



VINTAGE

TAKING THE
MEDICINE

DRUIN BURCH

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About the Book

Doctors and patients alike trust the medical profession and its therapeutic powers; yet this trust has often been misplaced. Whether prescribing opium or thalidomide, aspirin or antidepressants, doctors have persistently failed to test their favourite ideas – often with catastrophic results. From revolutionary America to Nazi Germany and modern big-pharmaceuticals, this is the unexpected story of just how bad medicine has been, and of its remarkably recent effort to improve. It is the history of well-meaning doctors misled by intuition, of the startling human cost of their mistakes and of the exceptional individuals who have helped make things better. Alarming and optimistic, *Taking the Medicine* is essential reading for anyone interested in how and why to trust the pills they swallow.

About the Author

Druin Burch works as a hospital doctor in Oxford, and is the author of *Digging up the Dead*, biography of the Victorian surgeon Astley Paston Cooper.

ALSO BY DRUIN BURCH

Digging up the Dead

To Theodore John Burch, who didn't help at all

Taking the Medicine

A Short History of Medicine's Beautiful Idea and our Difficulty
Swallowing It

Druin Burch

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Prologue

Few things are more frightening than standing over someone with a very large needle, the intention plunging it into their neck for their own benefit, and no previous experience of success.

I am not talking about the little needles you use to give drugs, or the slightly bigger ones for blood transfusions. I mean the large and long pieces of sharpened steel that are used for making entry holes into people's bodies.

The process is meant to be straightforward. You lie the patient flat, or tilt the bed backwards so that the head is below the feet and the blood vessels of the head and neck engorge. You clean the skin, put sterile drapes all around the neck (which means covering over the face) and inject some local anaesthetic around the jugular vein. Then, gloved and gowned, with a mask on your face and a cap on your head, you feel in the neck for a pulse. The heat of all the extra clothes makes you sweat. You find a pulse, then pause for a second to make sure it is not your own. Under your fingers, now, is the patient's carotid artery, each pulse taking a beat's worth of blood towards the brain. In most people the vein you need lies just to the outside of this pulsation.

Keeping your fingers on the pulse, you grab a very large needle attached to a small syringe. The vein you are after is deep beneath the skin. You cannot see it or feel it. The needle might pass through it or miss it entirely. It can pierce the artery, where the blood squirts along under high pressure, or it can pass through and puncture the top of a lung. It can make a hole in the windpipe or cut through important nerves.

You grab the syringe in one hand and, carefully, put the end of the needle on the skin of the patient's neck, next to your fingers. The tip is bevelled and sharp, not a round 'O' but, seen in profile, as you are seeing it now, a piercing 'V'. If you are lucky the patient is not moving their head, or twitching, and you are not nervously aware of how easy it is to plunge the needle through the thickness of your surgical gloves and into your own hand.

'You may feel some slight pushing now,' you say, hoping it sounds more convincing to the patient.

My education in placing these needles began on a ward that was unusually organised about monitoring for this. That was because two months before my arrival, a doctor tried the procedure and failed. He put his needle into the carotid artery. When he took the syringe off the end of the needle, just to make sure the blood spurted out with enough force to spatter its way across the length of the room. Hitting the carotid is reasonably common. You press hard enough for long enough and the bleeding usually stops.

The doctor then tried on the other side of the patient's neck, where he made the same mistake. Withdrawing, he pressed again to encourage the bleeding to stop.

The patient's neck swelled. Over each side there was a bulge of blood. It was contained within her flesh, not pouring uncontrollably onto the floor. The pressure grew in her neck, the two tomato-like swellings squashing the structures around them. The patient began to struggle for breath. The two internal bleeds, not much more than big bruises, pressed on her windpipe. They crushed it. She died.

Medical interventions are dangerous. Things sometimes go wrong, no matter how careful you are. It is easy to understand when looking at a large needle, somehow harder when it comes to a pill. Sharp edges are not required to make something dangerous. I have given clot-busting drugs to people having heart attacks, then seen them bleed so rapidly into their tongue that it has swollen and choked them. Others have collapsed with strokes, the drugs saving their hearts at the same time as making the

bleed torrentially into their own brains. Even when the deaths are not so dramatic, they are as real. Drugs can do their damage unobtrusively, scarcely noticed. A little more confusion than someone normally suffers, a slight step forwards in the crumbling of old age. Someone with cancer beginning to bleed internally, vomiting up their own blood. When you have been expecting something bad to happen, it is easy to overlook the fact that a pill may have hurried it along.

There are also the errors of omission. A doctor, remembering that two of his patients have bled to death from aspirin over the last month, becomes wary of giving it to others. The bleeds stick in his memory, nagging at him. The purpose of the aspirin is to fend off strokes and heart attacks, yet the patients carry on having them whether they are on the drug or not. Those few people who die spectacularly from blood loss are memorable. The many others whose heart attacks and strokes happen a little bit later, a little less often: they are less vivid. So the doctor slips in his habits, and the errors of omission happen in obscurity. When an old man clutches his chest and collapses, as all his family knew he one day might, it is easy to ignore the drugs that he was *not* on. Yet these deaths, too, are side effects of medical dangers.

You would think that doctors, aware of these dangers, know what they are doing and that seeking medical advice is a *good* thing. Most of the time you'd be right, but only recently. Doctors, for most of human history, have killed their patients far more often than they have saved them. Their drugs and their advice have been poisonous. They have been sincere, well-meaning and murderous. This book is about medicine's bleak past, and the methods it learnt in order to improve.

Using a handful of common drugs – opium, aspirin, quinine and a few others – I want to show how the way in which people have thought about medicine has determined their success. Different treatments tell different tales. Those collected together here share a common theme. Their story is about the importance of how you try to answer questions about the human body, about what makes people healthy or sick, and how surprisingly difficult it can be to tell the difference.

Most histories of medicine are strikingly odd. They treat their subject as though it was a matter of perspective, of judgement, of opinion. Roy Porter's *The Greatest Benefit to Mankind* is the best of the comprehensive modern histories. In his introduction Porter apologises for focusing on the people who made advances, disliking the idea of a “great docs” history which celebrated the triumphal progress of medicine from ignorance through error to science'. Porter was abashed about the extent to which he concentrated on the West. He did so, he explained, only because Western approaches became so culturally successful. 'Its dominance', he says, meaning that of Western medicine, 'has increased because it is perceived, by societies and the sick, to “work” uniquely well, at least for many major classes of disorders.'

Why should Porter put the word *work* in quotation marks?

Historians treat medicine the way they do politics and society and art. The Egyptians used ostrich egg pultices for open skull fractures, just as they mummified their dead and built pyramids for themselves. All these activities, for historians, fit into the system of beliefs that defined what it was to be an ancient Egyptian. And to the extent that another culture's medicine is as much a part of who people are as their religion, these historians are right. Porter's brilliantly written history contains thrilling accounts of the remedies used by the Egyptians, the Greeks, the Romans, the Victorian English.

Did their medicines save lives, cure ills, and offer comfort to them in their distress? Here the historians are less helpful. They will not tell you. Their interest is in the way the therapies reflect the beliefs of particular cultures. Porter's interest, like that of most historians, is in the cultural relativity of medicine. What may be a cure to my eyes could be a poison to yours. Each society's 'diagnostic

arts and therapeutic interventions', Porter says, are as valid as any others. He focuses on Western ones because of their worldwide popularity. This is the traditional view of medical history, in which medical systems war with each other like religions, battling it out for the hearts of the faithful.

Yet medicines are not like poems, the different virtues of pills and potions as capable of endless debate as odes and sonnets. Our bodies are the bodies of the Egyptians that came before us, and the Sumerians that came before them. We have the same organs and the same construction. The cancer and infectious diseases and hazards of accident and age have changed a little over the millennia, but not a great deal. Histories of medicine give readers a rich feeling for the vast array of drugs that the Greeks and Romans, the Chinese and Indians and eighteenth-century French, possessed. They provide a clear account of what people believed they were doing, but almost none at all of whether they were right.

Suffering from cancer, did a patient get better treatment under medieval French physicians than under the Egyptian doctor Imhotep? Struck down with pneumonia, was someone better off being blebbed for it by the Greeks, the Romans, the Renaissance Italians, the Revolutionary Americans or the best minds of nineteenth-century medicine from Harvard to Heidelberg? The answer is that it made no difference. The rationales varied, but not the effects. The Greeks had an explanation for why taking pints of blood away would help someone with a chest infection. George Washington's doctors had their own explanations. In terms of understanding the cultures of the two civilisations who held those views, the differences between their explanations are interesting. Relative to the effects of blood loss on a sick human being they matter not at all.

The Egyptians had complicated ideas about how the body worked and they believed that lettuce was a drug that caused lust. What happened a thousand years later, in the classical civilisations of Athens and Rome? Thomas Dormandy's recent history of pain is long and entertaining. When he gets to the Greeks and the Romans he comments that 'the garden lettuce gathered when young and tender had an established reputation as a mollifier of grief. But it could also encourage frenzy.' Could the lettuce have changed from the days of Egypt? Could human physiology? Should we be wary of salads?

On the last day of 1664, Samuel Pepys wrote in his diary of his unusually good health over the previous months. 'I am at a great loss to know whether it be my Hare's fote, or taking every morning a pill of Turpentine, or my having left off the wearing of a gowne.' Whatever the cause, it was none of those three. We are still at a loss for many things, frequently including physical explanations, but we have progressed since 1664. Medical progress is real, and it comes from realising that some medical theories are more useful than others. Pepys's beliefs were sincere, but they were wrong.

The United Nations Children's Fund started monitoring global child deaths in 1960. In 2007 they reported that for the first time deaths dropped below 10 million a year. Over the same period the number of children in the world rose. In 1960 20 million died each year. In 2007 the number was 9 million. The reason for the success was that some poor countries became a little less poor, meaning better food and housing and sanitation, while vaccinations and vitamins and mosquito nets helped save millions of children's lives. Progress relies on understanding that some medical treatments really do 'work'.

I never intended to save any lives. It was sort of an accident, arranged chiefly with a view to extending my sporting life. A time spent in genetic research failed – I found the pipette too dull a companion and the statistics too frightening – yet the outside world was not attractive. I could not understand the rush of my colleagues towards the City of London. That meant suits and rigid working lives, not to mention

very little opportunity to do any sport. The thought of a 'proper job' was equivalent in my mind with middle age. My mental world was divided up into sport and non-sport, and it was the first that I wished to live in.

So with these hidden motives, I applied for medical school. My interview preparation was largely non-existent. 'What if they ask you why you want to be a doctor?' suggested a friend. 'They won't ask me that,' I explained. 'Why would anyone ask such a dull question? They'll only get identical answers about liking science and wanting to help people.'

'Why do you want to be a doctor?' they asked me.

Whatever I said has long passed from my memory. Probably the examiners were not even listening. To this day I think it was a bad question. Medicine seemed reasonably interesting and reasonably honourable, but I did not have the first idea how I might one day feel practising it. How can you, other than by giving it a go?

Medical school went smoothly. My surgical tutor wrote me the kindest of possible reports. 'I have not met this student,' he recorded, some months after I was allocated to his weekly tutorials. 'But to understand his rowing has improved enormously.' It had. I never did turn up to any of my surgical teaching and the surgeon, whom I later discovered to be eminent, passed me without problems.

One summer I needed an excuse to stay on during the vacation and train. A helpful tutor, hoping my plans might represent some academic enthusiasm, helped me win a small grant to pursue medical history during the summer. So, after mornings going up and down the Thames, I spent the bulk of each sunny day sitting in an old library. I sat there reading until the heat of the day softened into gentle warmth, and then I went out rowing again. It was perfect. I read about the practice of medicine during the nineteenth and early twentieth centuries. It seemed very civilised, in many ways, except that the treatments were laughable. Leeches were popular, along with a range of other interventions that also shortened people's lives. I found it remarkable that no one at the time noticed.

When the summer was over (and winter training properly begun) we learnt about heart attacks. One of my books told me that you used a drug called lignocaine, but it wasn't mentioned in the lectures. I put my hand up and asked about it.

'We don't use that these days,' I was told.

'But my book says it saves lives.'

'Not any more. Nowadays it kills people.'

The lecturer was echoing a famous exchange from Molière, often quoted in medical journals:

GÉRONTE: It seems to me you are locating them wrongly: the heart is on the left and the liver is on the right.

SGANARELLE: Yes, in the old days that was so, but we have changed all that, and we now practise medicine by a completely new method.

How could something save lives one year and cost them the next? The days of leeches began to seem not so very far away. Now I noticed other contradictions in my textbooks. One said that amphetamines were good for helping students to concentrate, and that family doctors were happy to prescribe them. Another explained that antidepressants made people commit suicide. A third said that pregnant women should drink Guinness. The fourth stated that bed-rest saved lives, while the fifth was confident it cost them. On the wards, senior doctors in the mornings told you to avoid certain things at all costs, while others in the afternoon declared the same treatments to be essential. Professors

disagreed over whether people had infections, heart attacks, cancers and strokes – and then argued that their opponent's treatments were likely to be disastrous.

Around this time we were introduced to something called 'evidence-based medicine'. Truth, suggested, was not something that could be divined by the mysterious insight of experts. You developed a theory and then you tested it, and only certain types of tests were reliable.

A lot of things that seemed confusing started becoming clear. I began to understand about the leeches, and the textbooks and the professors. If someone senior and wise believed that something worked, it was not necessarily true. Even though sincere and educated and intelligent people thought treatment was helpful, it could still be toxic.

Down by the river, things also changed. Formerly my coaches had seemed like gods, gifted with perfect understanding and total power. Any time I failed, it was clear to me that it was my fault: some limitation in myself. The coaches shared these views. No matter how certain I was of their wisdom and understanding, they were more certain still.

'I want you to keep your heart rates at 85 per cent of max. for the next hour and a half,' they said. This was the kind of thing they said quite often.

'Why?' I began to ask.

There was usually a short pause.

'Because it's the best way to improve your fitness.'

'How do you know?'

There was a longer pause.

'Because I've done it before and it worked. Because that's what the people who win the Olympics do. I know, I've trained some of them.'

'But,' I asked, 'has anyone actually done an experiment?'

Another short pause, but this time a little more threatening.

'What on earth are you talking about?'

This book is my answer.

1 Early Medicine and Opium

WHEN OUR ANCESTORS ceased to gather and hunt some ten to fifteen thousand years ago, they were making a curious choice, not least because it made them less healthy. Their diet became more restricted, and more vulnerable to a bad season affecting one or two main crops. Domestic animals brought with them lice and worms and diseases that hadn't had a crack at *Homo sapiens* until that point. Hygiene became more of a problem. You don't need to be too scrupulous about where you defecate if you are likely to move on the next day. That changed. Average lifespan, at least for a little while, went down.

What agriculture did provide (other than a steady supply of beer, which some people have seriously argued was what made it attractive to begin with) was the opportunity for acquiring wealth. Grain could be stored, workers could specialise, chiefs could rise to the top and get fat and lazy. Healers, for the first time, could really concentrate on their craft. With large agriculturally minded populations, specialised professional doctors first appeared.

The Sumerians, the earliest agricultural society we know much about, lived around six thousand years ago in what is now Iraq. They had faith in their medics. 'My son, pay attention to everything medical! . . . pay attention to everything medical!' were the words of a Sumerian matron who, in the manner of many mothers since, felt her offspring paid so little attention that she needed to repeat herself. The Sumerians worried about 'the anxiety and intestinal disease which pursue mankind', as well as afflictions beyond the power of medicine ('A malicious wife living in the house is worse than all disease,' ran one proverb). They wrote of potions, of a doctor 'who keeps people alive, and brings them to birth' and of making 'perfect the divine powers of medicine'.

To get an idea of Sumerian medicine, we have to turn to the Egyptians. The clay tablets we have from the Sumerians contain poems, proverbs, history, religion and even a novel, but they are short on medical details. One does list a few medical ingredients – the shells of turtles, skins of snakes, thyme and milk and figs and dates – but gives no clue as to their preparation or intended uses. The Egyptians, however, inherited a great deal from the civilisation of Sumer, and we also have a better record of the specifics they offered to their sick. They were not, generally speaking, up to much.

Edwin Smith, a middle-aged adventurer from Connecticut, spent £12 in January of 1862 for two papyri. They were around three and a half thousand years old, and included knowledge handed down from long before that. They list around 160 different remedies, of which modern scholars have translated a small portion. So we know that the medical armouries of the Egyptians contained onions and watermelons and celery, as well as almonds and aniseed, dates and dill, juniper and cinnamon.

A recent historian of aspirin, Diarmuid Jeffreys, grew excited about the inclusion in this Egyptian list, as well as in that of the Sumerians, of willow. It is from willow that we originally get aspirin. It would be nice to think that this meant the Sumerians and the Egyptians were using willow in a medically effective way. They drew no distinction, however, between willow and their other ingredients. As far as they were concerned, willow was no more effective than onions or celery.

One of the papyri that Smith bought suggested mixing willow with figs, dates and beer to 'cause the heart to receive bread'. (The Egyptians used 'bread' as a synonym for all sorts of fine things. The daily greeting for each other was a cheerful wish for 'Bread and beer!' meaning pretty much everything in life that was good.) The historian of aspirin commented that 'many of the superstitions, reasoning and treatments are based on concepts that are alien to us'. That is true, but

is not what really matters. The Egyptians considered their doctors and their medicines as being potent and effective. Records of their practices show something different. These papyri, the oldest proper medical instructions of our species, contained potions and salves and drugs whose effectiveness was fantasy. Traditional knowledge of healing was not reliable. The first doctors in the world were frauds. This was a remarkable beginning for any profession, even more so for one that has always delighted in a special trust. For the next three and a half thousand years, little changed.

Despite it all, the world grew more populated. People began living longer. They became healthier. By the start of the twentieth century, someone lucky enough to be born in the developed part of the world could expect to live for almost three times the lifespan of their gatherer-hunter ancestor. The huge change came from having more food, better shelter and richer environments. Medicine took away more than it added.

The idea of science – the notion that theories must be tested, and that those that cannot or have not been tested are something other than facts – did not occur to the Sumerians. They had one drug, however, that worked so immediately and so obviously that they understood its effects. That drug came from the poppy, and it has stayed popular to this day.

The poppy is of the genus *Papaver*, family *Papaveraceae*, order *Ranunculales*, class *Magnoliopsida*, division *Magnoliophyta*, kingdom *Plantae* and the domain of the eukaryotes. It prefers soil that has been disturbed, by war or by the plough, and is a common sight in the Oxfordshire fields that surround my home. *Papaver rhoeas* is an annual plant, springing up in the midst of the small irregular fields of wheat and barley. It has the hairy stalk and drooping green flower bud of the *Papaver* genus, rearing up its head to the sun when its twin sepals fall and the scarlet and black petals beneath burst out for a few bright days. Other poppies have other colours: the oranges of the Californian poppy, *Platystemon californicus*, the clear yellow of the Welsh or the host of shades in which the large Iceland poppy appears.

With warm summer days the poppy's ovary swells. A fruit is formed, an upturned bell, the stigma forming a cap where the clapper should be. For a time this fruit is obviously lactiferous. Scratch it and a white substance oozes slowly from the seed-head. Eventually, though, it dries, and the breeze will blow the seeds through the capsule's pores, the plants of another year.

Growing up in the later part of the twentieth century, the poppy seemed to me to symbolise happiness. You saw them when idling in the countryside in good weather, or glimpsed them from the window of a train or a car, flashes of bright scarlet. Even the perpetual image of the Flanders fields heightened the sense of the poppy's cheerful nature. It was partly this contrast with the mud and the death all around that made it appeal so much to the troops: the way it crept into their minds like the promise of the pastoral home for which so many believed they were fighting, their memories of rural joy.

That was what the Sumerians called it: the joy plant. Their writing was cuneiform, a clumsier form of symbolism than our generally phonetic alphabet, and many of the clay tablets they used have survived. One from south of Baghdad describes how to extract the joy from the plant. You score the ripening seed-heads, and the bitter-tasting, drug-filled latex emerges. Leave it to dry and oxidise in the sun, then return and collect the brown sticky paste that results. What you have is opium.

Opium itself – the dried sap of the poppy – is a mixture of different chemicals, the most important of which we today call morphine. It is one of a class of compounds called alkaloids, many of which have pharmacological effects. Why they should do so is not fully clear, but it appears at least in part to be because many alkaloids are produced by plants specifically to have an effect on the species around

them. Many make a plant (or a portion of it) unappetising to whatever insect or herbivore might be otherwise tempted to eat it. Some of these defences can occasionally become attractions, as when people seek out chilli peppers for the heat that is meant to make mammals avoid them. In a similar way the production of morphine has proved to be a successful evolutionary adaptation for the poppy. The drug binds to neurons throughout our brain and spinal cord, subduing pain and producing happiness, as well as damping down both our drive to breathe and the normal movement of our bowels. For this, as well as for the delights of its flower, people have been moved to propagate and protect the plant.

There are other ways of extracting opiates from *Papaver*, some of them simpler. Eating a poppy seed bagel is sufficient to fail a drugs test; the stuff is in there, even if the doses are too low for you to feel. A botanist at the United States Department of Agriculture has suggested that there are significant quantities of opiates in all poppies, and that an unripe seed-head steeped in a glass of vodka could produce enough for a more than decent dose. Less than a century ago the same government department was advising farmers on planting drug poppies as a good cash crop.

If we take a drug in order to bring joy, is it a medicine? Using a drug to produce a sense of well-being does not seem 'medical' to most of us. Yet unhappiness, at least according to some, is a form of illness. So says the World Health Organisation, whose definition of health is stridently positive. Health, declares the WHO, 'is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'. From that perspective anything that brings happiness brings health. Opium has been used since ancient times as an antidepressant drug. Sometimes we still use it medically in similar ways. I have injected people with morphine and seen their fear, their misery and terror dissolve. Was it just that they were in pain, and the pain loosened their worst feelings? Perhaps. But sometimes pain and terror and unhappiness are not separate things. Opium can treat them all.

Papaver rhoeas, the poppy of the Flanders fields, is a poor producer of useful drugs. For potency you need a poppy like *Papaver setigerum* or, even better, *Papaver somniferum*. If a field of poppies reminds most of us of summer or of war, in days gone by poppies evoked sleep and rest and forgetfulness. Poetry was rich with it. Homer sang of Helen, daughter of Zeus, preparing a draught by which Odysseus's son Telemachus might forget the pang of his absence. She 'cast a drug into the wine of which they drank to lull all pain and anger and bring forgetfulness of every sorrow'. That certainly sounds like opium, the drug that a Victorian poet described as making him feel his soul were being rubbed down with silk. Dioscorides, who wrote a five-volume textbook of pharmacology in the first century AD, thought Helen had used henbane. That is an altogether less predictable and less beautiful drug and it seems unlikely, although Dioscorides, who travelled with the Roman military and almost certainly collected opium as he went, had some authority. More modern writers believe that Helen used opium, and an article in the *Bulletin of Narcotics* in 1967 even suggested that Telemachus avoided any ill-effects by virtue of being a regular user. It is not clear where in the *Odyssey* they found the authority for such a belief, but the *Bulletin of Narcotics*, perhaps, has some lingering worries about the effect of Homer on impressionable minds.

English poetry, especially in the nineteenth and twentieth centuries, was rich with the poppy. It bloomed with connotations of sleep, oblivion and mock-death – blessings all. Francis Thompson's 'The Poppy', written around 1887, today seems rather unintentionally soporific and forgettable. In 1919, though, it was regarded highly enough to make it into the *Oxford Book of English Verse*. There the poppy also hangs sleepily from Tennyson's craggy ridge, and blows in the Flanders fields of John McCrae. Isaac Rosenberg knew how a poet should keep a poppy safe, especially at break of day in the

trenches:

Poppies whose roots are in man's veins
Drop, and are ever dropping;
But mine in my ear is safe,
Just a little white with the dust.

Private Rosenberg was killed at dawn on 1 April 1918, having just completed a night patrol. Oscar Wilde, in tune with his occasional declarations that he reserved his best genius for his life rather than his work, preferred wearing poppies to writing about them. The homoerotic symbolism of the poppy, particularly a floppy-petalled purple one, helped prepare the ground for war poets who needed imagery to describe the red wounds of fresh young men. After McCrae's 'In Flanders Fields', the poppy became the symbol of the War to End All Wars – and then of the wars after it. The symbol of oblivion became that of remembrance.

Papaver somniferum has been found in human settlements dating back six or seven thousand years. It grew widely across Europe and Asia, perhaps being domesticated in the western Mediterranean. Burials in the Murciélagos Cave in Spain, dating to around 4200 BC, were accompanied by bags of poppy seed-capsules.

The ancient Egyptians, after the fashion of the Sumerians, cultivated the poppy. They used it for many purposes, but they were clear about its medical power. In their pantheon the god Isis gave opium to Ra, the sun god, to clear up his headache. In their long list of medical treatments, the poppy was important, in some ways unique.

In Roman days, Nero was fond of the poppy. Pliny reported that the emperor used it as a way of getting rid of his enemies. Coleridge, two thousand years later, found it enthralling. 'How divine the repose is,' he said, of the dreams it brought, 'what a spot of enchantment, a green spot of fountain and flowers and trees in the very heart of a waste of sands.' His London lectures, popular enough that the world's first one-way system was created outside to handle the traffic, were based on his belief that he could only be at his most interesting to his audience if he was also at his most interesting to himself. So he stepped up to speak with no fixed ideas of his script, and opened his mouth to hear what ideas came out. Into a glass of water on the podium he poured a little laudanum, opium in alcohol, and a few drops of it were enough to colour the whole glass. As he spoke he added more, and as the talk progressed the glass grew darker.

Here was something that was unmistakably a drug. The poppy caused sleep and happiness, relieved depression, shortness of breath and – remarkably – diarrhoea. Above all it could take away pain. Oscar Wilde, dying in the shabbiness that overtook his last years, was given morphine and opium to take away the pain of what the doctors believed to be a fatal meningitis. Towards the end, in November of 1900, they took the strange step of only pretending to give him the injections. Wilde, his mind half gone with disease, was reduced to shoving his hand into his mouth to keep from screaming. That his doctors withheld morphine was undoubtedly cruel, but it may have prolonged Wilde's life by a fraction. The poppy's ability to deliver people from a feeling of suffocation is not because it helps them breathe. It does the opposite, taking away their awareness of being short of breath. That eases away people's suffering. Potentially it eases away their lives too.

Appreciation of a drug's effects does not mean that the theories used to explain them are correct.

Opium, said Galen, 'is the strongest of the drugs which numb the senses and induce a deadening sleep'. Galen was a Greek living in Rome during the second century after Christ. He is the most influential doctor ever to have lived. His writings summed up the classical knowledge of the time with a few of his own innovations thrown in. For over a thousand years after he died his beliefs were accepted as absolute truth. Despite Galen's proclaimed belief in experimentation, the bulk of his knowledge was based on insight. Galen recommended soaking opium in boiling water, then using it on a woollen sponge either up past the anus or into the nose. Both methods work, the blood supply to the rectum and the nostrils being rich, and the mucous membranes lining those body parts being thin and easily permeable. Galen possessed opium. He had other drugs that gave people diarrhoea – senna and castor oil are still used today – and ones that made them vomit or sweat. Such effects were within the capability of primitive people to discover.

Anthropologists have sworn off using the word 'primitive', worried that it implies that others have cultures that are less complex or rich than our own. They may be correct. When it comes to objective knowledge, however, the word is truthful. Galen's understanding of medicine really was primitive compared to ours, just as ours will hopefully be compared to that of our grandchildren.

What was it about these early drugs that enabled people to discover them? If something, relative to the day, quickly, made someone vomit, sweat, hallucinate or become unconscious then you could see it. If the person's bowels or bladder behaved differently, he or she was able to tell someone about it the next day. Drugs with these effects could be pinned down by the same processes that helped people discover what was good to eat. Subtler effects, and longer time-scales, were not so easy. Many poisons which worked slowly were missed. The Romans sweetened their wine with lead. It was not obvious that the painful and lingering deaths that resulted – decades afterwards – were caused by the metal dissolving in the wine. Beneficial effects were overlooked too, if they were not immediate, dramatic and unmistakable. From the food they ate to the plants in their gardens, people were surrounded by substances containing active drugs – but they lacked the means to notice them.

This is not the impression given by standard medical histories. Roy Porter's 1997 *The Greatest Benefit to Mankind* puts it this way: '. . . after much pooh-poohing of "primitive medicine" pharmacologists studying ethnobotany now acknowledge that such lore provided healers with effective analgesics, anaesthetics, emetics, purgatives, diuretics, narcotics, cathartics, febrifuges, contraceptives and abortifacients'. Porter's list is generally accurate, yet his effect is to mislead. What, for example, did Galen possess? Emetics worked in that they made people vomit, but what conditions benefit from vomiting? Purgatives are useful for constipation but little else. In infectious diseases they serve a similar role to bleeding and emetics – helping to dehydrate and weaken patients who are already dehydrated and weak. Diuretics, drugs that make you urinate out extra fluid, are useful in heart failure – in small, predictable doses and to a minimal degree. Commonly they were used instead for acute illnesses, like trauma or infection. Like bleeding or purgatives, they worsened a situation that was already bad. Drugs that made people sweat were used, since people believed that poisons could be washed out of the body with sweat. They were wrong. What came out in sweat was salt and fluid – both vital for anyone already ill.

Drugs to bring on abortions or to prevent conception are old. The ancient Egyptian use of crocodile dung as a vaginal pessary actually did work – to an extent, and arguably as much by damping sexual attraction as being directly spermicidal. A very few ancient treatments actually did some good. Mercury, despite being very toxic, could help against syphilis: but not much, and often not enough to counteract its own harms. Another chemical element, antimony, has a limited ability to fight off a disease called schistosomiasis, a parasite that can be acquired from swimming in infected water.

Africa. Colchicine, from the crocus, was used with some benefit to treat gout – as well as with a lot of harm to induce vomiting and diarrhoea. So these treatments were biologically active, and did some good as a result. It is likely that these benefits were heavily outweighed by the harms that came with them.

Trepanation in ancient Egypt is often held up as an example of how advanced ancient surgery was. Surgeons were able to drill holes in people's skulls, to lift out pieces of bone. Skulls have been found where the wounds have healed over, showing that some people survived. The ancient Egyptians were advanced enough to sometimes remove a portion of someone's skull without killing the patient – but that does not mean they understood when doing so might be of help. They used the technique to save some of those suffering from certain types of fractured skulls. They used it to harm many who had problems that were actually psychiatric, neurological or infective, and incapable of benefiting from the pain and danger of trepanation.

The inclusion of a potentially helpful ingredient in a long list of others is no indication of real knowledge or any actual healing powers. In the twentieth century, for example, knowing that something in penicillin could kill bacteria, doctors still struggled to get any practical benefits from it. With exactly the right species of mould and advanced chemical techniques to extract concentrated amounts of its juice, they still found it exceedingly difficult to make it do anything useful. Getting a therapeutic effect from the *Penicillium* fungus was that hard. This tells us something important about how to interpret the fact that some Egyptian wound dressings included mouldy bread.

So something else matters, beyond the pharmacological properties of a drug: people's ability to harness it. Were the Greeks and the Romans able to use opium to *reliably* or even *usually* bring an end to pain? Did they make operations comfortable, death easy, illnesses mild? No. Even by the nineteenth century doctors were unable to do these things, remaining too confused about doses and preparations, too uncertain of effects, and too frightened of side effects.

2 Sophistry and Laudanum

AN EARLY STEP forwards in the history of science came with a philosophical argument amongst the ancient Greeks. Five hundred years before the birth of Christ, a group of Greeks made their living from their skills in argument. Athens was a litigious society, and success or failure in lawsuits often depended on such skills. This group of men were called sophists, initially as a compliment to their wisdom and, later, as something of an insult to their morals. ('Sophistry' came to mean arguing for something not honestly or because it was true, but with lies and confusions and because doing so served your own selfish interests.) The sophists rejected the widespread belief that the best way to understand the world was to reason it out. They argued that experience, rather than pure reason, gave you more accurate information about the way the world actually was.

One of the greatest opponents of the sophists was Plato. His belief was that experience of the world was misleading. The ground that we walked on and the buildings and people and shapes around us were only versions – imitations – of what was most real. That deeper truth was hidden. The mind could attempt to figure out, through the power of thought, the pure forms of this underlying reality. Experience only got distracted and confused by the jumbled reflections of it. Experiments could tell you only about these illusions and superficialities, not about anything more important. Those who believed in such barbarically practical methods as experiments were called 'empirics'. It was a term of contempt.

Aristotle argued against this belief in the value of speculation. Reason had to be founded on experience, he suggested. Philosophy was not enough to tell you about how a bee managed to fly or the number of teeth in a person's head. Instead you needed to study the bee, or to open up someone's mouth and start counting what you saw. The words 'experiment' and 'experience' still meant pretty much the same to Aristotle, but at least he felt that something important was hidden away in them. It was an idea that rumbled away in the human mind, not emerging into anything that saved lives or eased pains, but packed, all the same, with promise.

Aristotle complained that Plato relied too much on his own thoughts, his own ability to reason from nothing about how the world worked. That was not, suspected Aristotle, quite good enough. What should the world work the way you expected it to? It seemed better to him to start by observing what was around you, and then to move on to trying to think through what you saw. Fitting your thoughts to the world rather than the world to your thoughts held more promise of getting things right. Aristotle's belief was in what he called 'natural philosophy', in basing your knowledge on your experience. Thomas Aquinas rephrased this belief seventeen centuries later: *Nihil est in intellectu quod non prius in sensu*, 'Nothing is in the intellect which was not first in the senses.' Experience, both men believed, was more reliable than innate wisdom, at least when it came to understanding the truth about the natural world.

A lot of thought and effort went into working out what it was about experience that was helpful. Certain forms of experience seemed more useful than others. Organising observations made them more reliable; the notion that *experiments* were vital grew in people's minds.

Roughly a thousand years after the birth of Christ, Ibn al-Haytham was born in Basra, in the south of modern Iraq. His book on optics explored the nature of vision and included the most developed statement yet of scientific method. Observations, said al-Haytham, gave rise in people's minds to problems, which they then developed theories to explain. Those theories then needed experiment

examination. Both al-Haytham's approach and his optical knowledge greatly impressed Roger Bacon, the thirteenth-century English philosopher friar. Bacon stressed that observation, theorising and experimentation provided the means for finding out about the reality of the world. He documented his experiments in detail, precisely so that others could repeat them and check on his results.

Bacon's emphasis on verification contained an acknowledgement of his fallibility. Never before had anyone so seriously tried to build in safeguards against their own aptitude for errors and confusion. The decline of mental arrogance, the dissolution of people's instinctive belief in the accuracy of their intuition, was ever so gradually progressing.

In the late sixteenth century the unrelated Francis Bacon helped to popularise this view of scientific method. 'Men have sought to make a world from their own conception', he wrote, 'and to draw from their own minds all the material which they employed, but if, instead of doing so, they had consulted experience and observation, they would have the facts and not opinions to reason about, and might have ultimately arrived at the knowledge of the laws which govern the material world.'

Francis Bacon (his eyes like those of a viper, according to the contemporary physician William Harvey) died in the manner of a true scientist. A winter coach-ride in the company of the king's physician, Dr Witherborne, prompted him to wonder if the snow, lying round about, might preserve meat. Consumed with curiosity, the two men plunged out of their coach and into the nearest house, persuading the woman who lived there to sell them a live chicken. They had her kill and gut the creature, and Bacon, full of enthusiasm, grabbed handfuls of snow to help stuff it with. 'The Snow chilled him that he immediately fell so extremely ill, that he could not returne to his Lodging,' wrote the gossipy biographer John Aubrey towards the end of the seventeenth century, some fifty years after the events he confidently recounted. '2 or 3 dayes' after, probably having been bled by his travelling companion, he died of pneumonia. Later opinion on his life was mixed. 'If parts allure thee, think how Bacon shined,' wrote Alexander Pope in the eighteenth century, 'The wisest, brightest, meanest of mankind.'

These advances in thinking about the need to experiment were important scientifically but not medically. They changed nothing about the way patients were treated. Seeing a doctor for professional advice remained a bad choice. This is not to say that doctors were universally awful, or even that they did not occasionally do good, only that their overall impact on the human race was to diminish it – shorten lives and extend disease. Surgeons could set simple fractures and perform basic operations, often to the benefit of their patients. But without the idea of infection the wounds they created frequently went bad, and even the shallowest scratch of a doctor's needle let in the possibility of death. In the seventeenth century the Norfolk doctor Thomas Browne was greatly taken with Bacon's methods, as well as with another great find of the time: William Harvey's discovery of the circulation of the blood. 'Be sure', he wrote, 'you make yourself master of Dr Harvey's piece *De Circul. Sang.* which discovery I prefer to that of Columbus.' After thousands of years of ignorance, Harvey showed in the seventeenth century that the heart pumped blood in a circuit around the body. It was a terrific insight, more impressive to Browne than the discovery of the Americas, but it led to not a single change in the way doctors treated their patients. It did not even prompt them to reconsider their enthusiasm for bleeding and leeches.

*

These new ways of thinking played a central part in the life of Theophrastus Phillipus Aureolus Bombastus von Hohenheim – or, as he took to calling himself, Paracelsus. He was born in Switzerland

in 1493 and the name he chose signified his sense of superiority to the Roman medical authority Celsus. It was a superiority that Paracelsus declared for himself. His career took him across the known European world, searching out knowledge and its mad relations. Paracelsus took a florid interest in the theories, intuitions and products of his own genius, combining them with armfuls of the occult, alchemy and of more straightforward natural philosophy. 'When I saw that nothing resulted from [medical] practice but killing and laming, I determined to abandon such a miserable art and seek truth elsewhere.' His low opinion of contemporary medicine was accurate. Like many of those who held over the centuries, his consequent belief that he could do very much better was wildly off the mark.

The mental techniques with which Paracelsus armed himself were weak and treacherous. The 'doctrine of signatures', which pre-dated written histories, was one of his favourites. It held that innate powers could be determined by superficial appearances. When it came to medicine, this meant that similarities between a plant and a disease were taken to be proof of a therapeutic link. Gold cured jaundice since both were yellow, flowers that looked like testicles cured sexual diseases, the prickles of thistles mended prickly internal pains. It is an idea found in many societies, and neither its long heritage nor its attractive simplicity moves it any closer to being truthful. Other men trusted their intuitions and came up with therapies that were harmful. Paracelsus mocked them for it, then made up some of his own. More usefully, perhaps, he also equipped himself with a large sword. It was handy for itself, for a wandering and pugnacious soul in the medieval world, but within its hilt was something even better. He stuffed his sword with riches. 'I possess a secret remedy,' he declared, 'which I call laudanum and which is superior to all other heroic remedies.'

This pioneer of a new medicine talked a good revolution. 'If I want to prove anything,' he said, 'I shall not do so by quoting authorities but by experiment and by reasoning thereupon. I do not believe in the ancient doctrine of complexions and humours which has been falsely supposed to account for all diseases. It is because of these doctrines that so few physicians have correct views of disease, its origins and its course.' His 'experiments', however, were extensions of his own faith and intuition. Their results folded up into theories so curdled and capacious that they contained all possible outcomes. Paracelsus talked like a scientist but his 'truths' were often fabulously complex delusions. He used the scientific jargon of the day, adopted the words and the traditions of emerging chemistry and applied them in a manner as misleading as that of the mistaken Greeks, Romans and Arabs had been viciously scorned. 'I tell you, one hair on my neck knows more than all you authors, and my shoe buckles contain more wisdom than both Galen and Avicenna.' So much for his boasts. What, however, was this laudanum in the pommel of his sword?

The miracle cure that Paracelsus carried around with him certainly looked strange. It consisted of what he called 'Stones of Immortality', which looked a bit like the droppings of an odd and furtive animal. Citrus juice, gold and other more unlikely ingredients were combined with opium. In fact, the only part of them that had a real effect was the opium. And it was an effect that people rather liked.

They liked it not least because it really could increase their chances of living. So long as doctors like Paracelsus believed that it could cure them, they set aside their more dangerous alternative remedies. And while laudanum, like any form of opium, could be dangerous in overdose, compared to the rest of what the doctors used it was often safer than water.

What Paracelsus discovered was a more potent form of opium, a way of concentrating it. He dissolved the poppy's dried latex in alcohol rather than water. That added an extra dose of spirits to the medicine itself. It also meant, since the active compounds within the poppy dissolved far more easily in alcohol, that the pharmacological kick per pint was considerably greater.

Paracelsus died in 1541. Eighty-three years later, in the summer of 1624, a baby was born in the English county of Dorset. Thomas Sydenham grew up in a world whose medicine as well as its school teaching remained heavily Greek and Roman. Subsequent advances in anatomy and in scientific method continued to be of little use to those who sought help from physicians, apothecaries and surgeons. Still, with an Oxford education and much natural sense (the more useful of the two, given the quality of England's universities at the time), Sydenham was able to recognise a good thing. The poppy impressed him. He declared that 'among the remedies which it has pleased the Almighty God to give to man to relieve his sufferings, none is so universal and so efficacious as opium'.

Not that anyone yet understood how opium worked. Molière's mockery in *Le Malade imaginaire* in 1673 made fun of the pompous jargon with which doctors hid their ignorance.

'I have been asked by a learned doctor what is the cause and reason why opium induces sleep,' says a medical student, hoping to be granted a licence to practise as a fully qualified doctor. 'To which reply it is because there is in it a dormitive virtue, the nature of which is to sedate the senses.' His examiners are delighted with his excellent response.

Thomas Sydenham's commitment to fresher ways of looking at the world bit deep into his life. His first session of study at Oxford ended when the Civil War broke out in 1642, and Sydenham went off to fight for the cause of Parliament and democracy against the Divine Right of the kings. He returned having lost two brothers and a great quantity of his own blood, and finished his studies. But, he wrote 'I became convinced that the physician who earnestly studies, with his own eyes – and not through the medium of books . . . must necessarily excel.' His Oxford education was entirely based on books; for a physician to study anything else was seen as being beneath such highly qualified men. Sydenham believed otherwise, and did his best to persuade others. A junior colleague asked for advice about the most useful books to study. 'Read *Don Quixote*,' he was told, '. . . a very good book; I read it still.' It was not only the uselessness of contemporary textbooks that he was highlighting, but his own reputation for Quixotic eccentricity. It seemed more than a little mad for a doctor not to put his whole faith in the teaching of his elders.

Robert Boyle, the Royal Society chemist, described Sydenham to a mutual friend as a 'ripe scholar, a good botanist, and a skilled anatomist'. The friend repeated the praise, only for Sydenham to surprise him by responding:

This is all very fine, but it won't do – Anatomy – Botany – Nonsense! Sir, I know an old woman in Covent Garden who understands botany better, and as for anatomy, my butcher can dissect a joint full and well; no, young man, all that is stuff; you must go to the bedside, it is there alone you can learn disease.

His frank views went along with enough personal warmth to make him attractive to many leading thinkers. Boyle was a close friend, as was the philosopher Locke. Yet for all Sydenham's advances in epistemology and observation, for all that he prompted doctors to pay more attention to the natural history of diseases, recording their signs and symptoms, progressions and outcomes, the benefit for patients was almost nil. In the end, Sydenham's greatest therapeutic tool was his willingness to withhold medicines. 'The arrival of a good clown exercises a more beneficial influence upon the health of a town', he wrote, 'than of twenty asses laden with drugs.' Finding a patient brought to a state of physical and emotional collapse – not by disease, but by the drugs that others had given – bring on vomiting and diarrhoea – Sydenham 'therefore ordered him a roast chicken and a pint of canary'.

Sydenham's therapeutic nihilism, a disbelief in the purported value of medicines, was profound. He confidently affirm that the greater part of those who are supposed to have died of gout', Sydenham

declared, 'have died of the medicine rather than the disease.' As a gout sufferer himself, he worked his way through the available treatments, concluding that they were more toxic than therapeutic. He was not the first to decide that masterly inactivity was frequently the best option, but he was unusual in his views. 'It is a great mistake to suppose that Nature always stands in need of the assistance of Art,' he argued, referring to the art of a doctor. 'I have consulted the safety of my patient and my own reputation effectually by doing nothing at all.'

Sydenham's approach to bleeding verged on the revolutionary – rather than calling for a leech or lancet at every opportunity, he called for them with relative moderation. He recognised the benefits of laudanum, although he was not able to distinguish between those of the drug itself and those it brought about by helping a patient to escape from more poisonous 'cures'. He was suspicious of the extraneous ingredients added by Paracelsus, and simplified the recipe. In a medical world that prized the complexity of drugs – the more stuff, and the more exotic, the better – this was an accurate and fair original intuition. Woodlice, human skulls, supposed unicorn horn, pearls, snakes and the contents of animal guts were routinely added to preparations. It was called polypharmacy, indicating the number of constituents, and it carried on until nineteenth-century chemists became confident that what was important were the properties of particular active ingredients – an insight that developed into the idea of molecular receptors, cellular locks that responded only to keys of a specific microscopic structure.

For laudanum, Sydenham recommended two parts of opium to one of saffron, along with some cinnamon and some cloves, all mixed in with sweet wine. Cloves possess some mild local anaesthetic properties, but like the other spice and the choice of a popular (and relatively expensive) drink, the main purpose was far more practical. They tasted good. That helped the medicine go down. 'The act of all,' said Goethe in *Faust*, 'the reputation nothing.' Doctors knew better.

The fact that Sydenham dissolved opium in wine – canary wine, similar to the Madeira we have today – has an aspect to it that is easy to overlook. Wine and poppies went together. They provide both ease and forgetfulness and also alertness and a sharpening of the senses. When Samuel Taylor Coleridge, in 1817, wanted a word to describe what laudanum did, he coined a new one: *intensify*.

Part of the reason for our modern horror of opiates comes as a side effect of our war on drugs. The penalty for transporting coca leaves is the same as for cocaine; highly concentrated morphine is the same as for the unprocessed latex of *Papaver somniferum*. Potency therefore carries a premium. If you are going to risk yourself in producing and moving illegal drugs, it is in your interests to shift them as concentrated a form as possible. So the legal dangers of drug dealers become the physiological ones of their customers. Heroin now finds its way into every city, while the milder alternatives that were so common throughout human history – poppy tea, or home-made laudanum – have gone. All that has remained is a love of the poppy for the sake of its appearance.

How was it that doctors persisted in prescribing remedies that helped to kill their patients, yet the profession of medicine continued? How did doctors maintain a reputation for being helpful while causing harm?

The nineteenth-century Boston physician Oliver Wendell Holmes thought he had the answer. What people desired most was something to believe in, and they were willing to pay heavily for it:

There is nothing people will not do, there is nothing they have not done, to recover their health and save their lives. They have submitted to be half drowned in water, half cooked with gasses, to be buried up to their chins in the earth, to be seared with hot irons like slaves, to be crimped with knives like codfish, to have needles thrust into their flesh, and bonfires kindled on their skin, to swallow all sorts of abomination, and to pay for all of this, as if to be singed and scaled were a costly privilege, as if blisters were a blessing and leeches were a luxury.

To this day, little in medicine is so difficult as doing nothing at all. Medicine is founded on the desire

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