The Art and Magic of Medicine

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[Disclosure: Since 1973 I have the great honor of being a Fellow of the Royal Society of Medicine; the September 1st, 2008 of its Journal –under the editorship of Kamran Abbasi- is largely devoted to *the magic of medicine.* Much of the article that follows is a compilation of articles from that issue, and editorials published in *The Lancet* in 2017 by Roger L. Kneeborn, and by Deborah Padfield, Tom Chadwick and Helen Omand. These sources, and others, appear in the References].

"These good or white witches are commonly called blessers, healers, cunning wisemen or women (for there are of both sexes) but of this kind, many men."

(Bernard, "Guide to grand jury men", 1629)

The debate on whether medicine is an art or science is as old as medicine itself, but is it magic? 'Mystery, magic and medicine, in the beginning they were one and the same. Although doctors and magicians have since parted ways, they both want to leave their '*client' better off than when they met.*'

For a magician, this is the greater feat, as the client's initial view is one of suspicion and distrust, a desire to expose the magician's trickery. A talented magician will leave you aghast at the sleight of hand that has occurred, but a talented doctor might persuade you to consent to a procedure or change of lifestyle. Daniel Sokol, a magician and medical ethicist, proposes that magicians and doctors both practice deception but in different environments.

'Mystery, magic and medicine: in the beginning, they were one and the same'. So starts Howard Haggard's little book on the rise of scientific medicine (*Mystery, magic and medicine* Doubleday, 1933). In centuries past, a medicine man in some aboriginal tribe might have extracted an unwelcome stone or bone from a patient after showing his hands empty, much as a modern-day magician would pluck a sponge ball from a child's ear. The doctor strives to improve health or prevent further deterioration, the magician to raise the spectator's spirits or instill a pleasurable sense of wonder; looking at doctoring through the lens of the magician may provide insights for the practicing clinician.

Aside from close historical links, there is much that still unites doctors and magicians. Both groups deal with people, often in an intimate and intense context, and strive to effect a positive change in their audience. Both possess skills that their patients or audience do not have. They rely heavily on trust, fairness and clear communication for their success. Magicians, however, operate in an atmosphere of initial distrust and hence have developed expertise at creating trust in difficult conditions. They have learnt, through centuries of experiment and reflection, to influence people in subtle ways. I have tried to show that these lessons can be helpful to doctors, if only to make explicit certain techniques that may be used subconsciously. Aware of them, doctors can choose to use or avoid them as they see fit, although Sokol suggests they adopt a less permissive stance towards deception than their magician counterparts.

Since one goal of a doctor's performance is to leave patients satisfied with the consultation, likeability is a desirable trait. But what is likeability? Or, rather, what characteristics, attitudes and behaviours lead to likeability? A literature on the importance of likeability exists in the domains of personal life, business interactions and advertising. Tim Sanders, who wrote a book on what he calls *the Likeability Factor* (Crown Publ, 2005), defines likeability as the '*ability to create positive attitudes in other people through the delivery of emotional and physical benefits*'. Sanders correlates likeability with success and happiness – the more likeable people are, the more likely they are to obtain desired jobs, acquire friends, have happy relationships, and so on. He identifies four elements of likeability: friendliness (expressing an appreciation of the other person through body language such as a smile or kind look or by verbal means), relevance (establishing a connection with the other's needs and desires), empathy (identifying with the other's situation and being sensitive to their feelings) and realness (appearing authentic and genuine to the other, being humble and honest). Hence a key question, relevant in both the fields of magic and medicine, is *'can likeability be taught?'*

Yet verbal and non-verbal communications – the arts of a magician or clinician – are no longer sufficient to fully inform patients, although they are vital elements. Our information-rich, interconnected world makes it harder for clinicians to gather all the information required for a single consultation, while placing high literacy demands on patients; indeed, the greatest demands are often placed on the patients who are least well equipped in terms of literacy. Around 20% of patients will have too low a level of health literacy to understand health information provided to them.

Patient information leaflets can be useful but are insufficient to support doctors in their day-to-day practice as patients, like any group of learners, will learn best in different ways and via different formats and media. Anthea Colledge *et al*. explore the landscape beyond patient information leaflets and find a rich and varied landscape that requires further evaluation but is already showing promise.

Health professionals and health services have an important role to play in guiding patients to high-quality information and supporting their access to that information. But that information is increasingly delivered by different methods. We already have some evidence for success of pictograms and pictures alongside written information, multimedia games for children, audio recording of consultations, text messaging, DVDs and websites. These are all tricks that doctors can pull out of their magician's hats but they all require skill, patience and hard work to master and deliver effectively.

Both individual health professionals and health services have significant opportunities to improve health communication. Health professionals can actively guide and support patients to access and engage with high quality sources of information, as well as developing strategies to improve their own communication. These strategies are widely recommended, but conclusions about their effectiveness are currently limited by a lack of rigorous evidence. In many circumstances, alternative format resources are an effective and viable alternative to the printed patient information leaflet. The other strategies appear promising, but have not yet been rigorously tested and evaluated.

If you can't be bothered with all this complication of medical practice and find hard to know where to begin with all this prestidigitation, you may find solace in Richard Smith's piece on the value of procrastination. WH Davies asked '*What is this life if, so full of care, we have no time to stand and stare?*' Kurt Vonnegut went further. After describing a '*wasted*' morning that might make him a near-terminal case of chronic procrastination he writes: '*And I tell you, we are here on Earth to fart around, and don't let anybody tell you any different*.' A bit more procrastination and we might have avoided the tragedy of Iraq.

Similarities and Differences

The *magician* comes to your table while you are having a meal at a function with your friends. He's an attractive person and you can't help liking him. Although you've never seen him before he makes you feel completely at ease, as if he's another member of your party who has just dropped in to join you for a few moments. It turns out he's a close-up magician. With no apparent effort, he slides into your conversation and for the next few minutes performs astonishing tricks, inches from your face. Cards materialize and vanish, banknotes rotate slowly in mid-air with no visible means of support, coins defy the laws of gravity. Then the *magician* dislimns as quickly as he appeared and is gone before you quite realize what has happened. Somehow he has created a bespoke performance for you and your friends, enriching your meal without disrupting it.

Clinicians have similar skills. A patient comes to a doctor with a pain in the abdomen or the arm. Although they have never met, doctor and patient quickly establish a rapport and start to talk. Within moments the doctor is palpating the patient's abdomen, examining wrist or elbow, pressing and probing while continuing the conversation. This physical contact seems completely natural and paves the way for a discussion about what the problem might be and what to do next. Then the consultation is over, the patient leaves the room and another one comes in.

What have both these experts done and how have they done it? Each of these encounters is a close-up live performance, constituted jointly by a performer and an audience. The audience is very small—in the case of medicine, often just one person. Though seemingly effortless and natural, each performance is highly constructed, actively shaped by the performer. Beneath a semblance of normality, a lot is going on.

Contrary to popular belief, magic is not about concealing things but about building a shared narrative that makes sense for audience and performer. The magic is in the telling, constructing a compelling world through story. Without the story, you're left with just tricks. Medicine too is about creating a shared narrative that works for patient and clinician, accounting for each person's problem in the context of their life. The physical elements—examination, diagnosis, treatment— only make sense as part of this bigger whole. Without the story, you're left with just techniques.

Returning to the *magician*, beneath his relaxed exterior his brain is in overdrive as he performs. Acutely observant, he registers tiny cues to piece together the dynamics of each group of diners. His senses are finely attuned to what is going on around him and he continually adjusts his performance in response to subtle signs and feedback. Richard Smith describes a constant internal dialogue, monitoring the situation as he performs and alerting him when to change tack or back off altogether.

Experienced clinicians do something similar. Equally sensitive to tiny inflexions of intonation, gesture, and facial expression, they too describe an internal dialogue as they listen and observe, integrating what they notice with their clinical knowledge and their experience of past cases. "*Why has this person come to see me today?*" "*Is there something else concerning her?*" "*Could this cough be cancer…?*" This is the art that conceals art, invisible to an outside observer but taking years to acquire.

Close-up live performance with a very small audience, whether in magic or medicine, is another instance of what the furniture maker David Pye described in 1968 as the workmanship of risk, in which "*the quality of the result is not predetermined, but* *depends on the judgement, dexterity and care which the maker exercises as he works*" (*The Nature and Art of Workmanship.* Cambridge University Press). The essence of magic is the jeopardy of a live encounter. An overall plan must be modified as the performance evolves. Newly made on each occasion, its outcome can never be wholly determined in advance.

Magicians must develop extraordinary motor skills to make things vanish and reappear. These skills are honed through years of hard graft and unremitting practice. But dexterity on its own, however technically impressive, is only part of the picture. The real magic comes from interacting with a live audience. Establishing a rapport, controlling the focus of attention, constructing a retrospective impression of the encounter—all these are skills based on close noticing and acute observation. So how do magicians learn to do it? They are not born with performance skills -any more than clinicians are.

In a 2-year collaboration with the *magician* and seven other magicians, Roger L. Kneebone, MD, explored these ideas through closed workshops and public events before testing them with clinicians within the Imperial College Masters in Surgical Education in London, UK. Of course, there are performance techniques that can be learned and taught. The *magician* demonstrated some of them, explaining how he connects with his audience, establishing eye contact and directing attention so that he can shape each encounter without appearing to do so. But this kind of performance is not provided by one person and passively witnessed by another. It is a process of engagement, a two-way street.

Whether in a magic show or for the resolution of a clinical problem, the response of the audience is essential for the performance to work. As with bespoke tailoring, creating a partnership is key. And that can be a challenge. The *magician* talks about a shift which needs to take place in every performer as they develop—seemingly obvious but often missing. "*You have to learn that it's not about you, it's about them*", he said, as he described moving the focus of attention outwards to his audience rather concentrating on himself, on his own skills. This resonates with clinical education, where we spend years learning facts, mastering skills (from putting up a drip as a student to leading a major operation as an experienced surgeon), building up complex banks of knowledge and experience. In these early years, it is natural to focus on ourselves. But to be an effective clinician you should make the shift "*from* *you to them*", to let the facts and skills recede into the background and to attend to what is happening in the space between you and your patient. You must learn to focus on the other person, to be still and to listen.

There is another point of contact between clinicians and magicians. Close-up live performance with a very small audience does not rely on sight and sound alone. It also depends on **touch**. Unusually among performers, close-up magicians interact physically with their audience. They invite them to take part in tricks, to choose cards, and hold props. Some magicians pick their audience's pockets or even remove their watch unnoticed.

Clinicians too must master a lexicon of touch, with its complex registers and inflections, and the clinical setting gives license to bypass normal barriers of personal space. Yet physical examination does more than gather information. A single touch can convey confidence, reassurance, and competence— or tentativeness, hesitancy, and fear. Although the expressive power of touch is known to everyone, its vocabulary is unarticulated and seldom taught.

The performance space of bespoke is a complex arena where far more is conveyed than is spoken. Sight, sound, and touch come together in a complex web where multiple interactions are taking place at once. Communication is realized through skillful management based on detailed observation of human behavior and response. Underlying these examples of bespoke is an implicit contract of care, an assumption of integrity and trust—that a magician will return your watch after he has taken it, that a tailor is giving you genuine advice, that a doctor is placing your interests first.

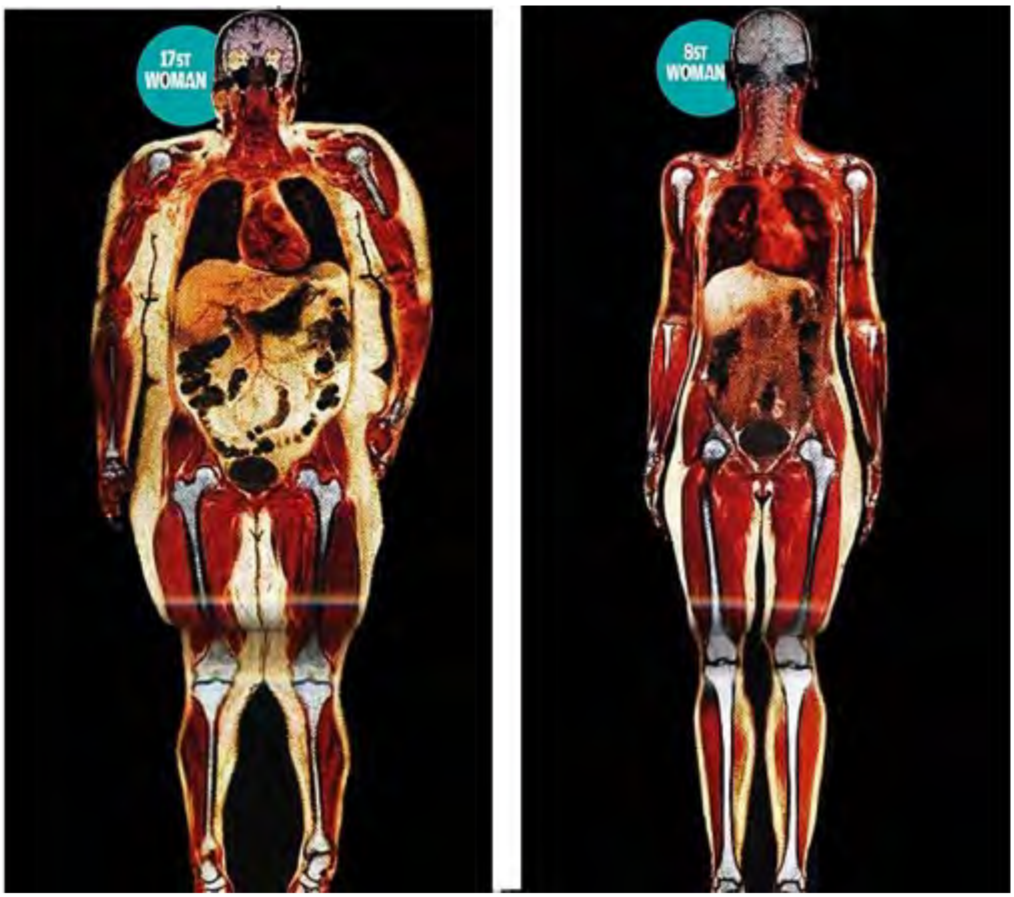
If magic shares similarities with the clinical consultation, there are important differences too. Magicians are accustomed to framing what they do as performance and they have clear criteria for success. If nobody likes their show, they don't get another booking.

Clinicians, by contrast, are schooled to see their work as the application of scientific knowledge, not as performance. For many, the notion of consultation as performance can seem uncomfortable, trivializing something serious. Yet there is nothing trivial about performance or the skills on which it depends.

By framing the clinical consultation as a close-up live performance with a very small audience, the focus shifts from the acquisition and application of scientific knowledge (an internal focus of attention) to an encounter where a narrative is jointly constructed and where the patient's perspective is prime (an external focus of attention).

This performance cannot be achieved by applying stock phrases and formulaic techniques. Instead it requires an effortful process of creating a shared space, jointly owned by clinician and patient. Making this shift from an internal to an external focus can be difficult within the frame of medicine, where domain-specific knowledge carries such weight. Stepping outside the medical frame to join the company of performers brings other ways of seeing.

The Body as Image: Image as Body



Pain is invisible and its experience highly subjective, making it hard to communicate. Deborah Padfield's essay grew out of the *Encountering Pain Conference* at University College (London, UK) that shared the findings of the *face2face and Pain: Speaking the Threshold* projects with patients, clinicians, academics, and artists. She and her associates explore narratives triggered by images co-created with pain patients and placed between doctor and patient in their pain clinic during the *face2face* project, using "*pain cards*".

Patients with chronic pain frequently undergo countless investigations and imaging processes, often with no cause visible. Psychologist Dianna Kenny describes how patients can search for mechanical and clinicians for psychological explanations—creating an impasse. Padfield *et al.* argue that images are one way of facilitating mutually beneficial interaction. Technology increasingly allows clinicians to see inside a person's body, while offering them less and less opportunities to see inside another's world and understand what it means to live with pain. It is easy to see how patients can feel the credibility of their subjective experience challenged by the weight of medical expertise.

Introducing images and narrative practices can help to rebalance these power dynamics. Images bring patients' experience directly into the pain consultation. They can help to open a different kind of space from the traditional verbal encounter of a medical consultation. Attention paid to patient narrative allows the meaning of pain across the whole self to be explored. Rita Charon has suggested that the central feature of narrative is that it is "*shared*". As a vehicle for sharing experience, narrative can be invaluable in the management of chronic pain. It is our belief that images can help patients share their narratives. We draw on art psychotherapeutic theory to understand how this might work in clinical settings.

The addition of the image into the space between two people changes the relational space from a two-way to three-way dynamic forming a clinician–patient–image triangle. The triangle provides a way of thinking about unconscious inner world functioning, a way of conceptualizing what happens in the space between people and image. Art therapist Margarita Wood has described it as "*triangulation around the potential space*", referring to psychoanalyst Donald Winnicott's ideas of intermediary areas: potential space and transitional objects. The images could therefore be viewed as transitional objects, mediating between inner and outer experience, increasing potential for narrative and communication with another.

Images are open to interpretation and patients can bring their own meaning to them. Images mediate between patients' inner selves and outer reality; as patients look at them they are in a dialogue with themselves and with the clinician. Art psychotherapist Joy Schaverien suggests that "*a picture creates space in terms of allowing imaginal space to manifest and offers a way of potentially sharing that space*". It was perhaps important for patients in this project that the pain images had been co-created with other patients. The photographs were translations of pain states; translations of ephemeral feelings made into concrete visual objects offered to other patients to project onto. As social psychologist Alan Radley, has suggested, photography is more than a medium; it "*is a way of making known and shaping experience*".

There are parallels here with anthropologist Alfred Gell's concept of the art object as relational, providing insight into how images work in social spaces. Handling, viewing, and responding to "*pain cards*" could be viewed as performances of identity construction and relationship building. The images create connections between participants and between the emotional and the sensory; the mind and body. In a sense, they stand in for the body in pain as a reminder of its corporeality, and bring this into the center of the consulting room and its language. The image is becoming, in Gell's words: "*personhood spread around in time and space*". But whose personhood?

In this context, the meaning of an image is made in relation to the clinician, who is in a position of discursive power relative to the patient. Encouraging the patient to lead the dialogue with images could facilitate a more balanced interaction. An aesthetic space, as provided by photographs, can expand dialogue and generate language in a pain consultation. In a target-driven health service clinicians may feel they do not have the time to use "*pain cards*". However, in certain circumstances time could be saved using images because they can encourage patients to discuss their concerns more quickly than they otherwise would. Emotional narrative might even influence the intensity of an individual's pain and its future trajectory. If images can elicit emotional narrative early in the consultation they could improve outcomes and save time in the future.

If only it were THAT simple…

In 2009, after she was diagnosed with stage 3 breast cancer, Ann Ramsdell began to search the scientific literature to see if someone with her diagnosis could make a full recovery. Ramsdell, a developmental biologist at the University of South Carolina, soon found something strange: the odds of recovery differed for women who had cancer in the left breast versus the right. Even more surprisingly, she found research suggesting that women with asymmetric breast tissue are more likely to develop cancer. **Asymmetry** is not clear. Yet below the skin, asymmetric structures are common. Consider how our gut winds its way through the abdominal cavity, sprouting unpaired organs as it goes. Or how our heart, born from two identical structures fused together, twists itself into an asymmetrical pump that can simultaneously push oxygen-rich blood around the body and draw in a new swig from the lungs, all in a heartbeat. The body's **natural asymmetry** is crucially important to our wellbeing.

But, as Ramsdell knew, it was all too often ignored.

In her early years as a scientist, Ramsdell never gave asymmetry much thought. But on the day of her dissertation defense, she put a borrowed slide into a projector (this was in the days before PowerPoint). The slide was of a chick embryo at the stage where its heart begins to loop to one side. Afterward a colleague asked why she put the slide in backward. *"It's an embarrassing story,"* she said, *"but I had never even thought about the directionality of heart looping."* The chick's developing heart could distinguish between left and right, same as ours. She went on to do her postdoctoral research on why the heart loops to one side.

Years later, after her recovery, Ramsdell decided to leave the heart behind and to start looking for asymmetry in the mammary glands of mammals. In marsupials like wallabies and kangaroos, she read, the left and the right glands produce a different kind of milk, geared toward offspring of different ages. But her initial studies of mice proved disappointing — their left and right mammary glands didn't seem to differ at all. Then she zoomed in on the genes and proteins that are active in different cells of the breast. There she found strong differences. The left breast, which appears to be more prone to cancer, also tends to have a higher number of unspecialized cells (according to unpublished work that's undergoing peer review). Those allow the breast to repair damaged tissue, but since they have a higher capacity to divide, they can also be involved in tumor formation. Why the cells are more common on the left, Ramsdell has not yet figured out. "*But we think it should do with the embryonic environment the cells grow up in, which is quite different on both sides*."

Ramsdell and a cadre of other developmental biologists are trying to unravel why the organisms can tell their right from left. It's a complex process, but the key orchestrators of the handedness of life are beginning to come into clearer focus.

In the 1990s, scientists studying the activity of different genes in the developing embryo discovered something surprising. In every vertebrate embryo examined so far, a gene called *Nodal* appears on the left side of the embryo. It is closely followed by its collaborator *Lefty*, a gene that suppresses *Nodal* activity on the embryo's right. The *Nodal-Lefty* team appears to be the most important genetic pathway that guides asymmetry, said Cliff Tabin, an evolutionary biologist at Harvard University who played a central role in the initial research into *Nodal* and *Lefty*.

But what triggers the emergence of *Nodal* and *Lefty* inside the embryo? The developmental biologist Nobutaka Hirokawa came up with an explanation that is so elegant *"we all want to believe it,"* Tabin said. Most vertebrate embryos start out as a tiny disk. On the bottom side of this disk, there's a little pit, the floor of which is covered in cilia — flickering cell extensions that, Hirokawa suggested, create a leftward current in the surrounding fluid. A 2002 study confirmed that a change in flow direction could change the expression of *Nodal* as well.

Damaged cilia have long been associated with asymmetry-related disease. In Kartagener syndrome, for example, immobile cilia in the windpipe cause breathing difficulties. Intriguingly, the body asymmetry of people with the syndrome is often entirely inversed, to become an almost perfect mirror image of what it would otherwise. In the early 2000s, researchers discovered that the syndrome was caused by defects in several proteins driving movement in cells, including those of the cilia. In addition, a 2015 *Nature* study identified two dozen mouse genes related to cilia that give rise to unusual asymmetries when defective. Yet cilia cannot be the whole story. Many animals, even some mammals, don't have a ciliated pit, said Michael Levin, a biologist at Tufts University who was the first author on some of the *Nodal* papers from Tabin's lab in the 1990s. In addition, the motor proteins critical for normal asymmetry development don't only occur in the cilia, Levin said. They also work with the cellular skeleton, a network of sticks and strands that provides structure to the cell, to guide its movements and transport cellular components.

An increasing number of studies suggest that this may give rise to asymmetry within individual cells as well. "*Cells have a kind of handedness*," said Leo Wan, a biomedical engineer at the Rensselaer Polytechnic Institute. "*When they hit an obstacle, some types of cells will turn left while others will turn right*." Wan has created a test that consists of a plate with two concentric, circular ridges. "*We place cells between those ridges, then watch them move around,"* he said.

"When they hit one of the ridges, they turn, and their preferred direction is clearly visible." Wan believes the cell's preference depends on the interplay between two elements of the cellular skeleton: actin and myosin. Actin is a protein that forms trails throughout the cell. Myosin, another protein, moves across these trails, often while dragging other cellular components along. Both proteins are well-known for their activity in muscle cells, where they are crucial for contraction. Kenji Matsuno, a cellular biologist at Osaka University, has discovered a series of what he calls "*unconventional myosins"* that appear crucial to asymmetrical development. Matsuno agrees that myosins are likely causing cell handedness.

Consider the fruit fly. It lacks both the ciliated pit as well as *Nodal*, yet it develops an asymmetric hindgut. Matsuno has demonstrated that the handedness of cells in the hindgut depends on myosin and that the handedness reflected by the cells' initial tilt is what guides the gut's development. "*The cells' handedness does not just define how they move, but also, how they hold on to each other,*" he explains. "*Together those wrestling cells create a hindgut that curves and turns exactly the way it's supposed to.*" A similar process was described in the roundworm *C. elegans*.

Nodal isn't necessary for the development of all asymmetry in vertebrates, either. In a study published in *Nature Communications* in 2013, Jeroen Bakkers, a biologist at the Hubrecht Institute in the Netherlands, described how the zebra fish heart may curve to the right in the absence of *Nodal*. In fact, he went on to show that it even does so when removed from the body and deposited into a simple lab dish. "*That being said*," he adds, "*in animals without Nodal, the heart did not shift left as it should, nor did it turn correctly. Though some asymmetry originates within, the cells do need Nodal's help*."

For Tabin, experiments like this show that while *Nodal* may not be the entire story, it is the most crucial factor in the development of asymmetry*. "From the standpoint of evolution, it turns out, breaking symmetry wasn't that difficult*," he said. *"There are multiple ways of doing it, and different organisms have done it in different ways."* The key that evolution had to solve was making asymmetry reliable and robust, he said. "Lefty *and* Nodal *together are a way of making sure that asymmetry is rob*ust."

Yet others believe that important links are waiting to be discovered. Research from Levin's lab suggests that communication among cells may be an underexplored factor in the development of asymmetry.

The cellular skeleton also directs the transport of specialized proteins to the cell surface, Levin said. Some of these allow cells to communicate by exchanging electrical charges. This electrical communication, his research suggests, may direct the movements of cells as well as how the cells express their genes. "*If we block the [communication] channels, asymmetrical development always goes awry*," he said. "*And by manipulating this system, we could guide development in surprising but predictable directions, creating six-legged frogs, four-headed worms or froglets with an eye for a gut, without changing their genomes at all*."

The apparent ability of developing organisms to detect and correct their own shape fuels Levin's belief that self-repair might one day be an option for humans as well. "*Under every rock, there is a creature that can repair its complex body all by itself*," he points out. "*If we can figure out how this works*," Levin said, "*it might revolutionize medicine. Many people think I'm too optimistic, but I have the engineering view on this: Anything that's not forbidden by the laws of physics is possible*."

Nature is –and remains- the most impressive *magician.* And healer.

The University of Padua *TripAdvisor*

The Birthplace of Modern Medicine

Padua, Italy, was at the forefront of a shift to scientific consciousness that allowed the real picture of human anatomy to emerge for the very first time

From the 2nd Century AD to the end of the Middle Ages, it was an accepted tenet that monkeys had the inner workings quite like those of man. This was the anatomical point of departure established by the 2nd-Century Greek physician Claudius Galenus – commonly referred to as Galen – who at the time was the authority on all things medical in Western Europe and Byzantium. Yet due to religious, legal and cultural taboos, he had never systematically dissected human bodies. Instead, his writings and dissections of monkeys, specifically Barbary and rhesus macaques, guided the development and practice of medicine for around 1,400 years.

And then something ground-breaking happened.

A scientific revolution burst through the self-imposed limits of ancient knowledge. After human dissections being frowned upon for hundreds of years, in the 16th Century a shift to scientific research and observation allowed the real picture of human anatomy to emerge for the first time, paving the way for the practice of medicine we see today.

At the forefront of it all was one Italian city – Padua – and its university.

During the 16th Century, Padua, Italy, was on the forefront of a scientific revolution
(Credit: Enrico Della Pietra/Alamy)

Padua has a rich artistic, religious and literary heritage. It's best known as the setting of Shakespeare's The Taming of the Shrew and where Italian artist Giotto – recognized as the Father of the Renaissance – frescoed the Scrovegni Chapel with biblical scenes loaded with human emotions. What is most remarkable about this northern Italian city, though, is that it's the cradle of modern medicine.

Medicine had been studied in Padua – once a free commune – for many centuries. This tradition was upheld when the University of Padua was founded in 1222. A renowned centre of the sciences, the University of Padua enjoyed unparalleled autonomy and religious tolerance even after it came under the rule of the Carrara dynasty during the 14th Century. When Padua was conquered by the Republic of Venice in 1405, the Venetians kept the university as the main educational hub of the Republic and managed it under the motto of *Libertas docendi et investigandi* (Freedom of teaching and researching).

Founded in 1222, the University of Padua was the main educational hub of the Republic of Venice *(Credit: Brenda Kean/Alamy)*

"The Republic understood that the university was a fundamental opportunity to foster a culture that celebrated Venice's government," explains Fabio Zampieri, associate professor of history of medicine in the Department of Cardiac, Thoracic and Vascular Sciences at University of Padua Medical School. "The best professors were called from all around Europe, captivated by the guarantee of freedom of research. The fame of the best professors attracted the best local and international students, too." As a result, the University of Padua became the centre of what Zampieri describes as 'the Scientific Renaissance', part of the larger Renaissance period.

This was a time of major change. While the Middle Ages relied on theology and knowledge that was acquired through the reading of theoretical books, the Renaissance period brought with it a shift to a scientific method that relied on practical testing and experimentation.

Zampieri continues, *"During the Renaissance, Galileo taught mathematics here and spread his new quantitative method, which deeply influenced also medicine. William Harvey – who first described fully the human blood circulatory system – was a student of medicine in Padua. Santorio Santorio – a professor at the university – invented the thermometer. Giovanni Battista Morgagni – a professor of anatomy here – founded modern anatomical pathology in the 18th Century. The first human heart transplant in Italy was performed in Padua in 1985."*

A brisk 15-minute walk will take you from the Padua train station to Palazzo Bo in the city's heart. The historical seat of the University of Padua, Palazzo Bo is the place where medicine finally received the systematic approach it needed to grow into a modern science. Stepping into the monumental courtyard decorated with the colorful heraldic crests of former students, stop for a moment: this is where in the 16th Century, Andreas Vesalius performed systematic dissections of human bodies in a temporary anatomic theatre in front of crowds of 500 people or more.

Many famous scientists passed through the University of Padua, including Galileo Galilei
(Credit: Rossi Thomson/Reproduced by concession of the University of Padua)

Born in Brussels, Vesalius arrived in Padua in September 1537 where he completed a doctorate in medicine in December that same year. He immediately became chair of the university's Anatomy and Surgery Department – a position he held until the early 1540s. During his time in Italy, Vesalius wrote his revolutionary work *De Humani Corporis Fabrica Libri Septem* (On the Fabric of the Human Body in Seven Books), which was published in 1543. The seven books explained the workings of our bodies in unprecedented detail, with help from meticulous illustrations executed by artist Titian's studio in Venice under the close guidance of Vesalius himself.

Greek physicians Herophilus and Erasistratus performed systematic dissections of human bodies in the first half of the 3rd Century BCE in the Greek School of Medicine in Alexandria, Egypt. However, the writings about their findings were lost in the great fire that devastated the library of Alexandria – the ultimate scientific and cultural hub of the Ancient World.

Human dissection fell into disfavor in both Greece and Rome, becoming such a cultural taboo by the 2nd Century CE that Galen had no other choice but to dissect animals in his quest to understand the human body. This led to several errors in his findings, and because there was no acceptable way to refute them, Galen's assumptions persisted as medical knowledge for more than 1,400 years.

Andreas Vesalius performed dissections of human bodies in the courtyard of the Palazzo Bo
(Credit: Rossi Thomson/Reproduced by concession of the University of Padua)

It was only towards the end of the Middle Ages that a wind of change could be felt. By the 1300s, human dissections were introduced as a valuable teaching exercise for medical students. However, dissections were not a common occurrence, and anatomists merely directed the proceedings by reading verbatim from Galen's texts, leaving the actual dissection to a surgeon. It wasn't until Vesalius came along that people truly began to question the existing knowledge of the human body.

"Vesalius revolutionized the teaching of anatomy by performing the dissection himself. Vesalius commented on the cadaver in front of him, thus putting for the first time the human body as the book of nature at the centre of anatomical research," Zampieri explained. "He also revolutionized the content of anatomy, by demonstrating that Galen never dissected human bodies and that the animals which he dissected presented many anatomical differences with man." On the Fabric of the Human Body in Seven Books

caused quite the stir in the 16th-Century world of medicine, provoking a strong rebuttal from Western Europe's most illustrious medical professors and practitioners who were devoted Galenists. Vesalius felt ostracized, and abandoned his academic career. But his departure didn't stop the advance of medical science at the University of Padua. Anatomists and physicians like Gabriele Fallopio (who first described the Fallopian tubes) and Bartolomeo Eustachi (who was the first to accurately study the anatomy of the teeth) took the proverbial baton and then passed it on. Nowadays, portraits of these luminaries of modern medicine adorn the Hall of Medicine at Palazzo Bo.

Fabio Zampieri: "Vesalius revolutionized the teaching of anatomy"
(Credit: Universal History Archive/Getty Images)

Just over 50 years after Vesalius performed dissections in a temporary anatomical theatre in the university courtyard, the world's first permanent structure designed for public anatomical dissections was erected inside the Palazzo Bo between 1594 and 1595 next door to the Hall of Medicine.

A guide leads groups to the '*kitchen*' – a room with dark-colored walls where the cadavers would be prepped for the dissections. Access to the anatomical theatre is from the door through which bodies were once carried and crowded right below the spot where the dissection table used to be placed.

This was a time of major change

In the dim light, one can glimpse the six narrow tiers on which up to 250 medical students and other spectators would congregate. There were no seats, no space to take notes and, initially, no windows. Shaped like a funnel and beautifully carved from wood, the concentric, gradually expanding tiers had amply-high balustrades to ensure that the spectators, if they fainted, could not fall and disrupt the dissection. Students, professors, aristocrats, visiting dignitaries and even noble ladies would attend the candlelit dissections. A violin orchestra would play on the top-most tier to make the atmosphere feel less nauseating. Each body would be dissected over several days in winter, traditionally during the Carnival season – a licentious period when social mores would be more relaxed and dissections could be performed despite the still-existing taboos around them.

The world's first permanent anatomical theatre was built in the Palazzo Bo in the late 16th Century *(Credit: DEA / A. DAGLI ORTI/Getty Images)*

After touring Palazzo Bo, venture back into the city where many other sites highlight

Padua's influence on modern medicine. Make your way to the Museum of history of Medicine (MUSME), which relies on hundreds of artefacts and dozens of interactive displays to tell the complex story of how we came to understand and treat the human body. From there, stroll through Padua's porticoes, past the Basilica of St Anthony to the university's botanical garden. Founded in 1545 and now a UNESCO World Heritage site, the botanical garden was vital to medical students' studies of botany – particularly the therapeutic and healing power of plants. Many new botanical species were introduced to Italy via this beautiful place, including sunflowers, potatoes and sesame, as well as jasmine and lilac. According to Zampieri, Europeans even have this botanical garden to thank for coffee. "*It's a fact that the first mention in Europe of coffee was in [the 16th-Century work] De Medicina Aegyptiorum by Prospero Alpini, who was the garden's director*."

The University of Padua's botanical garden was founded in 1545 to help scientists study the healing power of plants - *(Credit: Hilke Maunder/Alamy)*

As you leave the botanical garden, think of what Herbert Butterfield, history professor and vice-chancellor of the University of Cambridge, wrote in his book The Origins of Modern Science 1300-1800, published in 1959: "*In so far as any single place could claim the honor of being the seat of the Scientific Revolution, the distinction must belong to Padua*.

Coda

Magic and Medicine is the second album by The Coral, released on 28 July 2003 in the United Kingdom, where it debuted at number 1 in the charts, and on 10 February 2004 in the United States. The singles "*Don't Think You're the First*" and "*Pass It On*" earned them their first top ten hits.

The album title originates from a lyric in Time Travel, the hidden track on the band's debut album: "Well there's a war going on, ain't the obvious one. It's between magic and medicine". (Wikipedia)

"Everything ends with Songs"

(Pierre-Auguste Caron de Beaumarchais, Le Mariage de Figaro, 1778)

Acknowledgements

As mentioned earlier, the editorials and articles from *The Journal of the Royal Society of Medicine* and *The Lancet* triggered and revived my interest in the combination of psychological and manual skills that the successful practice of both illusionism and medicine require. Research on Google allowed for updates. The consequences of failure can be catastrophic for the magician; for the medical doctor –notably the surgeon- failure can –and does- kill.

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