbook* (Leiden: Brill, 2007)

20 Merriam-Webster Dictionary, “gelatin”, merriam-webster.com, n.d. <<https://www.merriam-webster.com/dictionary/gelatin>> [Accessed 22 September 2022]

21 Online Etymology Dictionary, “gel”, etymonline.com, n.d. <<https://www.etymonline.com/word/gel>> [Accessed 22 September 2022]

Gelatine is originally obtained in a lengthy process by boiling cow bones, isinglass or pig feet over a longer period of time. During the heat intense procedure, the contained collagen proteins exudes and undergoes a chemical reaction, in which its polymer strands hydrolyse irreversibly and transform into gelatine.^{22 23} Within the extracellular matrix of mammals and other vertebrates, the collagen reinforces various dermal and connective tissues. Besides skin, also cartilage, bones, tendons and ligaments are enabled to hold together firmly as well as to stretch in multiple directions simultaneously due to its enhancement. The protein is organised as repeating sequences of amino acids, which form left-handed strands and join into a triple helix. This configuration allows for an enormous elongation of the spiralled molecule without rupturing easily. While prolonging, the large amount of retained water within the extracellular matrix gets compressed and flows through the collagen network, providing many tissues with a high flexibility.²⁴ When extracted from the animal body, the triple helices get disconnected and dissolve as single strands in water-based liquids, before they reconnect to each other and form large gel-networks when heated up.²⁵

Raspberry juice with sugar becomes raspberry jelly,
 Artificial raspberry flavors and food coloring with sugar also become raspberry jelly
 Meat juice with sour pickles, egg and sausage or herring becomes aspic
 And all of them intermingled become a strange dish called jello salad.

Nowadays, the animal species gelatine is mainly made from in Europe are cows and pigs.²⁶ In the industrial production pre-treatments are used to free the raw materials from fat and minerals. The collagen structure of bovine connective tissue is very compact and therefore needs to be changed with an alkaline solution over several weeks. In contrast, the less densely interconnected porcine tissue only requires an acid treatment for one day. After rinsing, the raw materials are boiled and the gelatine extracted, followed by the steps of filtration, thickening, and lastly drying.²⁷ What remains is the purified gelatine: brittle, transparent, colour- and flavourless.

The first officially registered patents for industrially fabricated gelatine were made in France, Great Britain and the US in the 18th and 19th century. In the early days only available in a rather crude quality, the granulated or powdery product developed more palatable and convenient over time gained an increasing international popularity. Its mass production made it also more available to classes with lesser monetary means.^{28 29} These days it is also offered in thinly pressed leaves with a diamond-shaped grid imprinted to it. In that form, they made great windows in the witch's house, my grandmother used to bake from gingerbread for every Christmas, reminding one of stained glass.

22 GME Gelatine Manufacturers of Europe, "Manufacturing: Premium raw materials and state-of-the-art industrial facilities deliver a pure, high-grade protein", gelatine.org, <<https://www.gelatine.org/en/gelatine/manufacturing.html>> [Accessed 20 September 2022]

23 Robert H. Bogue, "Conditions Affecting the Hydrolysis of Collagen to Gelatin", *Industrial and Engineering Chemistry*, 15 (11)(1923) p1154

24 Khalesi, Hoda et al., "Fundamentals of composites containing fibrous materials and hydrogels: A review on design and development for food applications", *Food Chemistry*, 364 (2021) pp1-2

25 Yiping Cao and Raffaele Mezzenga, "Design Principles in food gels", *Nature Food*, 1 (2008), p108

26 GME Gelatine Manufacturers of Europe, "Manufacturing: Premium raw materials and state-of-the-art industrial facilities deliver a pure, high-grade protein", gelatine.org, n.d. <<https://www.gelatine.org/en/gelatine/manufacturing.html>> [Accessed 20 September 2022]

27 ibid

28 Mark Hay, "Before Jell-O, colorful Gelatin Desserts Were Haute cuisine: Celebrity chefs served molded jelly dishes to monarchs and royalty", *atlasobscura.com*, 2019 <<https://www.atlasobscura.com/articles/invention-of-gelatin-jello>> [Accessed 14 September 2022]

29 Regina Gattuso, "Celebrate the Heyday of Sweet American 'Salads' With These 7 Dishes: Highlights from an era of convenience, creativity and Cool Whip", *atlasobscura.com*, 2020 <<https://www.atlasobscura.com/articles/sweet-american-dessert-salads>> [Accessed 14 September 2022]

When using the gelatine for dishes other than crafted buildings made from spicy dough, usually a ratio is applied that turns the juices, dairy products, or broth into a light and self-supporting structure. Higher ratios like in gummy candies lead to a rubbery texture and a chewier mouthfeel. Generally, gelatine is added to many other foods such as marshmallows, ice creams and cakes to increase their inner stability. The low gelling temperature of only about 35°C makes them quickly melt by our body temperature and creates a voluptuous sensation in the mouth.

With their wobbly behaviour and soft texture most hydrogels already seem to be bodily related to our own corporeality on a phenomenological level. When looking at the origin of gelatine the familiarity becomes even more evident. Our human bodies literally consist of a great amount of jelly substance, a large piece of aspic walking the world on two legs. And when we eat some, it will be digested and absorbed, only to become part of ourselves. Shaking your bum is like shaking a jelly, and the trapped juices keep them jiggy. The extracted substance becomes a material abbreviation of the human body yet hydrolysed and highly purified.

B5. Boiling the human body down

Genetic fetishism is shortcut in explaining the formation process of the self by reducing it solely to the influence of genetics. Genetic essentialism, as it is referred to officially, is the reductionist view that understands a human body solely as an expression of its genetic make-up and conveys the idea that all significant information about a person is materially encoded in the polymeric form of DNA. material stored in the material form of DNA. Together with the closely linked concept of genetic determinism, the two beliefs suggest that genes are exclusively responsible for a person's traits, behaviour, condition, or even social group.³⁰

Dar-Nimrod and Heine elaborate on the notion of genetic essentialist biases, especially amongst lay people: "Learning about genetic attributions for various human conditions leads to a particular set of thoughts regarding those conditions: they are more likely to be perceived as a) immutable and determined, b) having a specific etiology, c) homogeneous and discrete, and, d) natural, which can lead to the naturalistic fallacy."³¹ Even though only in rare cases a strong genetic determinacy can be found in contrast to far more common "weak genetic explanations", genetic explanations in general have become a central paradigm for both the scientific and public understanding in the 20th century and still continue to be.

As several studies have shown, lay people quickly attribute another person's behaviour to a genetic explanation, despite the fact that a majority of the lay public lacks a complex understanding of genetics. Despite or maybe due a rather basic and limited grasp of the concept of heritability, many people exhibit a greater tendency to overestimate the influence of genes. The media abets this by offering simplified versions of scientific arguments and empirical research results, which "suggest strong genetic explanations and that resonate with the typical lay person's intuitive, and often incorrect, understanding about how genes operate."³²

Especially within the recent years, a broad fascination spread rapidly with the emergence of various direct-to-consumer genetic analyzing services such as 23andMe, which promise their customers to provide them with information such as their ancestry. Beyond that, genetics increasingly play a role in public policy making, legislation processes, and ideological movements. However, these developments should be observed very attentively, as the systematic attempts to measure and categorize the human body and its behaviour has been misused in the most horrifying ways before in human history. Especially members of socially constructed groups like race, gender and sexual orientation become the first to be at risk.

30 Ilan Dar-Nimrod and Steven J. Heine, "Genetic Essentialism: On the Deceptive Determinism of DNA", *Psychological Bulletin*, 137(5) (2011) p800

31 Ibid p800

32 Ibid p803

In the attempt to find interventions and moderating factors to reduce genetic essentialist biases amongst the population, Dar-Nimrod and Heine found that “people are influenced by scientific arguments regarding the role of genes in their lives in some profound ways that are distinct from learning about other kinds of scientific arguments. Not only do people’s genes influence their behaviour in the many intriguing ways documented by behavioural geneticists, but people’s understanding of genes also influences the ways that they live their lives.”³³

It could be appended to the quote that people’s understanding of genes moreover influences the ways how others can live their lives.

A4. Jelly Moulds

One of the oldest images of a gelatine dish found in the medieval handbook Tacuinum Sanitatis³⁴ depicts how a meat aspic gets served in a bowl. Here it seems that it does not get removed from its vessel, but

is directly eaten out of it. Encasing easily perishable foods like meat or seafood under a layer of gelatine was an early-known concept for preservation in times prior to the refrigerator, as it blocks the air and harmful bacteria from getting in contact with them.³⁵

In pre-industrial times and thus before the rise of convenience food, making gelatine was a costly and labour-intensive task. First of all, access to a large amount of animal raw material was needed, and secondly, the extraction process of boiling and filtrating the meat broth consumed a lot of time. Extravagant jellies, therefore, were once reserved to the ruling class, who had domestic servants and professional cooks at hand. Unimaginable nowadays, jelly was once a status symbol.³⁶

Over the centuries, methods of filtrating the meaty juices became more elaborate, so that the translucency of the jiggly substance transformed from a cloudy to a clear or even see-through state. The improvement of the visual qualities gave rise to more extravagant dishes. Not only did this allow the cook to play intentionally with the opacity by adding dairy products,



Figure 5 - Mrs Beeton's Book of Household Management, Advertisement for The Book Of Moulds, p17, 1861

33 ibid p800

34 The original script is the Taqwīm as-Sihḥa by Ibn Butlan of Baghdad from the 11th century, which got Latinized in the 14th century into the Tacuinum Sanitatis.

35 Diana Hubbell, “How America Embrace Aspics With Threatening Auras: From futuristic test kitchens to Under-the-Sea Salad, midcentury Jell-O took a turn for the weird”, atlasobscura.com, 2022 <<https://www.atlasobscura.com/articles/aspics-jello-salad>> [Accessed 14 September 2022]

36 Mark Hay, “Before Jell-O, colorful Gelatin Desserts Were Haute cuisine: Celebrity chefs served molded jelly dishes to monarchs and royalty”, atlasobscura.com, 2019 <<https://www.atlasobscura.com/articles/invention-of-gelatin-jello>> [Accessed 14 September 2022]

but also opened the opportunity to dye the gelatine with different juices or plant extracts to achieve marvellous hues reminiscent of precious jewels and gemstones. Other ingredients could be arranged within the newly gained visual depth. Exotic fruits and precious nuts were staged in a sophisticated layering and became actors captured in wet sceneries tinted by sap. A manuscript from the 16th century lists a ruby-hued jelly made from wine and spices amongst King Henry VIII's favourite dishes. Similarly, an elaborate Tafelspitz-Sülze was served to the Austrian Imperial family at the grand Hotel Sacher in the 1800s.³⁷

The enhancements in producing gelatine industrially amplified the desire of a wider population for intricately shaped jellies and fuelled the craftwork to develop new jelly mould designs. Until then they were mainly manufactured from ceramics, glazed earthenware, glass, cast iron, aluminium, and copper. The emergence of powerful pneumatic machines allowed for a mass-production of copper moulds. Increasingly ornate shapes could be punched out from metal sheets and pressed into different forms. Coinciding with the availability of cheap gelatine fabricated in factories, they became so popular that they are somehow emblematic for the kitchen culture of Victorian Britain.³⁸

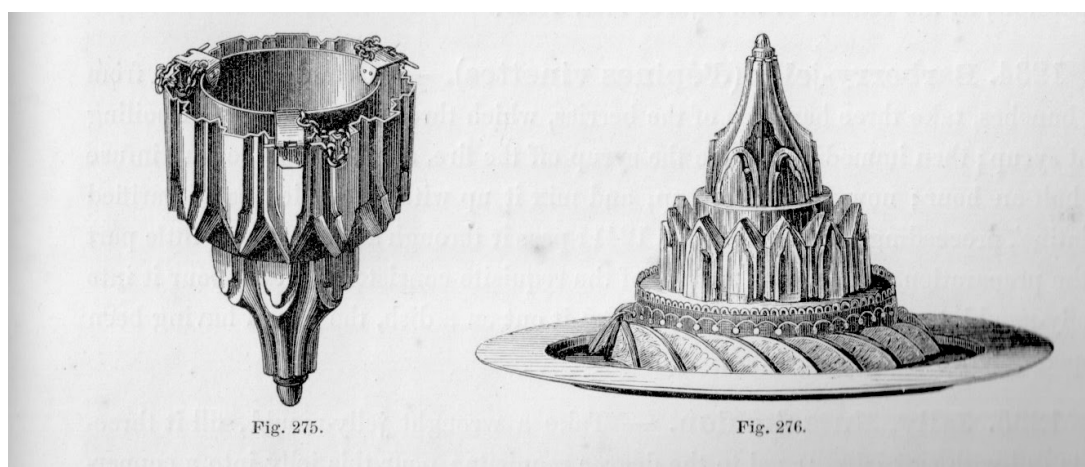


Figure 6 - A neo-gothic macedoine mould and liner, copperplate engraving, from Urbain Dubois, *Cosmopolitan Cookery*, 1870

Whereas the more figuratively shaped moulds often depict animal or floral motives executed as bas-reliefs, the more geometric and architectural styles were admired for their monumental appearance. No wonder, they were placed as spectacular centrepieces on the tables of larger festivities to grab the attention of the guests. The often circular or elliptic shapes varied from simple and round, to fluted, castellated, dome-shaped, or crystal-like or mimicked the current architectural trends.³⁹ While appearing in neo-renaissance, -classicism or -gothic fashion, they usually reached heights of only up to five inches. When casting the jellies higher, the cook risked them to split apart or to collapse under their own weight. A larger amount of gelling agent added to the mixture could help a jelly to remain more stable, however, only at the expense of creating a rubbery and less pleasant texture. Ingeniously, principles employed in statics were applied in the recipes to push the size limits of the edible miniature edifices just a little further. Fruits or profiteroles enclosed in the gel served as an internal armature and mediated tensile forces within the material, which allowed for another one and a half inches. Other highly specialized moulds like the Belgrave, Alexandra Cross or Brunswick Star were designed as two complementary

³⁷ ibid

³⁸ Ivan Day, "Macedoine and Other Eccentric Jellies", [foodhistorjottings.blogspot.com](http://foodhistorjottings.blogspot.com/2013/06/macedoine-and-other-eccentric-victorian.html), 2013 <<http://foodhistorjottings.blogspot.com/2013/06/macedoine-and-other-eccentric-victorian.html>> [Accessed 17 September 2022]

³⁹ World Collectors Net, "Collecting Victorian Copper Jelly Moulds and Price Guide", worldcollectorsnet.com, n.d., <<https://www.worldcollectorsnet.com/articles/collecting-victorian-copper-jelly-moulds-and-price-guide/>> [Accessed 17 September 2022]

parts.⁴⁰ Within the larger outer component a second inner component is inserted, so the jelly can be cast in two steps. At first, a regular layer of translucent gel is poured into the hollow space between the two. Once it has set, the inner shell is taken out and the void is filled with another reinforcing substance. Traditionally blancmange or another mixture rich in gelatine is used to support the whole structure.⁴¹

The tradition of impressive gelatine dishes had another heyday in the middle of the last century especially. Whereas most European cookery largely remained with the tradition of keeping sweet and salty away from each other in their recipes, the US-American jello salads made this a particular food trend. New concoctions of mixing sweet-flavoured gelatine with savoury ingredients, canned foods, juices and even other beverages like coke or lemonade blurred the line between savoury aspic and sugary dessert and enriched many dinners with their strange appeal.

Even though, gelatine was associated as a common utility food with its preservative qualities and with the food rationing during the Great Depression and World War II, the jello salad coincided with the zeitgeist of the post-war period, so that its representational qualities at social events received a renaissance in the 1950s.⁴²

The gelatine's malleability was used to create neat and decorative shapes, the saturated techno colours were perceived as modern and the preparation easy and convenient. Jelly dishes perfectly met the upcoming desires for social mobility paired with reactionary attempts of reinstalling the traditional gender roles. A wife could do both, going to work and still performing tasks in the household. A jello salad could be prepared the day before and was left to chill in the fridge overnight, ready-to-eat the next day and with no need to warm it up. The same applies to the preparations of a dinner party. In addition, a diet low in calories and fat was highly promoted back the days supported by the latest findings of nutrition sciences. Jelly could meet the expectations of a healthy food and its colourless and neutral powdery form also conveyed a scientific appearance, which was appreciated by the consumers at the time.⁴³



Figure 7 - Two different macedoine jellies with their moulds. To stop it moving or floating in the jelly, the inner liner is clipped to the outer mould, by Ivan Day, 2014

40 Ivan Day, "The Jonah Mould – Or Size Matters", [foodhistorjottings.blogspot.com](http://foodhistorjottings.blogspot.com/2017/01/the-jonah-mould-or-size-matters.html), 2013 <<http://foodhistorjottings.blogspot.com/2017/01/the-jonah-mould-or-size-matters.html>> [Accessed 17 September 2022]

41 ibid

42 Mark Hay, "Before Jell-O, colorful Gelatin Desserts Were Haute cuisine: Celebrity chefs served molded jelly dishes to monarchs and royalty", [atlasobscura.com](https://www.atlasobscura.com/articles/invention-of-gelatin-jello), 2019 <<https://www.atlasobscura.com/articles/invention-of-gelatin-jello>> [Accessed 14 September 2022]

43 Diana Hubbell, "How America Embrace Aspics With Threatening Auras: From futuristic test kitchens to Under-the-Sea Salad, midcentury Jell-O took a turn for the weird", [atlasobscura.com](https://www.atlasobscura.com/articles/aspics-jello-salad), 2022 <<https://www.atlasobscura.com/articles/aspics-jello-salad>> [Accessed 14 September 2022]

Interestingly, the once highly embellished jelly moulds, became more modestly shaped during this era. The standard was a circular, sometimes fluted mould, either solid or with a hole in the middle and often made from plastics. In German speaking countries, the Sülzkotelett, which mimics the rather plain form of a cutlet, joined the formal repertory. Altogether, they seem to be less exciting than their jelly-shaping ancestors. Their simple order and plain structure kind of reflects on the world view of the 1950s. The mid-century jelly moulds were modern, decorative, and convenient. Symmetrical and of simple beauty, yet ordinary, prudent and a bit demure.

Later in time, the postmodern era came up with a whole new range of images and dishes conveying new perceptions of jelly. On the one hand, the consumer was provided with fully prepared jelly desserts in boringly plain plastic cups, and with brain-, skull- or heart-shaped moulds made from soft silicon on the other hand. In TV commercials, the brightly coloured dessert leaves its traditional place on the platter and starts to jump around and to dance with kids. Children jiggle them in front of their faces, while cheerfully looking through them and into the camera. Meanwhile, adolescents began to prepare the gelatine with hard liquor and to slurp them as jelly shots. Not in a liquid state anymore, this new form of consuming alcohol needed quite some tongue work, which might have been one of the reasons why it became so popular amongst this demographic.

Whereas the list of edible gels, other gelling agents and even more exciting jelly mould designs could be continued,⁴⁴ the previous examples helped to outline the specific relationship between the gelatine dishes and their respective moulds. Even though they greatly vary in their degree in geometry, neatness and symmetrical order, and cover the whole range from completely plain to ornate and highly embellished, the jelly dish never occurs as a mere substance. Especially due to its everyday nature, its cast form is located in a certain place and time and situated in a distinct social fabric; the era's ideology becomes visible in the shape of the jelly. Its surface, which carries the imprints of the mould, becomes kind of an interface between the different agents involved in the gelation process including not only the cook and the consumer, but also expectations, affect, fashion, manners, objectives, social norms, and the intensity of light-heartedness to allow oneself to play.

As shown in the previous examples, the vast majority of jelly moulds follow the same principle: A simple flip-the-mould and turn-out-the-pudding procedure. Besides the very few exceptions of mould-free jelly shaping, the common types are one-piece and unidirectional. They offer a wide opening at one side, which lends a stable base to the cast object. Hardly any undercuts make it easy to remove the gelled object as a single piece. There is nothing wrong with this, as it is indeed totally practical when preparing food. Hardly anyone wants this to be a complicated operation with a high chance of ending up with a messed-up pile of broken jelly.

Even though these ready-made moulds are easy to apply, at the same time they incorporate the large limitations of how to use them. The shell, which is often made from hard materials, has hardly any wiggle room for altering the preconceived. It might be able to fill them up with several layers in different colours, but that does not really alter the surface structure, the overall volume, or the shape. Producing a jelly in that manner seems like a dead process bare of any creative improvisation and expression of the moment but shaped by a stiff and rigid surrounding structure. The jelly body hardly can come into being without completely relying on the mould.

But what's the matter with this, it's just a substance, a matter, a dish, a subject, an object, a something, some form of hydrogel. But it is also a method of thinking on the threshold of the semi-solid. So, when reflecting upon it from a scientific point of view, another light will shine through the gelled body. What does it mean when a mould together with a gelling agent achieves total control over a liquid, when it eventually seeks to create a matter of fact?

44 Two gels worthy of mention are the three-dimensional jelly art of painting into the jelly by injecting food colourings into gelatine spheres from Latin America and the various ways of producing jelly pearls.

relocates the visual refinement from a structured surface into a colourful inside. Instead of a monolithic jelly body lots of smaller jelly spheres similar to fish spawn are made by pouring drops into special solutions. The method works completely without a shaping mould is traditionally used in Asian cookery and nowadays also in the Western molecular kitchen.

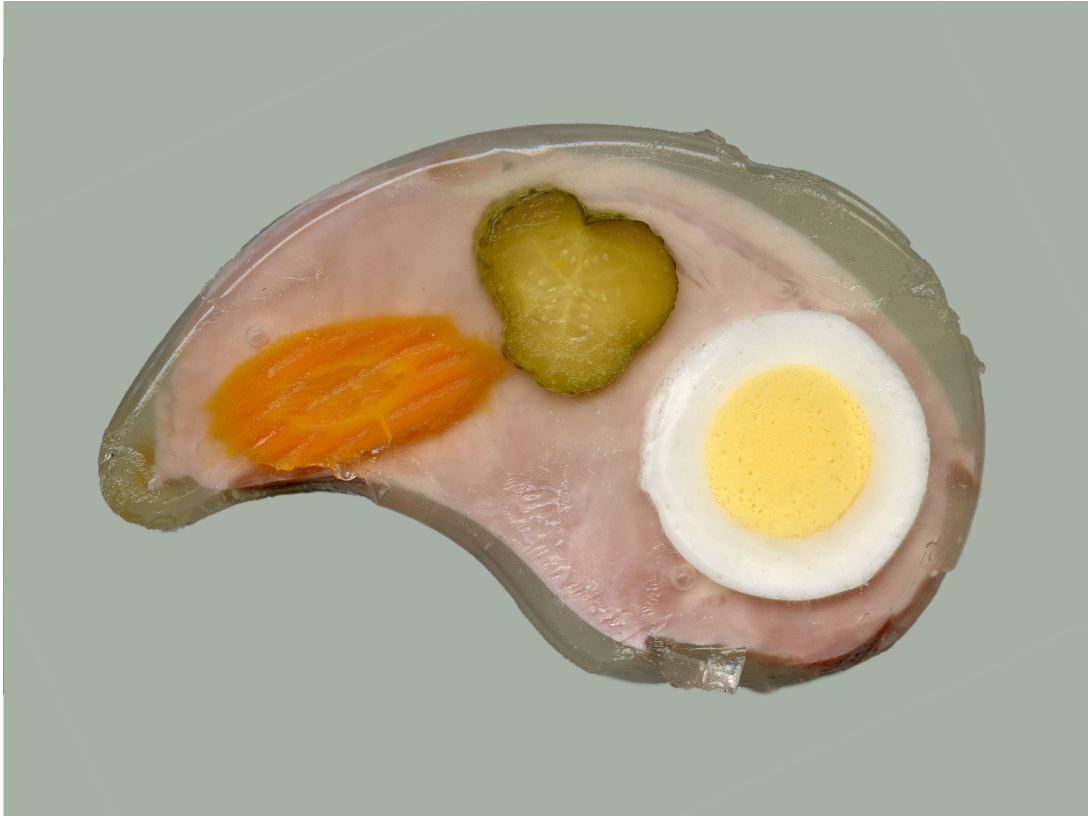


Figure 8 - Industrially made Sülzkotelett, 2005

B6. Ideological Moulds

A research result is always shaped by the social aspects of the group who designs, performs, and interprets the research: Their personal attitudes, the overall zeitgeist, cultural realm, place and purpose contribute to the configuration of an ideology, become the mould in which the research is situated. Analogously to the intricate Belgrave jelly, a research project most often is not shaped by a singular mould, but several ones nested into each other. It encompasses an ontological point of view, which influences how a research is performed. In the field of life sciences, the scientist's methodological approach and interaction with the research subject is closely linked to the biological-philosophical worldview they favour.

The belief that the genesis of sexual orientation can be completely explained through genetic examination is the offspring of a larger ideology called mechanism. The term is short for mechanistic materialism and understands the world as "[...] a mosaic of separate, independent parts. A detailed description of each of these parts and their interactions would produce a complete description of the system"⁴⁵ Hence, its supporters hold the view "[...] of a strictly deterministic universe where, if one knew all the inputs, it would be theoretically possible to predict the precise outcome of any process".⁴⁶ In consequence this means, in order to understand a complex system, it requires an analytical method of reducing the system to its parts, which then can be examined individually. This reductionist approach follows a top-down view, in which the analysis relies on dissecting the parts of a system to the lowest level of organisation, instead of looking at the whole.⁴⁷

Likewise, genetic essentialism understands the emergence and expression of sexual orientation as solely induced by biology and reduces the body to the materiality of DNA. By this it completely disregards any social, historical, and political aspects of the subject matter and the idea of dynamic interactions between those.

This way of thinking is intertwined with another preceding conception, which is that sexual orientation is a category of identity rather than a behaviour. This idea got completely internalised to our ways of thinking and the division into two opposing groups became a naturalised perception. In his work *The Will to Knowledge*, which is part of his historical studies on sexuality, Foucault describes how the notion of homosexuality emerged when an act carried out between two (or more) people was transformed into a personality equipped with its own history, characteristics, morphology, and anatomy. Homosexuality becomes an identity omnipresent in the person including their expressions and behaviour. It turned from being considered as a habit to a person's nature, or as Foucault expresses it, homosexuality became a species in its own right.⁴⁸

In his book *The Trouble with Nature: Sex in Science and Popular Culture*, Lancaster shows how this thinking was tightly linked to medical theorisation concerned with degeneracy, gender hybridity and notions of hygiene as well as to psychiatric practices operated on the queer body. Simultaneously " "The heterosexual," too, steps forth—as a person, as a way of life, as the Edenic paragon of normal, natural desire."⁴⁹ The naturalisation of the heterosexual body is a concept still untouched in recent scientific research, even though not necessarily in pathologizing the queer body, but by situating the research question always around the deviation and non-conformance to the heterosexual norm.⁵⁰

45 Garland E. Allen, "Mechanism, vitalism and organicism in late nineteenth and twentieth-century biology: the importance of historical context", *Mechanisms in Biology*, 36 (2) (2005) p265

46 ibid p269

47 ibid

48 Michel Foucault, *Der Wille zum Wissen: Sexualität und Wahrheit I* (Frankfurt am Main: Suhrkamp, 1983) pp47-48

49 Roger N. Lancaster, *The Trouble with Nature: Sex in Science and Popular Culture* (Berkeley: University and California Press, 2003) p238

50 Roger N. Lancaster, *The Trouble with Nature: Sex in Science and Popular Culture* (Berkeley: University and California Press, 2003) pp237-39



Figure 9 - Rowntree's Table Jellies, Advertisement, 1899

Along the social construction of the homosexual body and the attribution of the sexual act to a person's inherent nature, the concept of homosexuality becomes deeply engraved into people's physicality, on both an individual and a collective level.

This ideological change marked a turning point, as it was a necessity for enabling the sciences to examine queer bodies in their physical materiality in the first places. An academically justified search for specific morphologies, anatomies, or genetics could have only started since the 19th century and has flourished until today.

A liquid gelled in a vessel, a vessel shaping a liquid, a gelling agent forming a gel, data constituted by its moulding forces, a mould which shapes bodies.

B. Knowledge-making and hard facts

BI. Analysing DNA through wet bodies

Interactions of jelly bodies and human bodies:

Making one determinable through the other one

by solidifying the first and fragmenting the second

Gel is a tool, more precisely a wet one. Its rigid structure of tiny tunnels filled with slightly flowing liquid works as a molecular sieve that can be used to sort different macromolecules like proteins, DNA or RNA fragments by size.

This analytical technique is called gel electrophoresis: A flat chunk of agarose gel, a polysaccharide extracted from a certain red seaweed, is cast into a tray. During the casting, the teeth of a special comb are placed inside of it in order to create wells for loading the samples. Prior to the analysis, the large DNA strands need to be cut into shorter fragments. Restriction enzymes cleave the polynucleotide chains at specific recognition sites and since they are located on different spots for every genome, the lengths of the DNA fragments differ for every individual.

After preparing the DNA fragments with a specific solution, the mixture is loaded into the wells and the gel electrophoresis engine gets started by applying an electrical current to the agarose gel. Because the nucleic acids, the DNA is composed of, include a sugar-phosphate backbone, they are negatively charged and thus attracted to the anode. The pores in the gel act like canals, through which the molecules migrate towards the positive pole, however all with a different pace. The speed is inversely proportional to the logarithm of their size. Because each nucleotide contains exactly one phosphate, their charge is proportional to the mass, which is important when sieving larger proteins. However, with DNA the shorter molecules move faster, because they fit more easily through the gel pores and are able to migrate further in the same time. In comparison, the bigger fragments are like heavy-loaded freighters not fitting very well through sluices, and therefore easily overtaken by the smaller and more agile speed boats.

In the end, the race is not examined by observing who crossed a finishing line first, but by the distance they travelled within the same amount of time. In that way, the sieve apparatus makes the DNA molecules draw size-dependent patterns of horizontal lines in the gel substance, which are made visible by using UV light and specific stains, most commonly ethidium bromide.⁵¹

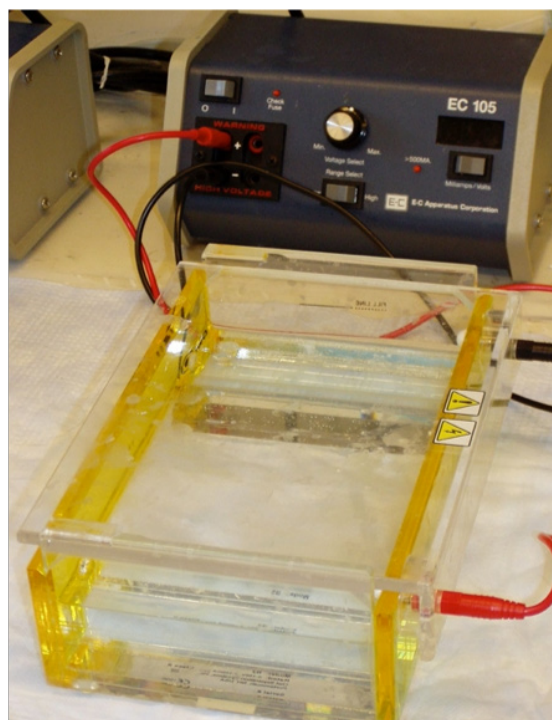


Figure 10 - Gel electrophoresis apparatus composed of a liquid-filled box and attached power supply, 2006

Not comparing the lines created by one sample, but by comparing the patterns of two different samples certain claims can be made.

Same patterns, same genome, same person, a crime scene might be solved.

Similar pattern, similar genome, akin people, yet maybe not familiar at all.

Results found in the wet, that is the promise.

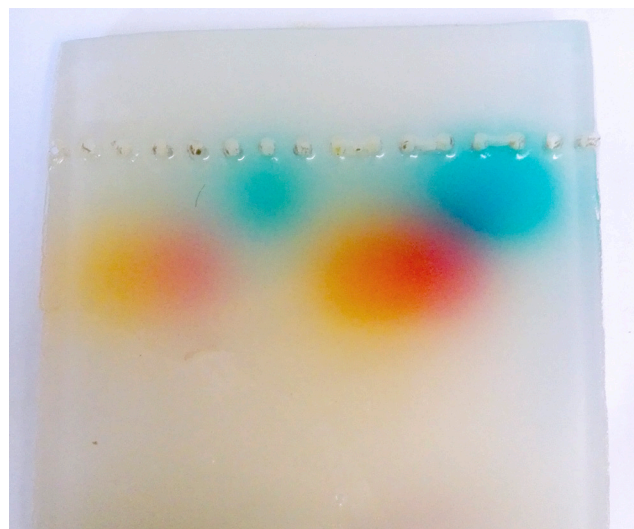
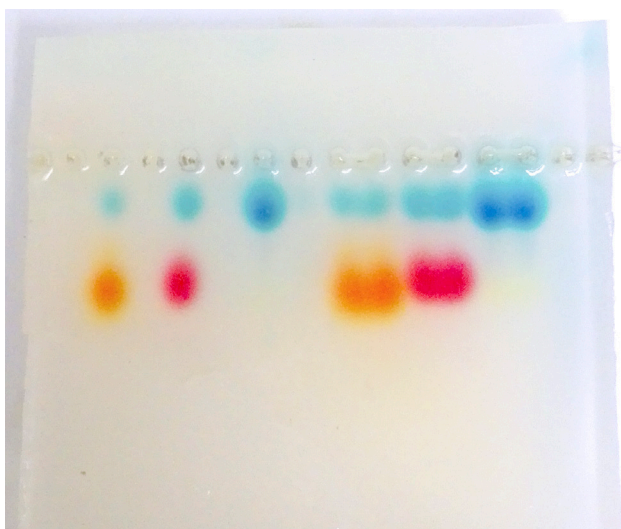
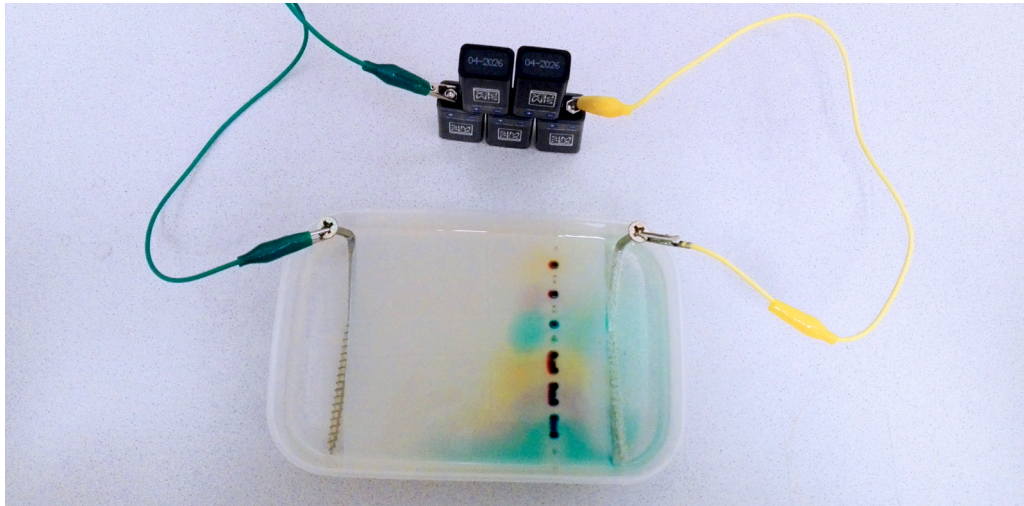


Figure 11 - DIY gel electrophoresis apparatus A) with batteries as a power supply. (B) Pattern of food dye samples while the power is running and (C) blurred out patterns 5 hrs later, 2021

B2. A quick ride through past research on sexual orientation biased by biological essentialism

In fact, the aforementioned is not entirely accurate. Similar gel electrophoresis patterns could also belong to identical twins, as they share the same DNA. This circumstance led to their favorability as research subjects in genetic studies on traits, but also on human behaviour. In twin studies the concordance between monozygotic twins (MZ), dizygotic twins (DZ) and adopted (and thus biologically unrelated) siblings in regard to a specific characteristic is statistically evaluated and compared on the basis of shared genes. The method is based on the unequal ratio of genetic similarities between the pairings in each of the three groups. MZ twins essentially share the same DNA, whereas DZ twins have on average only about 50% of their genes in common, and adopted siblings, whose genetic similarities are random.

The idea is that the extent of the genetic influence on a trait can be modelled through their data. Its traditional application in behavioural genetics promises a disentangling of genetic and environmental components within trait variance.

Unsurprisingly so, research on sexual orientation has been constantly performed with this method. The results hence rely on the ratio of the variance of shared genes amongst individuals sharing a phenotypically expressed trait. In contrast, previous explanatory approaches of sexual orientation heavily relied on anatomical or other biological features, psychosocial concepts, which includes the notion that it can be passed on amongst individuals, as well as a widespread pathologisation of homosexuality, treating it as a form of disease. Upsettingly, there are still plenty of people and governments who still believe in this kind of idea.

A review from Pillard and Bailey from 1998 on family and twin studies conducted in the 1960s and the 1990s, reports ambiguous results regarding the genetic influence on homosexuality. Regarding the concordance of the sexual orientation between regular siblings (no twins), they state that nonheterosexual male probands, who lie in the categories 2-6 on the Kinsey scale⁵², had about five times as many nonheterosexual brothers as the heterosexual probands (0-1 on Kinsey scale). Also, “[t]he few probands who were bisexual (2-4 on the Kinsey scale) had as many gay brothers as did probands who were exclusively gay. Individuals who had “more than occasional” gay contacts, even if most of their contacts were heterosexual, shared the tendency toward familial aggregation as strongly as did the exclusive homosexuals.”⁵³ They report similar findings for females as “Nonheterosexual women also appear to have more nonheterosexual sisters than do heterosexual women, although the familiarity estimates for women vary more widely.”⁵⁴

Already in the beginning of their paper, it becomes apparent, how questionable the research concerned with sexual behaviour truly is. The researchers strive for a terminology that maps it beyond a mere hetero/homosexual dichotomy. However, they still have to rely heavily on the binary of two sexes and by this, they miss to distinguish them actively from gender identity.

Subsequently, Pillard and Bailey present results of several twin studies, which compared the concordance between monozygotic twins (MZ), dizygotic twins (DZ) and adopted siblings, including studies carried out by themselves in 1991 for male⁵⁵ and 1993⁵⁶ for female probands. Out of 56 MZ twins, who were ascertained, 52% reported concordance for a nonheterosexual orientation, compared to 22% in 54 DZ twins and 11% in a group of 57 adopted male siblings. When modelling the data with multifactorial threshold models, which included different assumptions such as volunteer bias or population trait frequency, they calculated a heritability factor ranging somewhere around 0.5, which means that still about 50% of the factors influencing sexual orientation cannot be explained by genes. The female group shows a similar result with a heritability of about 0.5 and a similar distribution pattern: Concordance rates of 48% for MZ twins, 16% for DZ twins and 6% for adopted sisters. Contrastingly, another study by Bailey et al. in 1996⁵⁷ could not replicate the results and basically showed nearly no difference in concordance between female MZ and DZ twins, which consequently would mean that there is no heritability for female nonheterosexual desire. However, this study never got published.

Pillard and Bailey therefore make the effort to instance different biases that could occur in the studies and might be partly the reason for the different findings. An unbalanced recruitment of the probands,

52 The Kinsey scale was introduced by Alfred Kinsey in 1948 as a methodological tool to describe sexual orientation on a scale from 0 – 6, which respectively stood seven ranks ranging from exclusively heterosexual to exclusively homosexual.

53 Richard C Pillard. and J. Michael Bailey, “Human sexual orientation has a heritable component.” *Human Biology*, 70 2 (1998) p354

54 *ibid*

55 J Michael Bailey and Richard C. Pillard, “A genetic study of male sexual orientation”, *Archives of general psychiatry*, 48(12) (1991) p1089–1096

56 J. Michael Bailey et al., “Heritable factors influence sexual orientation in women”, *Archives of general psychiatry*, 50(3) (1993) p217–223

57 *ibid* p356+362

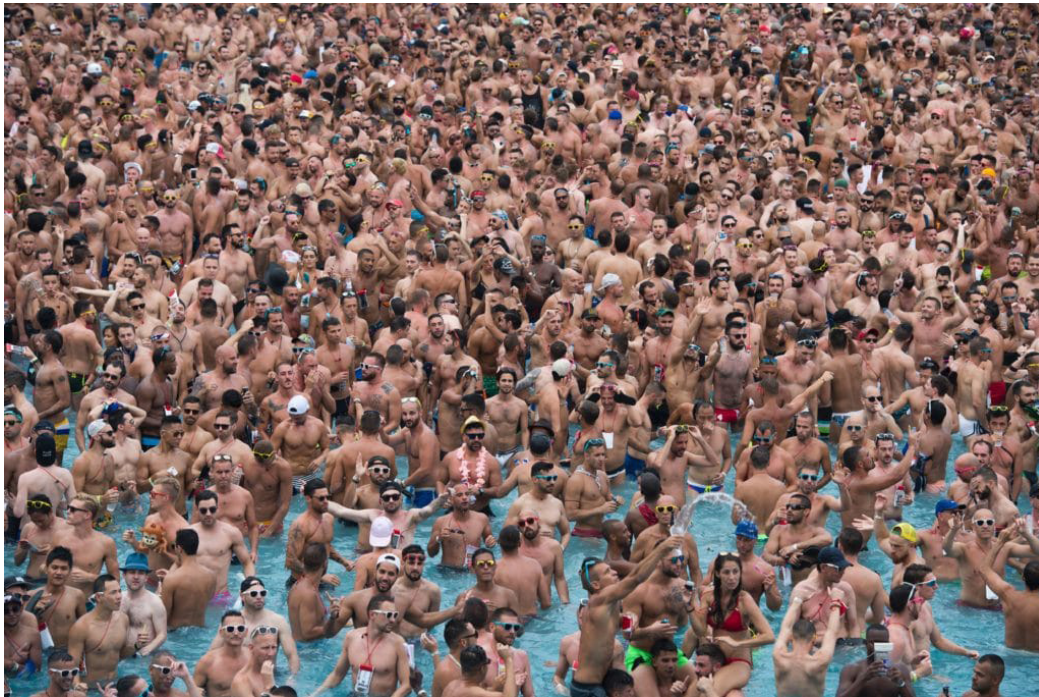


Figure 12 - A wonderful medley of Jello and Vienna Sausages, 2017/18

Figure 13 - SPAIN-GAY-PARTY. Revellers party in a swimming pool during the Circuit Festival's Water Park Day, an open air gay party in Vilassar de Mar, near Barcelona, on August 9, JOSEP LAGO/AFP via Getty Images, 2016

volunteer bias (probands who volunteer in the study differ from the overall population), and concordance-dependent bias (sibs who share a trait are more likely to join this research) are listed here. An asymmetric concordance-dependent bias, which is that MZ twins are more likely to join than DZ twins, could seriously distort the heritability estimates.⁵⁸

More recent twin studies from the last decade found that the heritability of homosexual behaviour lies between 20-50%^{59,60,61}, again the divergence in the scientific results is rather broad. Even though Bailey and Pillard have already shown in 1990s that most probably there is a heritable component, but that it can be neither probably measured nor is it a stable factor in between different proband groups or populations, scientists continued the research with similarly inconsistent results.

Another issue often not covered sufficiently in the studies but even more in their public communication, is the importance to stress the limits of what statements can be made with the findings. Heritability only states the variation amongst individuals in a population and from there estimates “the proportion of phenotypic variance that is due to genetic factors.”⁶² However, since heritability is a statistical value that is found by comparing numerous individuals within a population, it cannot be easily applied to a single individual. Consequently, the detected correlations cannot be used to predict a person’s likelihood to present a certain phenotype such as sexual orientation.

Trying to understand heritability studies strongly entangled with eugenics in Europe and Northern America makes the waves roll even higher. So, what is specifically important to keep in mind is that they are a statistical inquiry making statements about populations and not the examination of individuals.

Generally, the whole history of the compulsive need to delineate and explain homosexual behaviour scientifically is not an easy one to navigate, at least without getting strong feelings. Together with the invention of the term homosexual is just about 150 years⁶³ old (the word heterosexual followed only about 20 years later), the strange interest or even obsessive fascination for finding determinants of same-sex sexual desire spread. Before shifting to the examination of genes, common explanations focused often on psychopathological and/or socioenvironmental models. Both explanations share the idea, that homosexuality is an acquired phenomenon, either culturally or as a medical condition, and implies the harmful notion, that it can be changed. Many cruelties in the long trajectory of atrocities done to members of the queer community stem from this view: Sufferings from ostracization, juridical and political persecution, the deportation to rehabilitation camps, coercive sterilizations and other forced medical interventions including lobotomies, hormone treatments and electroshocks, and finally mass extermination. The list is long and cruel. The belief in these theories is still not dead today, as laws prohibiting to show queer affection publicly are reintroduced in various countries also within Europe these days.

Instead of replacing them, the newer findings that try to identify genetic determinants for homosexuality are only complementing them. The idea that homosexuality is inherited, and people are born gay, often does not rule out the homophobic fear that one can become homosexual during their life, even though both ideas are contradicting each other. Before looking into genetics, the biological essentialism was centered around brain anatomy, neurophysiology, and hormonal system, to the genome.

Throughout the last century and especially again in the 1990s, quite a lot of advocates of biological essentialism set out to discover what appeared as a white spot in their understandings of sexuality.

58 Richard C Pillard. and J. Michael Bailey, “Human sexual orientation has a heritable component.” *Human Biology*, 70 2 (1998) pp-356-357

59 Långström, Niklas et. al., “Genetic and environmental effects on same-sex sexual behavior: a population study of twins in Sweden”, *Archives of sexual behavior*, 39(1) (2010), pp75–80>

60 Alanko, Katarina et al., “Common genetic effects of gender atypical behavior in childhood and sexual orientation in adulthood: a study of Finnish twins”, *Archives of sexual behavior*, 39(1) (2010) p81–92

61 Zietsch, Brendan P. et al., “Sexual orientation and psychiatric vulnerability: a twin study of neuroticism and psychoticism”, *Archives of sexual behavior*, 40(1) (2011) p133–142

62 Wray, Naomi and Peter Visscher, “Estimating trait heritability” *Nature Education*, 1(1) (2008) p29

63 Michel Foucault, *Der Wille zum Wissen: Sexualität und Wahrheit 1*, (Frankfurt am Main: Suhrkamp, 1983) p47

They returned from their voyages with a multitude of scientific findings about the influencing factors of homosexuality: a decreased volume in the interstitial nucleus of the anterior hypothalamus (INAH) in gay men, a structure within the limbic system, which is thought to be linked to sexual behaviour⁶⁴, the gene Xq28, a subtelomeric region on the long arm of the X chromosome, which was concluded as a maternal transmission of male homosexuality⁶⁵, the fraternal birth order, proposing that a male fetus induces a maternal immune reaction of antibodies towards subsequent male fetuses and was thought to interfere in the development of sex-dimorphic brain structures of male fetuses in subsequent pregnancies⁶⁶ amongst some other.

Studying the research designs more closely though, most of them lack reliability. Very small sample groups, biases in the acquisition of probands, non-replicability of the results⁶⁷ by other scientists or the attempt to not publish the complete data sets makes them contestable. Together with brain anatomies, neurophysiology, chromosomes, and hormonal systems a common thread throughout all of the studies is a general over-simplification of sexual diversity.

B3. The construction of a gay genetic architecture

The research went on ever since, and in 2019 Ganna et al. published a research article titled Large-scale GWAS reveals insights into the genetic architecture of same-sex sexual behavior⁶⁸ in the Science Magazine, which was a novelty because its search for specific genetic variations included the enormous amount of about half a million probands. The study's two main cohorts consist of the data of 408,995 genotyped UK residents aged 40-70 years provided by the UK Biobank and 68,327 customers of the direct-to-consumer genetic testing service provider 23andMe, who were mainly located in the US. Genetic studies of this size only became possible recently, when technologies for genetic analysis got more feasible and less expensive.

The study's objective was to identify SNPs⁶⁹ of the human genome, which are linked to a person's sexual behaviour engaging with the same sex. The researchers performed a genome-wide association study (GWAS)⁷⁰, with the result of identifying five loci that show a statistical significance in the association with same-sex sexual behaviour. Two of them apply only for males, one only for females, and two for both of these sexes. Overall, Ganna et al. conclude that "all tested genetic variants accounted for 8 to 25% of variation in same-sex sexual behavior".⁷¹

64 LeVay S., "A difference in hypothalamic structure between heterosexual and homosexual men", Science, 253(5023) (1991) p1034–1037

65 Hamer, Dean et al., "A linkage between DNA markers on the X chromosome and male sexual orientation", Science 261(5119) (1993) p321–327

66 Blanchard, R. and Klassen, "H-Y antigen and homosexuality in men", Journal of theoretical biology, 185(3) (1997) p373–378

67 Rice, G et al., "Male homosexuality: Absence of linkage to microsatellite markers at Xq28" Science, 284(5414) p665–667

68 Ganna, Andrea et al., "Large-scale GWAS reveals insights into the genetic architecture of same-sex sexual behavior" Science, 365(6456), eaat7693, p1

69 Single nucleotide polymorphism (SNP) refers to single-letter differences of the DNA that occur at a specific position in the genome amongst individuals within a population.

70 In genome-wide association studies (GWAS) the association between genetic variants, typically SNPs, and phenotypic trait is statistically examined. Correlations between the two are found, if many people who share a trait also have certain SNPs in common.

71 Ganna, Andrea et al., "Large-scale GWAS reveals insights into the genetic architecture of same-sex sexual behavior" Science, 365(6456), eaat7693, p1

In their introduction the researchers already declare that their findings “do not allow meaningful prediction of an individual’s sexual behavior” and only “underscore the complexity of sexuality”.⁷² Nevertheless, they confidently add, that the research “provide[s] insights into genetics underlying same-sex sexual behavior”.⁷³

Interestingly enough, many of the critical remarks that can be made towards the ideological underpinning of the applied method, are already tackled in the research paper. It makes one wonder, why they still continued with the study knowing how flawed it actually was from the very beginning. First, the study again works with the longstanding binary of a male and female sex. To make this feasible, they dropped “individuals from [their] study whose biological sex and self-identified sex/gender did not match. This in an important limitation of [their] analyses because the analyses do not include transgender persons, intersex persons, and other important persons and groups within the queer community.”⁷⁴ Tweaking the data set in the way of erasing whole groups of people from the research is justified by the scientists merely by stating that it would be common practice to do so.

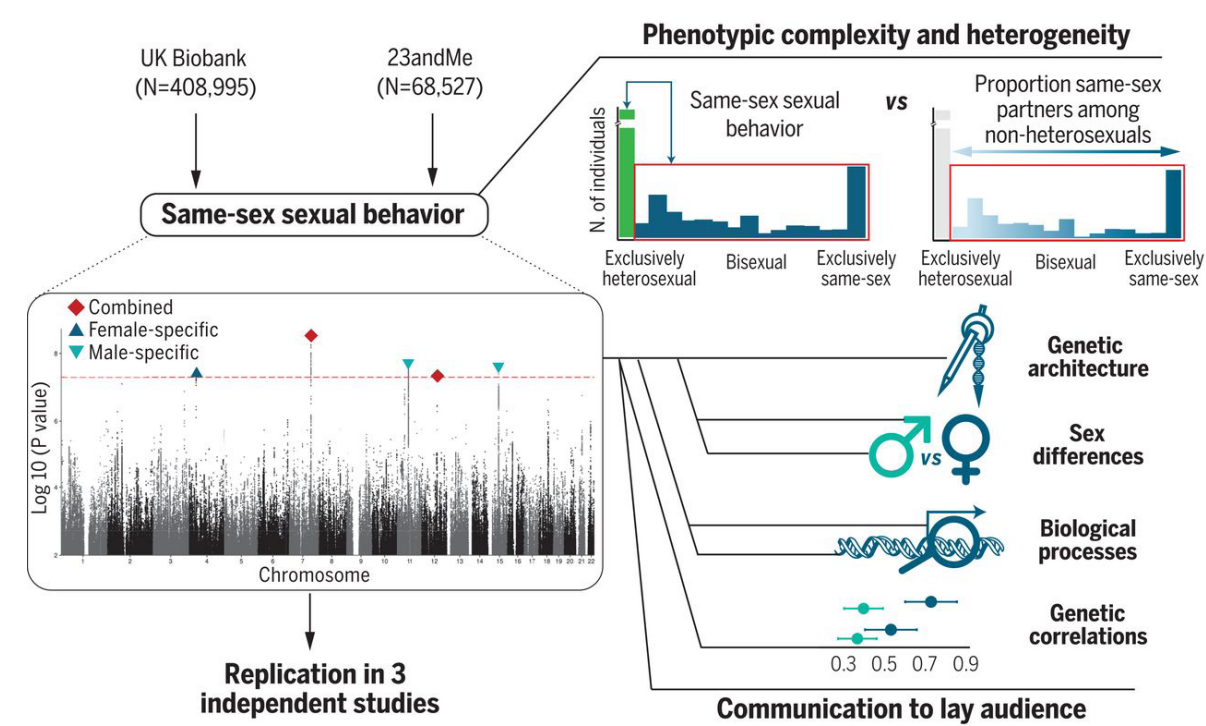


Figure 14 - A genome-wide association study (GWAS) of same-sex sexual behavior reveals five loci and high polygenicity, 2019

Furthermore, they also “acknowledge that the grouping phrase “nonheterosexuals” has the potential to present messages of othering (that is, undesirable marginalization of another person or group on the basis of their sexual expression)—by defining an “outgroup” in reference to an “ingroup” and implying that “nonheterosexuals behavior” may have a negative connotation, whereas “heterosexual behavior” may have a positive one. [They] wish to make clear that [their] choice of language is not meant to forward messages of othering on the basis of sexual behavior.”⁷⁵

Although the data was initially surveyed more carefully and gave the probands several alternative answers to choose from, the study reduced them into two categories. Participants from the UK Biobank could self-report their total number of sex partners along with the number of same-sex sex partners over their lifetime, from which a ratio between the two was calculated and registered in a gradual

72 ibid
73 ibid
74 ibid p2
75 ibid p2

Wcontinuum comprising sixteen ranks. Slightly different, customers from 23andMe completed a sexual orientation survey, in which they stated their sexual encounters into seven response options varying from other to same sex only. However, to conduct the GWAS those answers were transformed into dichotomous attributes, by assigning everyone who ever in their life reported sex with a person from their own sex, even if only once, to the nonheterosexuals. In contrast, only people who reported to never have had sex with same-sex partners counted as heterosexuals. To justify this grouping decision, Ganna et al. cite other scientific findings, which propose that “sexual preference is taxonic rather than dimensional in structure”.⁷⁶ They conclude from this arguable suggestion that the clear-cut differentiation between individuals reporting only opposite-sex preference from people who are somewhere on a same-sex preference spectrum is based on some natural foundation rather than on an arbitrary decision. An ever vs. never had I sex with someone from my own sex-binary replaces the nuanced data.

On top of that, Ganna et al. are looking for correlations with other traits, including mental health traits “because they are substantially heritable [...], and previous population surveys have shown elevated risk of adverse mental health outcomes (such as depression, anxiety, or substance use) in sexual minorities”.⁷⁷ In their study states to have found genetic linkage between same-sex sexual behaviour and personality traits like loneliness and openness to experience, as well as mental health disorders like depression and schizophrenia. Additionally, it claims “[...] genetic correlations with bipolar disorder, cannabis use, and number of sexual partners were significantly higher in females than in males”.⁷⁸ The researchers mention that the correlations could have different reasons, including “[...] environmental factors relating to prejudice against individuals engaging in same-sex sexual behaviour”,⁷⁹ yet, they throw these parameters into the same pot again. Suggesting overlaps in their heritability has a long history when pathologizing same-sex desire and leaves the attentive reader with a bitter taste.

The genetic architecture of human sexual orientation, as it is referred to in the research title, architecture as something planned and constructed, now is presented as the discovery of a blueprint to the understanding of our bodies, our minds, and our social behaviours. But isn't architecture something planned, designed, and constructed?

Sexual behaviour is so liquid in its very core and how it occurs within a population, that it needs to be jellified in order to make certain research questions possible. The data is artificially solidified, parts are cut off and the remains get crudely dissected. We are presented with research results, that tell us about five genetic loci that can be associated with same-sex sexual behaviour and supposedly have an influence on the expression of the trait.

Human desires, pleasures and wet dreams are not grasped, but grabbed with stubby fingers. The computability of desire is what seems to make some kind of people drool. Fantasies once soggy and swampy – operationalised, put into measurable variables and divided in two. Iterations of uncovering the undreamable incalculability. Fog on silent waters.

Or as Tatianna would say – Choices.

76 ibid p1
77 ibid p4
78 ibid p5
79 ibid

B7. Splashy desserts

“In present day century, however, Western society has become more secular and more rationalist, and the chief sources for social theory have become the professional intellectuals, the scientists, economists, political theorists, and philosophers who work largely in universities. These intellectuals are aware of the power they have to mould public consciousness, and they constantly seek ways in which they can publicize their ideas. The common pathway is to become a minor celebrity, known for some all-encompassing and usually rather simplistic “discovery” about the secret of human social and psychic existence. It’s all sex or money or genes. A simple and dramatic theory that explains everything makes good press, good radio, good TV, and best-selling books. Anyone with academic authority, a halfway decent writing style, and a simple and powerful idea has easy entry to the public consciousness.”⁸⁰

Scientists earn their living on their academic activity, so the more scientific output they produce and the more this output is cited, popularised, and reproduced, the more fundings can be acquired and respectively, the more money will be provided to perpetuate their research and perpetuates it. Sex sells, also in the sciences.

As the same holds true for media, the news reports usually play along in this strategic game. For example, in the coverage of Hamer’s findings on a gene located at Xq28, that was thought to have direct influence on the sexual orientation of men, more specific questions on the statistical significance, causal relationship and research design were completely omitted. The information was served to the public audience more in a way that Lancaster calls an “oversimplified folkloric understanding of genetics and heritability”⁸¹, which most often implies the notion of immutability of a trait. Further on describes the media’s sensation-seeking phrasing of the topic by referring to “Headlines [that] tell us that biologists have unearthed the “roots” of sexual orientation”⁸², a wording that glosses the complexities of genetic research and biological processes. Instead of explaining the restraints of the research properly, the concept of heritability is presented in a way, which easily reads as “gay genes” and often mistakes genetic correlation with causation.

As both the sciences and the media are at least to a certain degree moulded by culture in which they operate, research based on biological determinism is continuously carried on. The results often get reported in mainstream media, despite stemming from hardly representative sample groups so small that they are close to the error limit. Instead of scientific quality the decisive criterion for a successful publishing seems to lie in being in accordance with pre-existing paradigms on sexuality. More elaborate studies that follow up, but cannot reproduce the previous findings, however, are mostly dismissed from the news. The expectations seem to be that hardly anyone would be interested in nonfindings or re-working. So, whereas the public is left with the information that sexual orientation emerges through biological predispositions, the scientific community often concludes that the true determinants have still to be found, instead of stepping back from an uncoverable causality.⁸³ This reoccurring pattern of repeating a biological examination on a social construct, is a principle that scientists both create and are socialized with. What becomes replicated here is a scientific behaviour instead of scientific findings.

80 Lewontin, Richard C., *Biology as Ideology. The doctrine of DNA* (Toronto: House of Anansi Press, 1991) p vii

81 Lancaster, Roger N., *The Trouble with Nature: Sex in Science and Popular Culture* (Berkeley: University and California Press, 2003) p254

82 *ibid*

83 *ibid* pp240-257

More critical reviews like philosopher Edward Stein's *The Mismeasure of Desire: The Science, Theory, and Ethics of Sexual Orientation* published in 2001, which criticizes many of the afore mentioned studies by LeVay, Hamer, Bailey and Pillard from the 1990s were given little attention in mainstream but also the queer press. Back then, he already propagated the necessity of opting out from the absolute claims of biological essentialism or respectively social constructivism.⁸⁴ However, conceptions which convey ideas of unclarity, vagueness and ambiguity do not enjoy the largest popularities.

Bruno Latour introduced the concept of the theatre of proof and refers to the sophisticated construction of presenting an experiment to an audience, which convinces them of the validity of the shown proof. In order to work, a few conditions must be fulfilled in the presentation. The audience needs to be interested in it (of course, the public always is on fire, when the topic is sex) and the proof has to be clear, undisputable and dramatic all at the same time: "Without this double movement of interest and dramatization, the tests might have been indisputable but would either have remained undiscussed because they interested nobody or [...] have been discussed but remained disputable."⁸⁵ Different agents like a laboratory, working techniques and literary resources can be utensils to enforce its effectiveness, as well as the construction of a scientific article. Whereas the scientific language is hard to understand for an untrained audience, it similarly contributes to this effect. "Indeed, the exactness of a science does not come from within. It, too, comes from the strength of the agents with whose fate it has managed to become linked."⁸⁶ Nonfindings and watery interrelationships though, are much harder to stage in the scientific theatre.

The lay audience can be easily convinced by the results presented by Ganna et al. The extremely large data set, they have conducted their work with, seems both impressive and indisputable. Especially, when considering how much the public is often misled by genetic essentialist bias, they can easily come up with the impression that determinants defining a person's sexual orientation have been finally found.

A5. Translucent matters

Another crucial question considering the large desirability of jelly for representational purposes than other mouldable dishes like cakes, meat loafs or puddings, as they could be cast into towering heights. One reason certainly is the appealing translucency of gelatine dishes, through which they not only present the outer surface, but also reveal their inner structure. The interior of the backside becomes visible, light plays on the surface and dances throughout the whole body. Exciting shimmers and gleams. Refraction distorts the encased ingredients and bends them into funny and odd shapes. The raw substance transforms into edible crystals and bright-shining jewels. Imagine how precious they must have appeared before thermoplastic could be turned into any shape and the transparency was mostly reserved to brittle glass, diamonds and quartz, and wobbling jelly.

84 Stein, Edward, *The Mismeasure of Desire: The Science, Theory, and Ethics of Sexual Orientation* (Oxford: Oxford University Press, 2001)

85 Latour, Bruno, *The Pasteurization of France* (Cambridge: Harvard University Press, 1988) p87

86 *ibid* p52

B8. Forced translucency

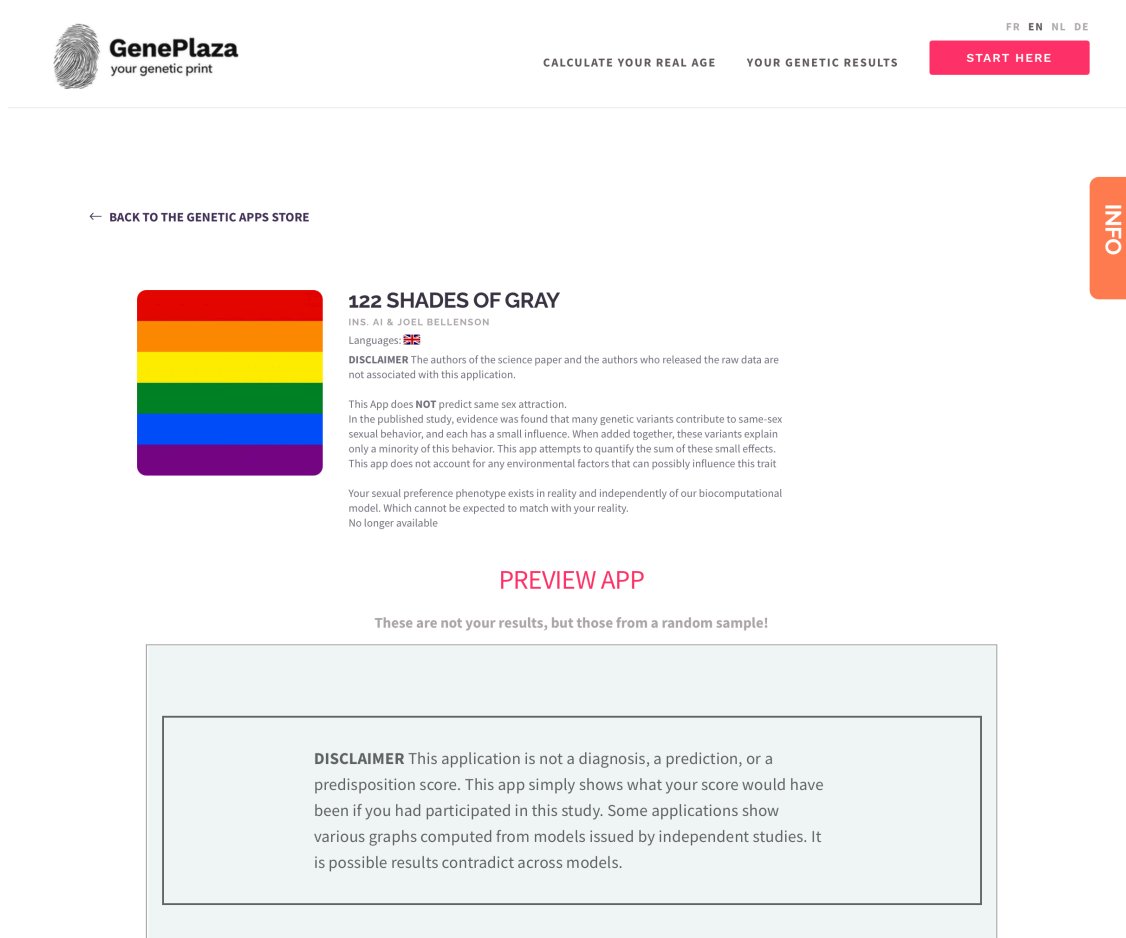


Figure 15 - GenePlaza: 122 SHADES OF GRAY, by Joel Bellenson, Screenshot from geneplaza.com, 2019

“On the other hand, if someone’s message is that things are complicated, uncertain, and messy, that no simple rule or force will explain the past and predict the future of human existence, there are rather fewer ways to get that message across. Measured claims about the complexity of life and our ignorance of its determinants are not show biz.”⁸⁷

In October 2019 and thus only about a month after the publishing of the research article by Ganna et al., Joel Bellenson developed an app called *How Gay Are You?*, which was offered for US\$5,50 on GenePlaza, an online marketplace for genome-interpreting apps. The genetic data is supplied to the individual person by direct-to-consumer genetic sequencing companies like 23andMe by sending in a saliva sample. By 2019 already tens of millions of people worldwide have had their DNA sequenced by direct-to-consumer companies and up to 62% of the customers upload their genetic data to third-party websites for further genetic analysis. With other apps provided by GenePlaza traits like intelligence, neuroticism or the taste perception of cilantro can be assessed.⁸⁸

⁸⁷ Lewontin, Richard C., *Biology as Ideology. The doctrine of DNA* (Toronto: House of Anansi Press, 1991) p.vii

⁸⁸ Maxmen, Amy (2019). “Controversial ‘gay gene’ app provokes fears of a genetic Wild West”, *Nature*, 574(7780) (2019) pp609-610

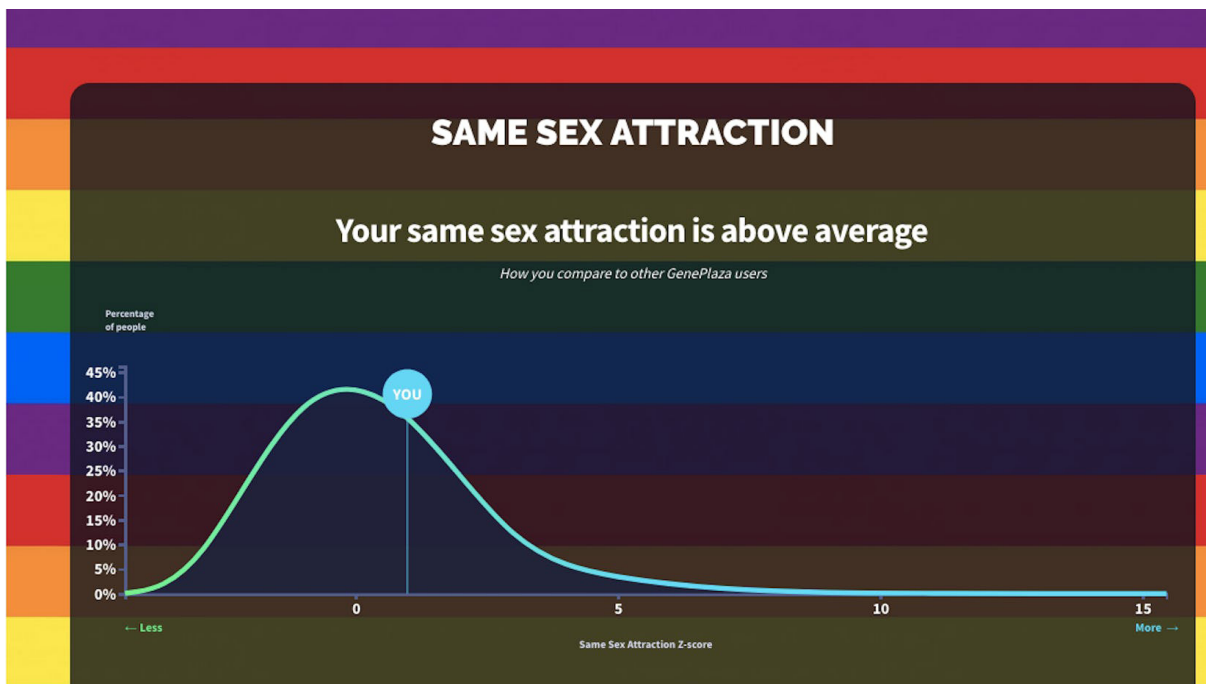


Figure 16 - Bell-shaped curve to illustrate a customer's results on same sex attraction generated within the app *122 SHADES OF GRAY*, Screenshot from geneplaza.com, 2019

The app *How Gay Are You?* made an interpretation by using an algorithm based on the research results of Ganna's GWAS. The result is then visualized as a marking on a graph shaped in a bell curve, which supposedly tells the customer the score as if they had participated in the original study.⁸⁹

Geneticist Sarah Nelson, who studied interpretation tools of third-party developers, argues that geneticists are often not aware how difficult it can be for a lay audience to understand their research in a nuanced way. The app only exemplifies how easily scientists can lose the control on how a study can get communicated to the public.⁹⁰

A disclaimer in the first version of the app cited the study published in *Science* as the source of their information. It also warned the users that the app did not predict same sex attraction. However, the small text, which appears when opening the app, gets easily forgotten, when it is followed by a flashy image including rainbow colours and a scientifically looking graph, that evokes feelings of neutrality and objective truth in the reader. The small remark on the side, which explains to the user that the app only tells the score as if they had participated in the original study, is hardly understandable information for many people as no further explanation is provided.

When the researchers complained that the app misrepresented their work and that its test was not grounded in science, the app was firstly renamed to *122 Shades of Gray* with a disclaimer that the authors of the scientific study were not affiliated with the app, before it got finally deleted from GenePlaza.⁹¹

89 ibid p609

90 ibid p610

91 ibid p609

Bellenson, an US American entrepreneur who is not a scientist, programmed the app within a weekend. Residing in Uganda, a country, where gay sex is punishable by life in prison, he claims that besides its non-predictiveness, the app still encourages the larger public to engage in sciences: ““It may not be much better than a horoscope or a tarot-card reading, but at least it lets bioinformatics be something fun.””⁹² Moreover, he rejected the fear uttered by various scientists that similar products rooted in genetic research could be misused and to harm vulnerable queer people around the world. He calls a scenario like this ridiculous and absurd by claiming that countries like Uganda would rather use social media profiles to discover a person’s sexual behaviour. At the same time, when saying that ““Genetics and bioinformatics are so mature, [...] Academia can no longer control it””⁹³, he predicates how easy genetic data can be appropriated by various non-scholarly authorities.

Another expression from the German language, the *Gläserner Mensch* (transparent human) occurred in the late 20th century. It evolved around issues of data security and a general fear for the loss of privacy due to the collection and storage of personal information. This figure of speech illustrates a concern to become predictable to the powers, which own the data.

Nowadays, people deliberately disclose the biological data encoded in their DNA. Not even for free, they have to pay private service providers to analyse their genetic information. Bodies become increasingly legible for private companies. Foucault used the architecture of the panopticon to illustrate the surveillance of modern society. In *Discipline and Punish*⁹⁴ he argues that since the 18th century disciplinary techniques have become utilised to assure the maintenance of order within a complex society. The panopticon is a prison building, in which all prison cells are arranged circularly around a tower in the middle. Here, a security guard can possibly watch all the cells, whereas the prisoners are hindered to see if they get watched by the panopticon’s specific construction. Thus, they constantly need to act as they were watched.

As Ganna et al. refer to a genetic architecture, the panoptic construction manifested in a building gets relocated into the physical structure of the human body. With the increasing understanding of genetics, the actual observation of behaviour becomes obsolete, as it can be predicted through the DNA, at least in the understanding of genetic essentialism. The formerly glassy human transforms into a jelly body sharing the artificially created translucency with its predecessor. The body itself is at risk to become the panopticon.

“The power of genetic essentialist biases is evident in the repeated rise of eugenic ideologies across history. We submit that these ideologies follow directly from the ways that people perceive genetic foundations to be immutable, homogeneous, and fundamental to human character. When genes are perceived to be the locus of causality then it follows that efforts to improve humanity will focus on improving genes or the gene pool, more generally. We anticipate that eugenic ideologies will continue to arise as people try to integrate their social worldviews with their encounters with genetic discoveries relating to human characteristics.”⁹⁵

In the best case, the individual genetic code only becomes the raw material for mercurial divination, in the worst-case scenario however, the queer body’s very matter will be threatened in its further existence by bioinformatic fortune telling.

92 Joel Bellenson, quoted in Maxmen, Amy (2019). “Controversial ‘gay gene’ app provokes fears of a genetic Wild West”, *Nature*, 574(7780) (2019) p610

93 ibid

94 Michel Foucault, *Überwachen und Strafen: die Geburt des Gefängnisses* (Frankfurt am Main: Suhrkamp) pp256-262

95 Ilan Dar-Nimrod and Steven J. Heine, “Genetic Essentialism: On the Deceptive Determinism of DNA”, *Psychological Bulletin*, 137(5) (2011) p810

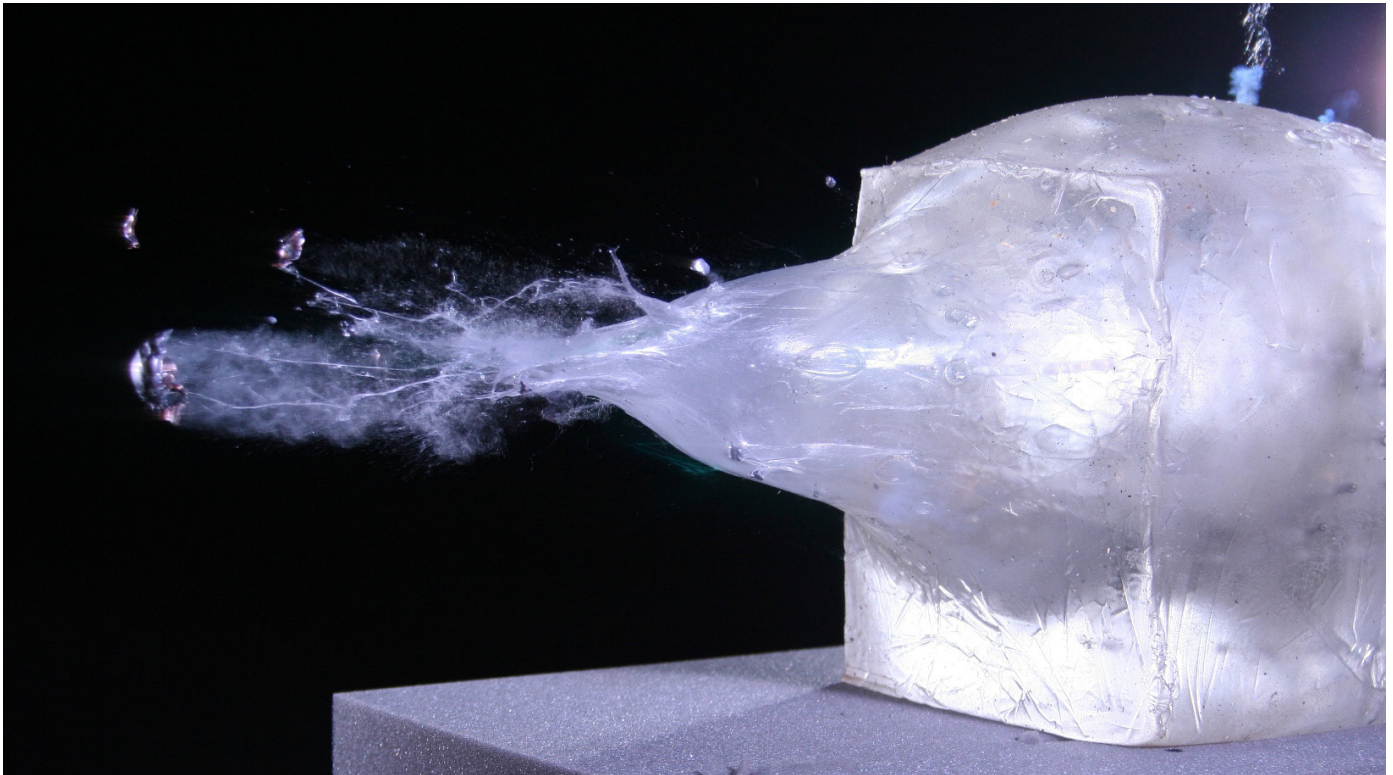


Figure 17 - Photo of synthetic ballistic gelatin showing terminal fragmentation of a .243 projectile, 2014

C. How to conclude

One last and probably a major reason for many people, why jelly is still so popular and fascinating to them has not really been touched so far. Yet it seems quite obvious: jiggle-jiggle.

*Shaking your bum is like shaking a jelly,
and the trapped juices keep them jiggly.*

*So, Shake your bum together with a
jiggling jelly. However, if you developed
strong aversions to it over the course of
these pages, push it from the plate and
dance in the remains.*

Drink from your hands.

*Break a mould that is giving you feelings
of claustrophobia.*

*Exceeding the gel point is only
one event in the gelation process.*

*Try to imagine a jelly's shape
in outer space.*

*Imagine to float in endless jelly without
the slightest touch of gravity.*

*Take an ax and split water in halves.
Observe what happens.*

*Spit into a vanilla pudding
while preparing it. See how it sets.*

Gel as a lubricant to avoid friction.

Drifts,
Currents,

Skinny Dipping.

List of Illustrations

Figure 1 - Microscopic image from agarose-hydrogel, by Jannis Neumann, 2022

Figure 2 - Jeff Wall, *Jell-O, Transparency in Lightbox*, 143,5 x 180 cm, 1995

Figure 3 - The light microscope images of the cross-sections of conventional (A) and dual network (B) scaffolds prepared and stained using standard histology/tissue processing protocols. The diffusion of fluorescein sodium salt as the model substance into the conventional and dual network scaffolds after 0 (C1), 0.5 (C2) and 1.5 (C3) h immersion in 10 µg/ml aqueous solution. Micro-CT 3D image of the dual network scaffold (D). Pore size distribution profile of the dual network scaffold (E1), % total pore volume and cumulative surface area as a function of pore size (E2) as well as pore volume, surface area and cumulative surface area for different ranges of pore size (E3) obtained by mercury intrusion porosimetry. The SEM images of primary pores (F1), porous wall of a primary pore (F2) and the opening of the secondary pores (F3) of the dual network scaffold, from Rasoulianboroujeni, M., Kiaie, N., Tabatabaei, F.S. et al. Dual Porosity Protein-based Scaffolds with Enhanced Cell Infiltration and Proliferation. *Scientific Reports* 8, 14889 (2018). <https://doi.org/10.1038/s41598-018-33245-w>

Figure 4 - Schematic representation of the process of collagen denaturation and gelatin production. Collagen molecules self-assemble in a quarter-staggered array into microfibrils to form fibrils with characteristic periodic D-spacing, from Marques, Catarina & Diogo, G. & Pina, Sandra & Oliveira, Joaquim & Silva, Tiago & Reis, Rui L.. (2019). Collagen-based bioinks for hard tissue engineering applications: a comprehensive review. *Journal of Materials Science: Materials in Medicine*. <https://doi.org/10.1007/s10856-019-6234-x>

Figure 5 - Mrs Beeton's Book of Household Management, Advertisement for *The Book Of Moulds*, p17, 1861

Figure 6 - A neo-gothic macedoine mould and liner, copperplate engraving, from Urbain Dubois, *Cosmopolitan Cookery*, 1870

Figure 7 - Two different macedoine jellies with their moulds. To stop it moving or floating in the jelly, the inner liner is clipped to the outer mould, by Ivan Day, 2014

Figure 8 - Industrially made Sülzkotelett, by Rainer Zenz, 2005

Figure 9 - Rowntree's Table Jellies, Advertisement by Rowntree's, 1899

Figure 10 - Gel electrophoresis apparatus composed of a liquid-filled box and attached power supply, by Jeffrey M. Vinocur, 2006

Figure 11 - DIY gel electrophoresis apparatus A) with batteries as a power supply. (B) Pattern of food dye samples while the power is running and (C) blurred out patterns 5 hrs later, by Jannis Neumann, 2021

Figure 12 - A wonderful medley of Jello and Vienna Sausages, posted by u/SmokeTheFire on reddit.com, 2017/18. https://www.reddit.com/r/shittyfoodporn/comments/8kdqll/this_a_wonderful_medley_of_jello_and_vienna/

Figure 13 - SPAIN-GAY-PARTY. Revellers party in a swimming pool during the Circuit Festival's Water Park Day, an open air gay party in Vilassar de Mar, near Barcelona, on August 9, JOSEP LAGO/AFP via Getty Images, 2016

Figure 14 - A genome-wide association study (GWAS) of same-sex sexual behavior reveals five loci and high polygenicity, from Ganna, Andrea et al., "Large-scale GWAS reveals insights into the genetic architecture of same-sex sexual behavior" *Science*, 365(6456), eaat7693 (2019). <https://doi.org/10.1126/science.aat7693>

Figure 15 - GenePlaza: I 22 SHADES OF GRAY, by Joel Bellenson, Screenshot from geneplaza.com, 2019

Figure 16 - Bell-shaped curve to illustrate a customer's results on same sex attraction generated within the app I 22 SHADES OF GRAY, Screenshot from geneplaza.com, 2019

Figure 17 - Photo of synthetic ballistic gelatin showing terminal fragmentation of a .243 projectile. This photo demonstrates the terminal ballistic fragmentation of the Federal Power-Shok 100grn .243 projectile upon impact of a soft target such as the Clear Ballistics synthetic ordnance gelatin block. The image exposure was 1/2,000,000th of a second (0.0000005 sec), illuminated with a total of approximately 150,000,000 beam candela of light. The image was captured with a simple Canon Rebel XT. Note the multiple small and large projectile fragments, by Kurt Groover and Nathan Boor, 2014

Bibliography

Books

- Chanda, Manas, *Introduction to Polymer Science and Chemistry: a Problem-Solving Approach*. Chemistry (Boca Raton: CRC Press, 2006)
- Foucault, Michel, *Der Wille zum Wissen: Sexualität und Wahrheit I*, (Frankfurt am Main: Suhrkamp, 1983)
- Hong, Seung-Beom et al., *Methods in Biotechnology* (Blackwell: Wiley, 2016)
- Kar, Mousumi et al., *Current Developments in Excipient Science: Implication of quantitative Selection of Each Excipient in Product Development*. In: Rakesh K. Tekade, *Basic Fundamentals of Drug Delivery* (Academic Press, 2019)
- Lewontin, Richard C., *Biology as Ideology. The doctrine of DNA* (Toronto: House of Anansi Press, 1991)
- Lancaster, Roger N., *The Trouble with Nature: Sex in Science and Popular Culture* (Berkeley and Los Angeles: University and California Press, 2003)
- Latour, Bruno, *The Pasteurization of France* (Cambridge: Harvard University Press, 1988)
- Nasrallah, Nawal, *Annals of the Caliphs' Kitchens: Ibn Sayyār al-Warrāq's Tenth-Century Baghdadi Cookbook* (Leiden: Brill, 2007)
- Stein, Edward, *The Mismeasure of Desire: The Science, Theory, and Ethics of Sexual Orientation* (Oxford: Oxford University Press, 2001)

Articles

- Alanko, Katarina et al., "Common genetic effects of gender atypical behavior in childhood and sexual orientation in adulthood: a study of Finnish twins", *Archives of sexual behavior*, 39(1) (2010) p81–92. <https://doi.org/10.1007/s10508-008-9457-3>
- Alemán, J. et al., "Definitions of terms relating to the structure and processing of sols, gels, networks, and inorganic-organic hybrid materials (IUPAC Recommendations 2007)", *Pure and Applied Chemistry*, 79(10) (2007), p1801–1829. <http://dx.doi.org/10.1351/pac200779101801>
- Allen, Garland E., "Mechanism, vitalism and organicism in late nineteenth and twentieth-century biology: the importance of historical context", *Mechanisms in Biology*, 36 (2) (2005), p261–283
- American Psychological Association, "Guidelines for psychological practice with transgender and gender nonconforming people." *American Psychologist*, 70(9) (2015), 832–864. <https://doi.org/10.1037/a0039906>
- American Psychological Association, "Key terms and concepts in understanding gender diversity and sexual orientation among students", 2015 <<https://www.apa.org/pi/lgbt/programs/safe-supportive/lgbt/key-terms.pdf>> [Accessed 22 September 2022]
- Bailey, J. Michael and Richard C. Pillard, "A genetic study of male sexual orientation", *Archives of general psychiatry*, 48(12) (1991) p1089–1096. <https://doi.org/10.1001/archpsyc.1991.01810360053008>
- Bailey, J. Michael et al., "Heritable factors influence sexual orientation in women", *Archives of general psychiatry*, 50(3) (1993) p217–223. <https://doi.org/10.1001/archpsyc.1993.01820150067007>
- Blanchard, R. and Klassen, "H-Y antigen and homosexuality in men", *Journal of theoretical biology*, 185(3) (1997) p373–378. <https://doi.org/10.1006/jtbi.1996.0315>
- Bogue, Robert H., "Conditions Affecting the Hydrolysis of Collagen to Gelatin", *Industrial and Engineering Chemistry*, 15 (11) (1923) p1154–1159. <https://doi.org/10.1021/ie50167a018>
- Cao, Yiping and Raffaele Mezzenga, "Design Principles in food gels", *Nature Food*, 1 (2008), 106–118. <https://doi.org/10.1038/s43016-019-0009-x>
- Dar-Nimrod, Ilan and Steven J. Heine, "Genetic Essentialism: On the Deceptive Determinism of DNA", *Psychological Bulletin*, 137(5) (2011), p800–818. <https://doi.org/10.1037/a0021860>
- Ganna, Andrea et al., "Large-scale GWAS reveals insights into the genetic architecture of same-sex sexual behavior" *Science*, 365(6456), eaat7693. <https://doi.org/10.1126/science.aat7693>
- Khalesi, Hoda et al., "Fundamentals of composites containing fibrous materials and hydrogels: A review on design and development for food applications", *Food Chemistry*, 364 (2021). <https://doi.org/10.1016/j.foodchem.2021.130329>

Hamer, Dean et al., "A linkage between DNA markers on the X chromosome and male sexual orientation", *Science*, 261(5119) (1993) p321–327. <https://doi.org/10.1126/science.8332896>

Kunzig, Robert, "Finding the Switch: Homosexuality may persist because the associated genes convey surprising advantages on homosexuals' family members." *Psychology Today*, 3 (2008), 88-93

Långström, Niklas et al., "Genetic and environmental effects on same-sex sexual behavior: a population study of twins in Sweden", *Archives of sexual behavior*, 39(1) (2010), p75–80. <https://doi.org/10.1007/s10508-008-9386-1>

LeVay S., "A difference in hypothalamic structure between heterosexual and homosexual men" *Science*, 253(5023) (1991) p1034–1037. <https://doi.org/10.1126/science.1887219>

Maxmen, Amy (2019). "Controversial 'gay gene' app provokes fears of a genetic Wild West", *Nature*, 574(7780) (2019), 609–610. <https://doi.org/10.1038/d41586-019-03282-0>

Pillard, Richard C. and J. Michael Bailey, "Human sexual orientation has a heritable component" *Human Biology*, 70 2 (1998) p347-365

Rice, G et al., "Male homosexuality: absence of linkage to microsatellite markers at Xq28" *Science*, 284(5414) p665–667. <https://doi.org/10.1126/science.284.5414.665>

Wray, Naomi and Peter Visscher, "Estimating trait heritability" *Nature Education*, 1(1) (2008) p29. <https://doi.org/10.1534/g3.115.020701>

Zietsch, Brendan P. et al., "Sexual orientation and psychiatric vulnerability: a twin study of neuroticism and psychoticism", *Archives of sexual behavior*, 40(1) (2011) p133–142. <https://doi.org/10.1007/s10508-009-9508-4>

Websites

Day, Ivan, "Macedoine and Other Eccentric Jellies", *foodhistorjottings.blogspot.com*, 2013. <http://foodhistorjottings.blogspot.com/2013/06/macedoine-and-other-eccentric-victorian.html> [Accessed 17 September 2022]

Day, Ivan, "The Jonah Mould – Or Size Matters", *foodhistorjottings.blogspot.com*, 2013. <http://foodhistorjottings.blogspot.com/2017/01/the-jonah-mould-or-size-matters.html> [Accessed 17 September 2022]

Dr. Oetker, "Dr. Oetker Gelatine Sheets", *oetker.ca*, n.d.. <https://www.oetker.ca/ca-en/our-products/baking-ingredients/dr-oetker-gelatine-sheets> [Accessed 13 September 2022]

Gattuso, Regina, "Celebrate the Heyday of Sweet American 'Salads' With These 7 Dishes: Highlights from an era of convenience, creativity and Cool Whip", *atlasobscura.com*, 2020. <https://www.atlasobscura.com/articles/sweet-american-dessert-salads> [Accessed 14 September 2022]

GME Gelatine Manufacturers of Europe, "Manufacturing: Premium raw materials and state-of-the-art industrial facilities deliver a pure, high-grade protein", *gelatine.org*, <https://www.gelatine.org/en/gelatine/manufacturing.html> [Accessed 20 September 2022]

Hay, Mark, "Before Jell-O, colorful Gelatin Desserts Were Haute cuisine: Celebrity chefs served molded jelly dishes to monarchs and royalty", *atlasobscura.com*, 2019. <https://www.atlasobscura.com/articles/invention-of-gelatin-jello> [Accessed 14 September 2022]

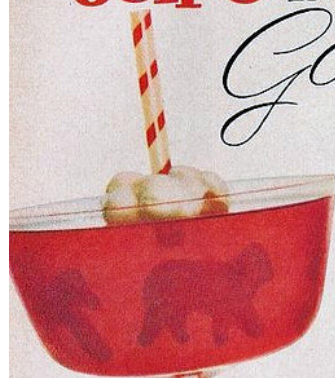
Hubbell, Diana, "How America Embrace Aspics With Threatening Auras: From futuristic test kitchens to Under-the-Sea Salad, midcentury Jell-O took a turn for the weird", *atlasobscura.com*, 2022. <https://www.atlasobscura.com/articles/aspics-jello-salad> [Accessed 14 September 2022]

Merriam-Webster Dictionary, "gelatin", *merriam-webster.com*, n.d.. <https://www.merriam-webster.com/dictionary/gelatin> [Accessed 22 September 2022]

Online Etymology Dictionary, "gel", *etymonline.com*, n.d.. <https://www.etymonline.com/word/gel> [Accessed 22 September 2022]

World Collectors Net, "Collecting Victorian Copper Jelly Moulds and Price Guide", *worldcollectorsnet.com*, n.d.. <https://www.worldcollectorsnet.com/articles/collecting-victorian-copper-jelly-moulds-and-price-guide/> [Accessed 17 September 2022]

Jell-O is the *Gay* Dessert



It's the gaiety of Jell-O's
11 sparkling fruit-fresh flavors
that appeals to the nursery
crowd! Grown-ups, too!

You and Jell-O can make
so many light-hearted, pretty
desserts so easily.
Go gay with Jell-O — today!

JELL-O KINDERGARTEN CAROUSEL

1 package Jell-O (any red flavor)
1 cup hot water
1 cup cold water
Animal crackers or vanilla wafers
Striped candy sticks
Whipped cream

Dissolve Jell-O in hot water. Add cold water. Pour into dessert glasses and chill until almost firm. Arrange crackers around edge of dessert glass so they show. Chill until firm. Centre each serving with candy stick, and trim with a swirl of whipped cream. Makes 4 servings.



JELL-O IS A REGISTERED TRADE MARK OWNED IN CANADA BY GENERAL FOODS, LIMITED