SALVING SUCCESSIONS + RUPTURES WITH THE PAST

Tectonic shifts in scientific thought and medical practice during the nineteenth century fractured past conceptions of life. Relations with God, nature and our very selves transformed. Vectors of subjectification turned around a multiplicity of events as the old world order collapsed under the pressure of new technologies. Pieces were placed within the collections highlighting elements which connect the life of the theatre and garret to the social and technological convulsions of the time, their historical roots, what passed, and the futures that were seeded.

Interventions were contextualised by a talk which mapped out relationships between disparate themes and traced histories backward and forward from the introduction of anaesthetics into surgery. These relationships were visually sketched out and parallels drawn between what went before and what came after. Viewers were encouraged to explore alternative meanings by suggesting the possibility of lateral connections, which are not spatially or temporally bound, between subjects. As systems of understanding grow, openings for future undermining are set in their foundations. Conditions for novel thought are created outside of the ossified structures of traditional ways. The new is fertilised by exclusion and negation by the other. As the resistance of a collapsing past is overcome the new itself becomes rigid, filling ecological voids opened up by the disintegrating old order.

On page 8 there is a plan that shows where each intervention is placed in the museum and which part of the collection is referenced, and on page 7 there is a diagram that traces particular trajectories between the subjects.

The life of this operating theatre straddled a period when anaesthesia was introduced and the foundations which led to aseptic practice were laid. I wanted to contextualise this by looking at previous and subsequent medical practice and my experience of this museum. The work endeavours to map out the relevant technological developments and how they related to changing world views in the nineteenth century. Each different aspect interlocks through trajectories which connect each of the histories. A varied cast of characters and institutions falls in and out of the story, against a backdrop of changing an evolving society and the steady accumulation of revolutionary ideas. Serendipitous circumstances and casual advice have triggered fundamental changes in practice and attitude, with past histories lauding the achievements of some while ignoring or ridiculing others. Some of these changes of attitude have been supplanted by new conceptions of life whereas others are still with us – now we wait to see which will disappear in future revolutions.

Human Nature - A rich conception of ourselves, connected

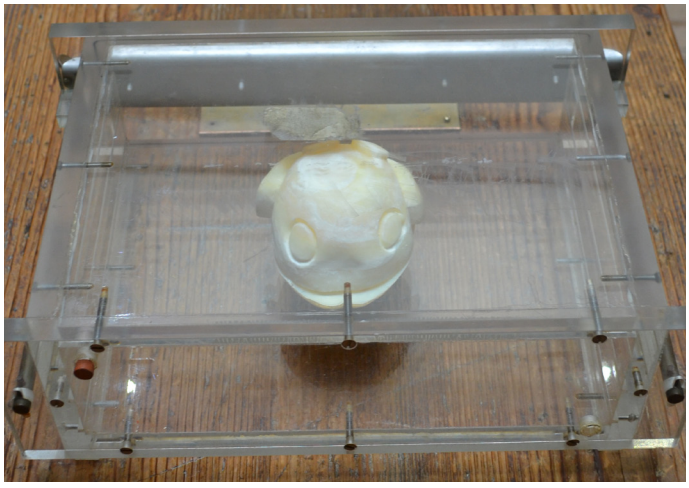
to our biology and the environment, as well as our mental and socio-technological universes, more fully reflects our experienced reality. The ever expanding dimensions and rhythms of our shifting relations open up new evolutionary niches. Unpredictable juxtapositions of unknowably complex structures of material, information, and desires propel us along trajectories which defy our past – as individuals, societies, and stewards of the environment.

I will start with the sculpture (**Human Nature**) in the Herb Garret, which references how we perceive our connection to the world and human culture. It represents our animal nature and mental ecologies, our connection to society, language and technology, and the environment that sustains us. As a symbol of cycles of life, death and rebirth it seems an appropriate place to start a circular path. The holistic medicine of the early nineteenth century supplied a model system that explained our character by its connection to nature and the cosmos, making sense of the world's complexity by attaching human meaning to these mysterious dimensions.

Natural Blessings - The principles of ancient Greek medicine separated the role of physician from religious concerns and applied natural methods to the diagnosis and treatment of the sick. Quoting the venerated physician Galen, "Pain is useless to the pained", James Young Simpson countered those who would not have him administer anaesthetics during child birth. This practice was resisted by the sexist theologians of the time who held that God had cursed Eve – "Unto the woman he said, I will greatly multiply thy sorrow and thy conception; in sorrow thou shalt bring forth children; and thy desire shall be to thy husband, and he shall rule over thee" Genesis 3:16 (King James Bible).

This 'humoral' medicine was based on the ancient Greek Hippocratic tradition which saw the body's functions dictated by four fluids which were analogous to four elements – water, air, fire and earth – and ebbed and flowed with daily and seasons rhythms and were the influence of external agents abroad in both the land and the heavens. These fluids – Phlegm, blood, yellow bile and black bile – were seen to manifest as two qualities – heat and moisture – which exerted influence across two orthogonal axes. These produced four distinct humors associated with different physical symptoms and personality types: blood, hot/wet and sanguine/manic; choler, hot/dry and aspic; melancholy, cold/dry and depressed; phlegm, cold/wet and lazy. A healthy body was thought to have a good balance of these fluids. Doctors sought to redress the balance when a patient was ill, using treatments to either purge or retain the humors. In the case by the bar (see **Natural Blessings**) you can see instruments for 'bloodletting' which were employed in the treatment of those afflicted by too much blood.

During the 17th and 18th centuries the natural sciences as we know them today were being formulated, and figures such as Bacon, Newton, and Leibnitz promoted the idea that the only reasonable natural philosophy was inductive – first look at the world, then generalise and form laws. In the early nineteenth century the idea of Hypothetico-Deductivism gained ground in debates about what constituted the best scientific method. This popularised the view that one should first produce hypothetical theories (hypotheses), then test them in experiments and form theories from the results. These arguments are now seen as oversimplified and there is no general scientific method. We also see that proponents of either Inductivism or Hypothetico-Deductivism happily used the other in their own scientific work when we look at the historical record. Today science is seen as a vast collection of puzzle solving methods specific for certain problems. It incorporates elements of illogic in hypothesis production, abductive reason in retrospective rationalisation of unexpected results, subjective judgement in choosing between disparate opinions, and it advances in an unpredictable, historically contingent and non-linear manner.



Rhizomatic Rupture - Through the perpetual integration of different cultures new knowledge is formed and novel understandings are born – the previously unreal becomes real. Meandering thoughts are constrained and distilled, hypotheses teased out, and experimental frameworks formulated in order to cajole facts out of fantastical entities which are held in an epistemic limbo until they crystallise with communal assent. Interpretations, judgements and arguments proceed, models wax and wane, until the satisfactory fact ossifies, building on or undermining the theoretical edifices of the past.

The "**Rhizomatic Rupture**" piece parallels how we tease out a conceptual construction from the phenomenal world, construct an experimental framework around

this abstract idea, then interpret the results in order to form a model of the world which can be used as a tool for prediction – each process forming and deforming each other in ongoing and evolving cycles. Particular worldviews and numerous other "non-scientific" influences may affect all parts of the procedure. Results are only ever provisional and the interpretations continually reviewed. What becomes "scientific fact" is regularly rewritten, and, historically, how these facts came to be was too.

Various aspects of science and culture come to bare in the history of anaesthetics which has its roots in the late eighteenth century when the big thing in the new science of chemistry was figuring out what air was made of. In 1775 Joseph Priestly first synthesised Nitrous Oxide. In the 1790s James Watt published methods for the production of the different types of air and apparatus for its inhalation. In 1799 Thomas Beddoes used it to treat TB and he tasked a young Humphrey Davey to investigate these 'Factitious Airs', who reported the analgesic properties of Nitrous Oxide in 1800. It's potential for pain relief however was little recognised, probably because opium was so much more effectiv, but it maintained a place in the social life of the British elite at "Laughing Gas Parties".

By the 1830s similar "Gas Frolics" had become a popular attraction at American county fairs. Soon after they appeared in Georgia the small town medic Crawford Long took to supplying the local youth with this harmless alternative to alcohol. Then, in 1842, when he had ran out of the materials needed to make the gas he suggested ether, which was a commercially available laboratory solvent of the time, as an alternative for their frolics. It soon became all the rage in several counties and Long started to note the many painless injuries he and others sustained during their recreations. When a young patient needed a tumour removing from his neck Long suggested he take ether as he was petrified of pain. The operation was a success and ether was subsequently used in dozens of surgeries in the coming years. The results were carefully recorded published three years later. Unfortunately things had moved on elsewhere and more ambitious people saw to it that Long's achievements were overlooked.

In 1844 the dentist Horace Wells attended a demonstration of new medical gases by the showman Gardner Colton. He noticed that when one of the volunteers injured his leg after inhaling Nitrous Oxide he felt no pain. He immediately registered the potential and procured a bag of the gas off Colton the next day, proceeding to have his own wisdom tooth removed under the influence. Unfortunately for him his own public demonstration went wrong, with the patient calling out and him being laughed off stage. His ambitious assistant William Morton, however, was not put off and continued to experiment with the gas. When he ran out of the gas he visited his old chemistry professor Charles Jackson because he could not make it himself. Jackson, who bemoaned Morton's practical incompetence, suggested that he go and buy some ether instead, suspecting it would have a similar effect. After more tests Morton took his ether, dressed up as a secret recipe, to a surgical demonstration by John Warren and Massachusetts General Hospital in 1846. The demonstration was a success and news of the event rapidly travelled across the Atlantic.

Faithful Frolics - James Young Simpson opined that "chloroform had a delicious aroma and was far better than ether" – shortly before rendering himself insensible. His wife, who thought her husband and his company particularly loquacious that evening, exclaimed "I'm an angel! I'm an angel! Oh, I'm an angel" upon inhaling the vapours… before passing out herself. Today naivety is lost, the ever expanding pharmacopeia that relieves our sufferings on the operating table offers a deadening salve to the plight of the desperate.

Three days after hearing news of John Warren's demonstration Robert Liston performed the first etherised surgery in England. However, for years to come there was resistance to the use if anaesthetics because consciousness and pain were seen as vital for the patient survival. John Snow offered his services to Liston, wanting to help by investigating the better application of ether, which was proving problematic because of its bad smell, irritant properties and the initial excitation in caused in patients. Drawing on the work of Joseph Priestly and John Dalton, Snow produced an apparatus for controlling how the vapours were administered. Soon after, because of the issues associated with ether, the Glasgow based doctor James Young Simpson decided to investigate different solvents. An apothecary from Liverpool

called David Waldie suggested Chloroform. It's 'anti-spasmodic' properties were already known through veterinary experimentation but it was thought to be too lethal for human use. Simpson soon discovered that Chloroform was 'far stronger and better than ether' and he started to use it during problematic child births. This in itself was very problematic as it raised the ire of the theologians of the time, who thought it heretical. The relevant scripture is quoted in the piece (**Faithful Frolics**) opposite the obstetrics case.

Snow's Surgery - John Snow identified the five degrees of effect that anaesthesia produces so that doctors could safely administer chloroform. He also developed an apparatus so that inhalation of the vapours could be controlled. Longer, more complicated procedures could be undertaken on an anaesthetised patient, and surgeon's now had time for precise dissection of the living body. Instruments were transformed from those adapted for the super-fast procedures, required for treatment of the unanaesthetised, to a plethora of specialised blades for specific tasks. Experimental technique entered the body, opening it up for new observations which revolutionised physiology and medical practice.

Snow now repeated his experiments on the more effective but deadly chloroform. In the corridor next to this theatre is a piece (**Snow's Surgery**) which outlines the five stages of the effects of anaesthesia and the inhaler apparatus which meant that it could be safely administered. In the coming years several people died of poorly administered chloroform and surgeons in France and America returned to ether. However, Snow and Simpson tirelessly campaigned for its continued use in Britain, and the tide was decisively turned when Queen Victoria requested it for the birth of prince Leopold in 1853. With the aid of anaesthetics surgery started to evolve. More time could be taken with an insensible patient and more precise work because they were rendered immobile too. The tools of the trade (the long slim knives you see in the cabinets here, which were perfected for super-fast amputation) gave way to a plethora of specialised scalpels. Doctors could now dissect a living body and our understanding of physiology took a leap forward. Progress though was still hampered by infection, which was the most dangerous aspect of any surgery, and precluded operations that were too invasive, setting the torso and brain out of bounds.

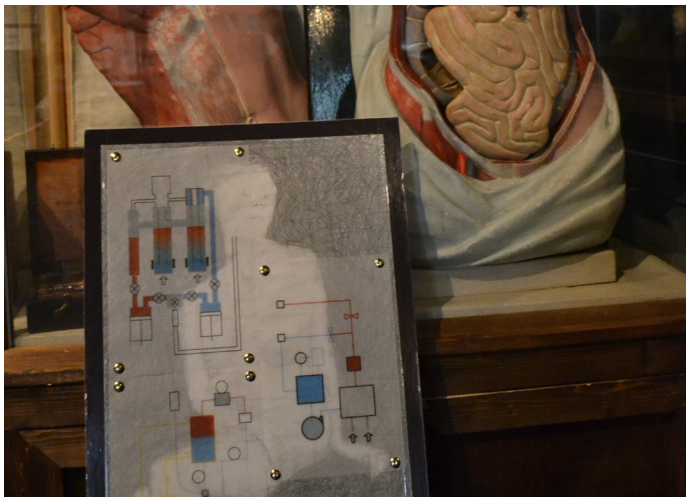
Disease was still thought to be caused by bad air, so called miasma, but attitude were slowly starting to shift. William Budd theorised that Typhoid was spread from person to person in the 1839 and he and John Snow suspected water to be involved in spreading Cholera outbreaks in 1849. The causal agent remained essentially unknown for decades, even though Filippo Pacini had identified it in 1854. People had been aware of the diverse array of micro-organisms that surround us for a couple of centuries but a reasonable amount of dirt was seen as natural. The Hungarian doctor Ignaz Semmelweiz, while working in Vienna noticed that rates of certain infections were higher in patients treated by doctors who had just performed autopsies. He instructed staff to wash their hands with a disinfectant before tending to other patients and demonstrated greatly reduced rates of infection. However, he was ridiculed when he tried to promote his work and was driven to depression.

It was in the 1860s that Louis Pasteur discovered what was responsible for spoilt wine and he published his findings on microbe fermentation in nutrient broth in 1864. He also speculated that bacteria may be the cause of infection. When Joseph Lister read this in 1865 he immediately started to apply the toxic chemical carboxylic acid to bandages in his Glasgow hospital. He also experimented with application of the chemical during surgery and published his findings on asepsis in 1867. Pasteur and Robert Koch went on to develop germ theory, showing that particular microorganism were responsible for specific diseases (Germinating Theory). Despite all these developments doctors were often reluctant to change as these new ideas flew in the face of established practice. When Lister moved to King's hospital in 1877 the surgeons and nurses even refused to implement his aseptic methods.

Germinating Theory - The epidemiological pioneers William Budd and John Snow suggested that Cholera was transmitted via water in the 1840s. Even though Filippo Pacini identified Vibrio cholerae as the cause of Cholera in 1854, it only became widely known in 1883 when Robert Koch isolated it. In 1864 Louis Pasteur showed that airborne microbes were responsible for spoiling wine, and postulated that disease was caused by bacteria. Pasteur and Koch went on to develop germ theory, showing that particular microorganisms caused specific diseases. "…it is from the vitality of the atmospheric particles that all the mischief arises…" Joseph Lister (Lancet 1867).

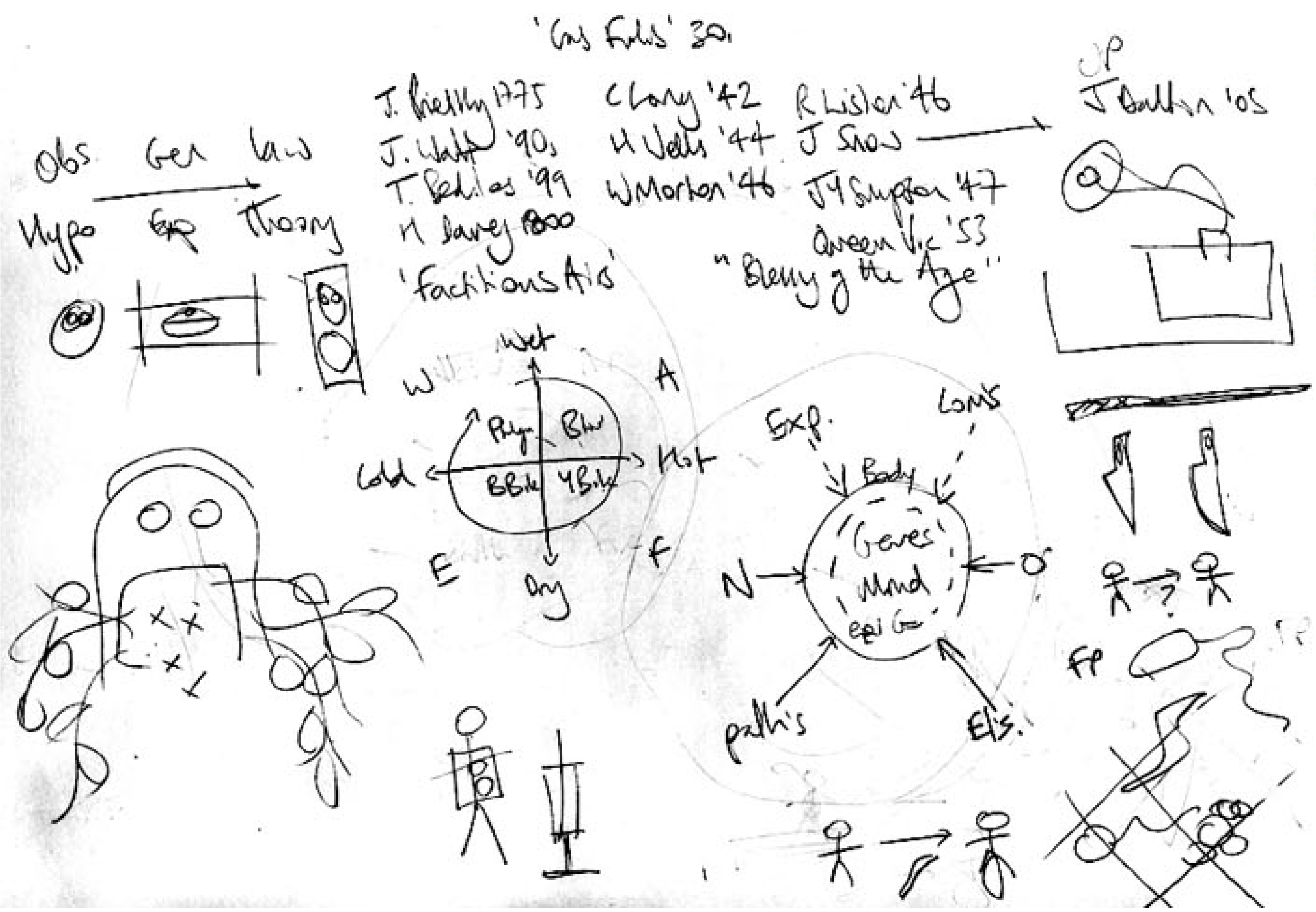
The discovery of microbial pathogens and demonstration of the benefits of aseptic practice propelled medicine into a form which we a familiar with today. It allowed the development of specific treatments for specific diseases and opening up new frontiers in surgery. Anti-septic principles and the invention of the hypodermic needle in mid-century allowed us to inject things into the body without fear of infection and, with increasing physiological knowledge, led to new forms of medicine. This mechanistic view of the body has enabled us to keep our failing organs going and challenge our perceptions of health (**Digital Destinies**).

These discoveries and others from the nineteenth century ushered in a twentieth century framework of thinking about the body which is still prevalent today. In the eighteenth century Buffon introduced the idea that species were an artificial construct, countering the taxonomic trends of the time, and saw living forms as malleable. These ideas influenced the evolutionary theories of LaMark and Darwin, undermining the "God designed all" narrative of the established churches. The geological work of men like Lyell, which built on the earlier work by Hutton, contradicted biblical histories of the earth. Developments in biology, like Schwann's cell theory and Mendel's work on inheritance, radically shifted perceptions of the human body. Creationism fell away, as did the foundations of humoral medicine. Scientism supplanted old beliefs and new theoretical edifices were erected. The concrete gene and mysterious mind were placed at the centre of a new framework. Our machine like anatomy, nurtured by nutrients and fuelled by oxygen, separated us from the environment in which we were abused by both pathogens and the elements.



Digital Destinies - Antiseptic practice and our advanced understanding of physiology allowed us to splice the living with the mechanical, maintaining our failing bodies. Plugged into the machinic assemblages of health care our human nature is evolving, locked on a trajectory with an unknown destination. By controlling our biology new horizons open up, and fears first raised in the nineteenth century now look more and more likely to come true. If our new technologies are not used for the nefarious control of societies, or trigger unpredictable plagues, will we be tempted to turn our backs on our human form, fleeing to more efficient and hardy realms?

Coming into the twenty-first century this framework has grown in complexity. A layer of epigenetic control and memory facilitates the interaction of our bodies with the environment through our experiences – countering the dogmatic claims of nature eclipsing nurture. More nuanced views of what is good and bad about our environment are developing – from our embodied minds to our symbiotic relationships with commensal organisms. It seems important that we maintain a plural approach when applying these models in our science and draw on all aspects of our culture in our scientific endeavours. We also need to be honest about what science does and doesn't do and be clear that it is our servant not our master. As our environment degrades and societies bare the weight of new technological forms which we don't truly understand I hope that we can move forward with our eyes open, unafflicted by the self-serving narratives of both charlatans and honest folk of al hues.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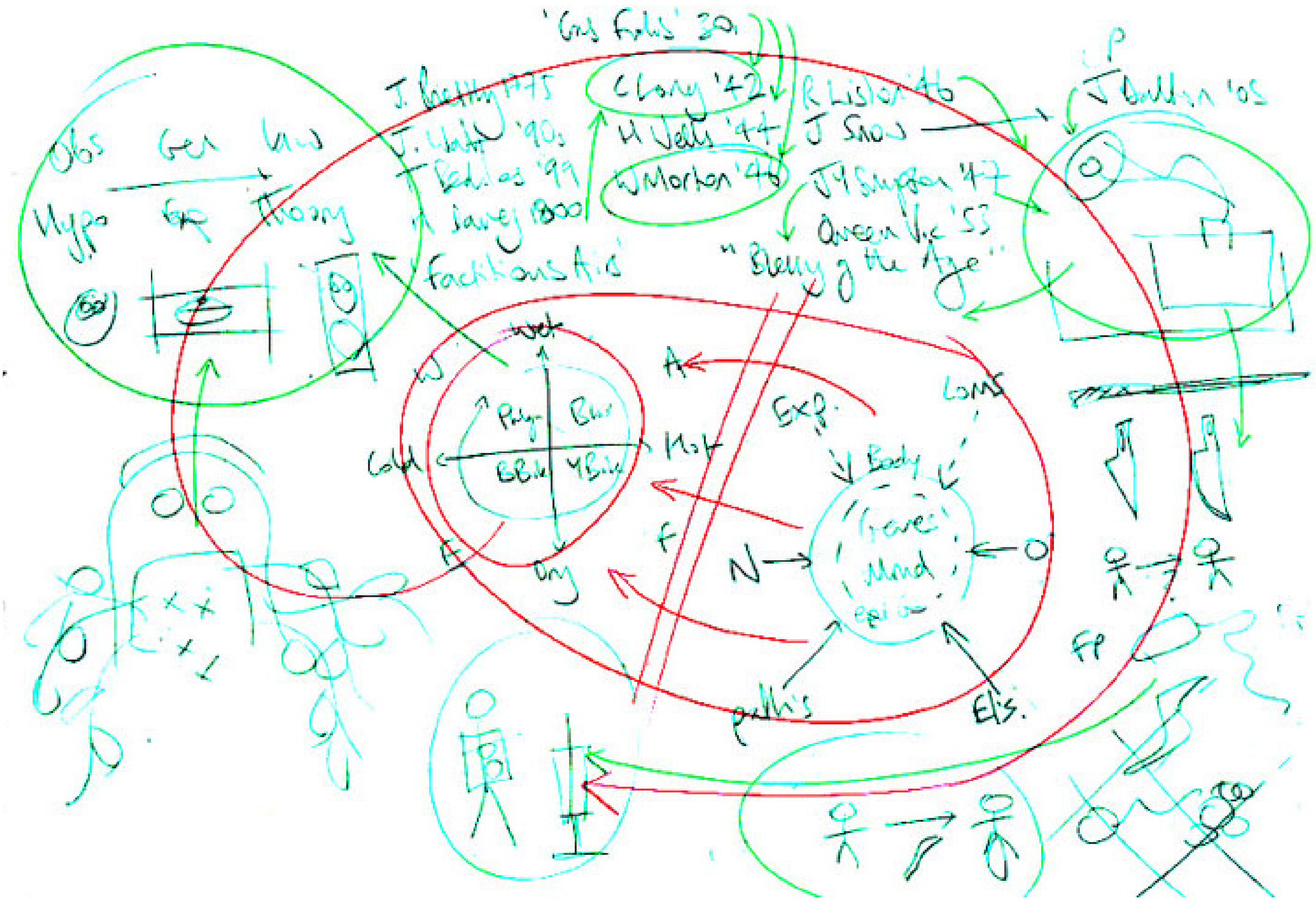
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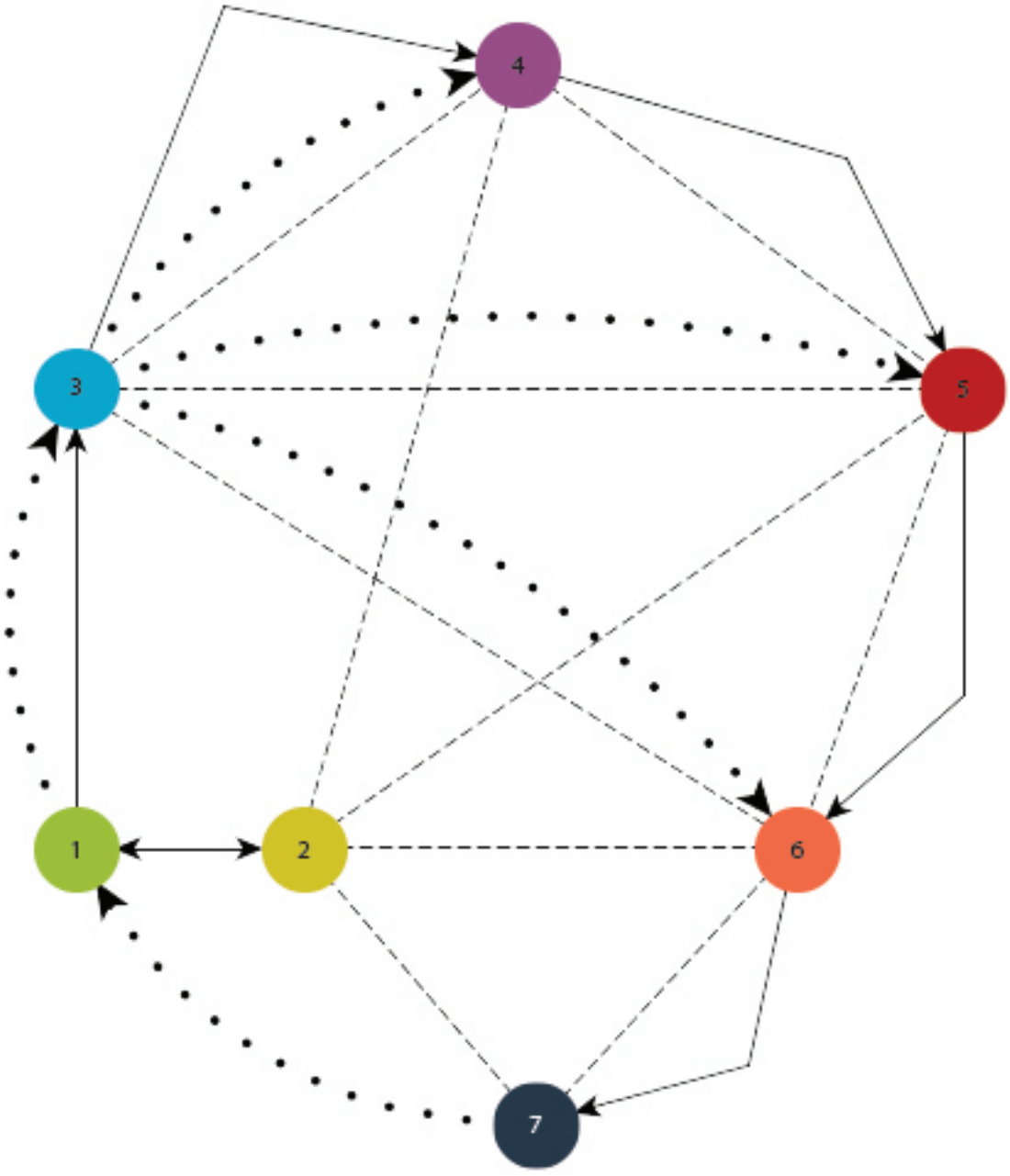
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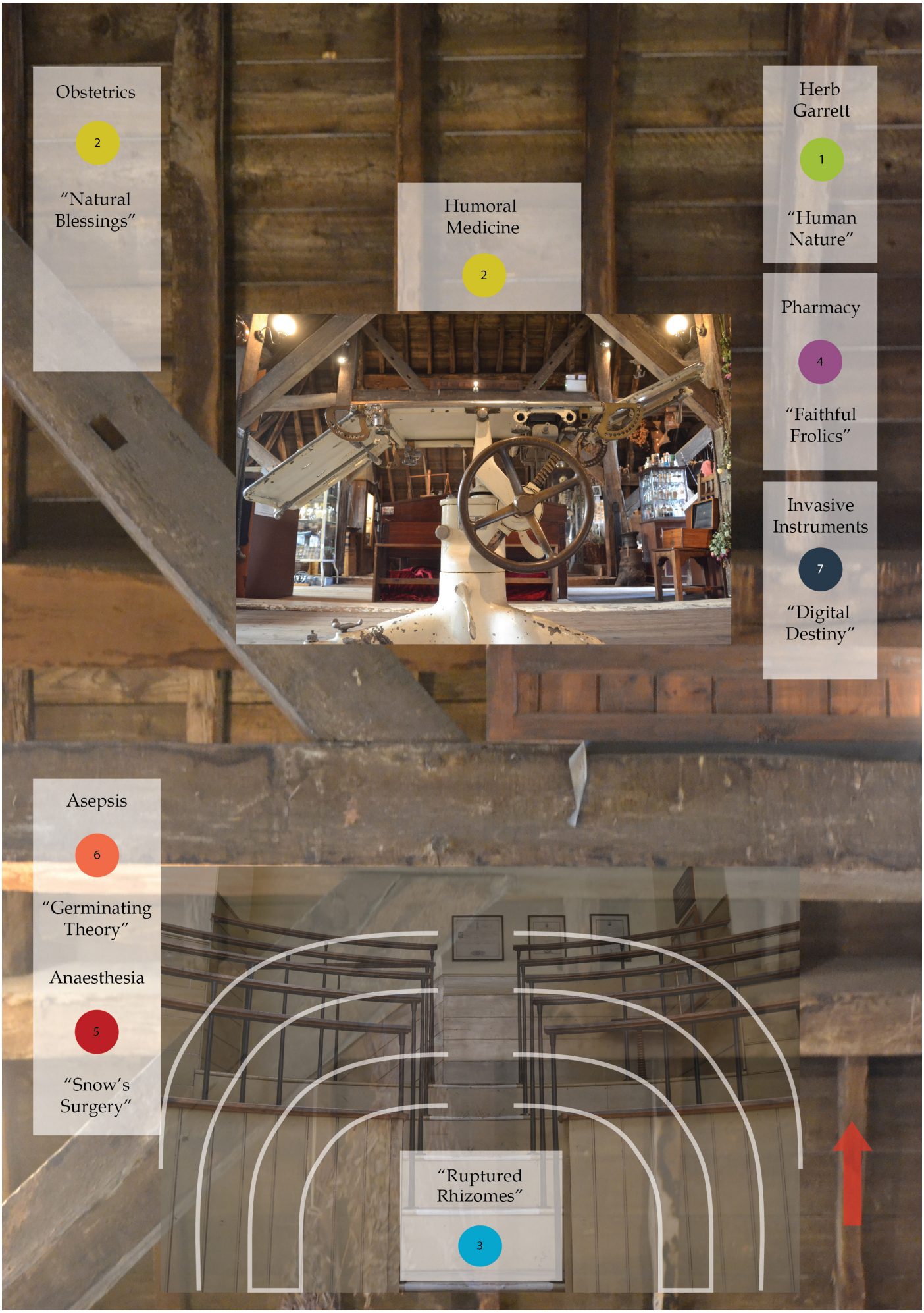
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