DAVID MISSELBROOK

THINKING ABOUT MEDICINE

An Introduction to the Philosophy of Healthcare

CRC Press
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This introduction to the philosophy of medicine surveys the landscape of Western philosophy, as it pertains both to medicine and healthcare more generally, in an accessible way. Written by a doctor for doctors and other health professionals, framing the "toolbox" of philosophy within the community of medicine, it encourages examination of the implicit assumptions made in the construction of medical knowledge and practice.

Taking the reader step-by-step through the concepts that underpin modern philosophy, they will be challenged to reflect upon the premises within clinical practice which might benefit from scrutiny and challenge, including the nature of scientific knowledge, the limits of our biomedical model, the cultural and relational context and the failure to recognise or manage adequately the fact/value distinction in medicine and healthcare.

The book is an ideal textbook for students of medicine and medical philosophy and will also be of interest to bioethicists, medical sociologists, clinical commissioners and practicing clinicians in medicine and the allied health professionals seeking to improve their understanding of philosophy and ethics and sharpen their critical thinking skills.

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An Introduction to the Philosophy of Healthcare

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Foreword

Medicine has always been practiced within its own traditions and with its own assumptions, evolving over time. But why do we seldom think about the underlying philosophies of medicine and healthcare when we are caring for our patients or teaching students?

In earlier days, around the 1800s, medicine was concerned only with the patient's symptoms, and the hope that empirical therapy might cure them. However, with the recognition of physical signs, starting with Laennec's introduction of the stethoscope, we were led to a more structured clinical diagnostic process.

Nevertheless, it wasn't until 1910 following Abraham Flexner's harsh report on the state of medical education in the United States and Canada, where he mentioned "*quackery and a disgrace*", that medical training became more scientific. It required a grounding in human physiology, biochemistry and clinical science, with faculty being actively engaged in research as physician-scientists and academicians.

Since then, medical education has been through many innovations, with education taking on a more student-centred learning approach using methodologies of problem-based learning, case-based learning and team-based learning. William Osler championed learning medicine from direct experience at the patient's bedside. However, this author states that listening to the patient's voice has often not been taught well.

Students are now taught in the context of the diverse population they serve, sensitive to culture, religion and language. The public and society have had much to do with this, with the development of a public trust and broader societal norms.

The subject of whether medicine is a science or an art is difficult to determine, but inevitably both are intertwined. If a science, the author states that humans are hypothesis-generating problem solving beings. Any hypothesis we generate will be influenced by our cultural background. The role of perception itself is very complex and limited from what we see. Thus, people may "see" and yet put a different interpretation on a similar problem, and, of course, we all have our own cognitive biases.

Using Bayesian logic, the author suggests that we can calculate the probability of a hypothesis being true, but this is a "probability" and not a "certainty". Medicine can never be a certainty, but our uncertainty can at least be evidence based.

So where does this book fit in? What is the philosophy of healthcare? It will include a study of ethics, a study of the mental and physical processes that we use to define problems, and a study of the people who use healthcare. Again, healthcare involves both science and human values. This book teases out various ideas – ethical, moral and practical as well as scientific.

The author suggests that to practise as a clinician, one doesn't *have* to learn any medical philosophy, apart from some ethics. One can just follow the herd and survive as a practitioner. However, he suggests that perhaps it's time to become curious and make professional life more interesting and worthwhile by examining the philosophy behind medicine.

I found this book fascinating! It made me think again and to get a new perspective on what being a doctor is all about. I would recommend it to all teachers as well as to the more interested student to try and answer the inevitable "why" questions about medicine.

Professor Dame Parveen Kumar, DBE FRCP

About the author

David Misselbrook was a Lewisham general practitioner (GP) for 30 years, a GP trainer and a General Practice Vocational Training Scheme (GPVTS) course organiser/program director.

Misselbrook was Dean of the Royal Society of Medicine (RSM), representing the RSM on the Directors of Continuing Professional Development Committee of the Academy of Medical Royal Colleges, which develops and regulates UK Continuing Professional Development (CPD).

Misselbrook was President of Faculty of the History and Philosophy of Medicine at the Society of Apothecaries and Course Director for the Diploma in Philosophy of Medicine (DPMSA).

Misselbrook then became Associate Professor of Family Medicine at the Royal College of Surgeons in Ireland Bahrain (RCSI Bahrain), where he was the ethics lead for the medical school. He convened the Research Ethics Committee and was chair of the School of Medicine Academic Committee. He was a member of the Bahrain National Health Regulatory Authority CPD Committee and the Bahrain Ministry of Health Internship Committee. He is now semi-retired, with ongoing academic and committee work.

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Thinking about medicine: Introduction

Plumbing and philosophy are both activities that arise because elaborate cultures like ours have, beneath their surface, a fairly complex system which is usually unnoticed, but which sometimes goes wrong.

Mary Midgley[1]

I once attended a lecture by James Ladyman, a professor of philosophy at the University of Bristol. He was required to produce a mission statement for the philosophy department. He was a bit puzzled, as he felt that a department of philosophy would normally be expected to do what it says on the tin. But, being an agreeable chap, he agreed and came up with *Analysing concepts in the Bristol and Avon area*. Whether this mission statement was ever used I do not know.

However, if we leave Bristol and Avon out of it, *"analysing concepts"* is a pretty good definition of philosophy.

Philosophy is not something obscure, requiring the heroic pose and mental physique of Rodin's *The Thinker*. We analyse concepts and answer questions all the time, from *do you want anything at the shops?* to *"is this patient's grieving normal or pathological?"* Philosophy is the attempt to do this better – to think more clearly, to use our reason in a structured way in order to avoid being led astray by wrong assumptions, wishful thinking and shortcuts.

So is it all just common sense? Well, not quite. Our brains are adapted to cope well with everyday life. *"Do you want anything at the shops?"* is not too demanding. But our brains are not only wired for reason, they are also wired for our desires – we seek answers that we like. And we use shortcuts – we will believe answers that have been OK before, or that are approved by our social group.

Philosophy provides us with a box of tools that give us a better chance of getting right answers.

Philosophy is not a path to finding the meaning of life – although it can be a path to living a better life.

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Philosophy is not a guarantee of getting the right answer to dilemmas – although it should help us to sort out better answers from less good answers, discarding quite a few wrong answers along the way.

Of course, philosophy is not one simple thing, any more than medicine itself or physics or any other discipline. This book mainly uses the Western philosophical tradition. It mostly follows a particular part of that tradition – so-called analytic philosophy. This is not to say that other traditions would be less interesting – but that is not this book.

This book is a sightseer's map, marking a few tourist highlights. It does not drill down into the geology of the world's deeper foundations. And there are far too many highlights to mark them all – the book misses out far more than it includes. I talk both about "medicine" and about "healthcare". Quite often these may be interchangeable, but I take medicine, my area of professional interest, to be a subcategory within healthcare as a whole. I hope this book may illuminate both.

This book should also contain a health warning, especially for clinicians. Thinking can be startlingly addictive and will not necessarily help you to please your managers. But it most certainly will help you to think, and it may empower you to flourish as a human being.

And this book is personal. In the human world there is no absolute objectivity. Even science is a human activity, and philosophy most certainly so. I was a clinician for 35 years and the book is written from that perspective. There are quite a few things that I care about because I think they matter. So here and there I make this obvious, and I hope you will agree or disagree with me as you please.

This book leaves out most of the psychology and sociology of medicine, although there is a huge overlap. I wrote about these in my 2001 book *Thinking about Patients*. I am immensely grateful to Taylor & Francis for reissuing this. I hope that *Thinking about Patients* and *Thinking about Medicine* will, together, form a sort of "everything you wanted to know about healthcare but were afraid to ask".

This book brings together some of my previous published work from articles and book chapters. I have indicated the main places where I have used such work, and I am grateful for the different publishers' permissions to reproduce this material.

I am immensely grateful to Professor Trevor Stammers and to Dr Lotte Elton for their kindness in offering me feedback, chapter by chapter, as I wrote this book. The book is much the better for it. Errors, of course, remain my own. And I am grateful to Dr Andrew Papanikitas for encouraging me to finally write the book and for putting me in touch with the wonderful Jo Koster from Taylor & Francis, together with her ever helpful colleagues.

It is impossible to write a crossover book like this without using some technical terms. I hope I have explained these, but there is also a glossary at the end. Not to mention a short guide for further study. Thinking is meant to challenge the status quo, so let the subversion begin!

David Misselbrook

REFERENCE

1. Midgley M. Philosophical plumbing. *Royal Institute of Philosophy Supplement*. 1992; 33: 139–151.

SECTION 1

On knowing

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CHAPTER 1

Epistemology part I: Problems with knowing

Chapter summary[i]

We usually seem very sure about what we think we know. But what we think we know keeps on changing. So what kind of statements might actually be true? How could we know if they were?

Are we to establish human society on doubt, and no longer on belief?

Bertolt Brecht[1]

You can't depend on your eyes when your imagination is out of focus.

Mark Twain[2]

Case report[ii]

Mrs Jones was elderly and frail with a history of heart disease. She fell and was admitted to hospital with a fractured hip. A couple of days after surgery she rapidly deteriorated with chest pain and shortness of breath and died. You completed the death certificate and explained to the family that she had probably died as a result of a postoperative

i Some parts of this chapter include material from my earlier work *Thinking about Patients*, Chapter 2, Petroc Press 2001 (now CRC Press), reproduced with permission.

ii All case reports, except where stated otherwise, are fictional.

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pulmonary embolus, although a cardiac cause was also a possibility. The family thanked you for the care you had given.

A postmortem was carried out. This showed that the cause of death was pneumonia. The family is now demanding to see you urgently, wanting an explanation for your failure to diagnose her pneumonia.[iii]

INTRODUCTION – WHAT DO WE KNOW AND HOW DO WE KNOW IT?

Epistemology is the *"theory of knowledge; the branch of philosophy that inquires into the nature and the possibility of knowledge. It deals also with the scope and limits of human knowledge, and with how it is acquired and possessed"*[3].

But what do we mean by knowledge? Perhaps our ideas go something like this: *"Knowledge is my grasp of truths about how the world really is"*. But there are a surprising number of problems with this statement:

- Firstly, for reasons we shall explore, we cannot assume that knowledge gives us access to the world as it really is.
- Secondly, we tend to think of our knowledge being "true", but we know that both we and others have made many errors about truth in the past. Why should we think we are right now?
- Thirdly, this model assumes that knowledge somehow tracks the world, observing it passively. But as often as not it is the other way around. Our belief systems – systems of knowledge – mould our perceptions of our world. Consider the placebo effect – my belief in a dummy pill may make a difference to my real world.[4]

We tend to be rather too certain about what we think we know. This is fine for everyday tasks like driving to the shops. False certainty works in our favour when we are probably right, so long as we are smart enough to spot evidence of likely errors and deal with them in a flexible way – I need to drive around the new road works, not straight into them.

However, our everyday knowledge systems do not always work. Philosophers are very cautious talking about "truth". Firstly, what we think of as a truth might turn out to be wrong, and secondly, if it happened to be true, then how would we be sure? Philosophers are generally more inclined to talk about truth claims, i.e. statements, which are offered as candidates for possible truths. Philosophers also talk about truth-seeking practices. Knowledge is generally agreed as being an awareness of something that has a strong truth claim. Thus, given our fragile grasp on truth,

iii The literature suggests that between 28% and 39% of cause of death diagnoses are proven to be wrong at postmortem examination. Pneumonia is one leading "missed" cause of death.

we should always be cautious about our truth claims. However, we all have beliefs – things that we take to be true, whether or not they are.

Reflection point

When was the last time that something you were certain about turned out to be wrong? What does this tell you about our certainties?

Epistemology is the conversation about how we might justify truth claims via truth seeking practices. A diagnosis is an example of a truth claim, and medicine has developed very specific pathways for truth claims about disease, which sometimes work out well and sometimes do not.

HOW DO WE KNOW ANYTHING?

Let us first take a step back. How do we know anything? This is quite a complicated and confusing area, and we often rely on inbuilt heuristic systems (rules of thumb) that usually work for everyday tasks. But the fact that I don't worry about the epistemological challenges inherent in popping out to the shops can work against me when I do more complicated things – like practicing medicine.

We tend to think that we can somehow compare our thoughts and theories against the world as it is in itself,[iv] to check their accuracy. Philosophers sometimes call this "the God's eye view". But there is no God's eye view *available to us*, for reasons that we will see.[5] We have to scrabble around to try to make sense of things.

We might construct a common sense theory of how we obtain knowledge, something like this:

1. Careful observation using our five senses gives us wide-ranging data about the world.
2. We can further widen this data and make it more accurate by taking measurements, including the use of scientific instruments or medical investigations.
3. Sensory data and measurements provide us with general theories about how things work.
4. By checking repeated measurements we can prove sound theories to be true.

You might be surprised that the first point is wildly inaccurate and the third and fourth are frankly untrue. Hence the need for this chapter.

iv "The world as it is in itself" is a term used by philosophers to describe actual reality. Our knowledge of this will always be partial. The term is often contracted to "the world itself", which I will mostly now use.

"Knowing that" or "knowing how"?

You could read a book containing every piece of information you need to ride a bike. This would not enable you to ride a bike. The book would be good for *knowing that* you need to do X, Y and Z to ride a bike. But you would only *know how* to ride a bike once you had practiced it a few times and got the hang of it. (Then, of course, you would not need the book.)

In philosophical literature *"knowing that"* is called descriptive or declarative knowledge, and *"knowing how"* is termed procedural knowledge.

Medicine and healthcare often involve both types of knowledge, i.e. an understanding of how the healthcare world works plus the acquisition of the skills needed to actually do things. So before I put in my first central line, it is good to look up how to do it safely and effectively. But I cannot learn how to put in central lines by reading a book.

The majority of the rest of this chapter is about descriptive knowledge – how we *know that*…. But we need to be aware of the distinction lest we get muddled up between the two and assume that one implies the other. (Hint – the early years of medical school tend to be heavier on *knowing that,* even though medicine itself is heavy on *knowing how.*)

SECTION 1: THE CONSTRUCTION OF (DESCRIPTIVE) KNOWLEDGE

Knowledge is supposed to tell us something about the world itself. But this knowledge will always be incomplete, sometimes wrong, and often patchy. So I am using the term "knowledge" to mean what we *think* we know about the world itself.

We tend to think of knowledge as something we discover, but it would be more accurate to see knowledge as something we *construct*. I am not suggesting some form of extreme relativism, as if we could validly construct any old knowledge claim; rather I am referring to difficulties in knowing about the world. Here are three: the problems of perception, attribution theory and philosophical scepticism.

THE PROBLEM OF PERCEPTION

We cannot know the world itself. We can only know *about* the world through our senses.

Consider what I do know about the piece of paper in front of my keyboard, my chapter plan. Google tells me that this piece of paper contains about 2.4×10^{23} atoms. And each atom will be composed of its constituent subatomic particles, *each one* with its own applicable field equation. My mind cannot begin to conceive of this complexity.

So how does my mind construct the paper as an object? This is via my perception of the paper, in part tactile but mainly visual. But Thomas Nagel helpfully reminds us that the "*assorted frequencies that we are tuned to receive only give us access to a small part of the available data being streamed within the world out there*".[6]

The electromagnetic spectrum goes from gamma rays at 10^{-6} nanometres, to long wave radiation of several meters wavelength. Our eyes are able to perceive light which lies in only a very small region of the electromagnetic spectrum – "visible light". Visible light corresponds to a wavelength range of 400 nm (violet)–700 nm (red), less than 0.001% of the electromagnetic spectrum.

Carl Sagan's view is that *"we go about our daily lives understanding almost nothing of the world"*.[7] As Nagel again reminds us *"the world extends beyond the reach of our minds"*.[8] So my perception of the piece of paper in front of me is based on an incredibly limited ability to perceive signals from the world itself.

So my mind ignores almost all that it knows about my perception and the paper itself, and I regard it as a simple object, to be scribbled on and thrown away. The main thing I know about the world is that I see and understand almost nothing about the world. As St Paul said, *"For now we see through a glass, darkly"*.[9]

On top of this the senses do not report directly to our conscious mind. Twentieth-century psychology has taught us that we are active participants in the act of perception. Sense perception is a highly unreliable basis for our beliefs about the world itself. The beautiful and natural image of the world in our conscious mind is *constructed* within our brains from a huge body of digital data from the sensory nerves. It is not the real world – it is a grossly simplified and patchily distorted image. Sensory inputs are filtered, interpreted and modified by the process of perception, following which our mind constructs preliminary internal models out of sensory data. The image on our retina is not the world; it is an image on our retina.

Immanuel Kant stated that *"as the senses never enable us to know things in themselves, but only their appearances, all bodies must be held to be nothing but mere representations in us, and exist nowhere else than merely in our thought"*.[10]

Kant terms the world-as-it-is-in-itself the "*noumenal* world", and the world-model in our minds created by perception of the "*phenomenal* world".

The active process of the mind constructing what we are "seeing" is a natural source of error in our beliefs about the world. We may easily be deceived by a particular perception within an unusual context. For example, we tend to see the middle lines in the well-known Müller-Lyer illusion (Figure 1.1) as being of different lengths, even when, having been undeceived, we know them to be of the same length.

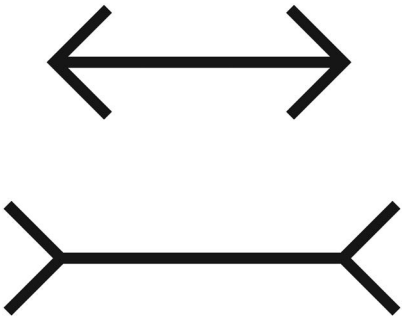

FIGURE 1.1 The Müller-Lyer illusion

This is a trivial illusion, but the principle applies more generally. We tend to see what we expect to see, including when we examine and diagnose patients. This makes the whole issue far from trivial.

We have no God-like comprehension of the billions of wave functions inside and around us. We do not experience the curvature of space, the mutability of time. We are trapped within our own little phenomenal world, even as we know the world itself to be unbelievably bigger and more complex. This separation between the "thing-in-itself" and our perception of it is one of the most important ideas of philosophy and a model shared also with modern neuroscience.[11] Our phenomenal world will never be able to perfectly apprehend the noumenal world – there will always be a gap.

MODELS OF REALITY?

Kant states that *"intuitions without concepts are blind, concepts without intuitions are empty"*.[12] By "intuitions" Kant means individual sensations or pieces of sense data. By "concepts" Kant means theories or models. Kant's view is that our understanding of all sense data depends on the theories that we hold about the context of the data and how it fits together within systems of meaning.

Kant takes a hugely important step in asserting that such sense impressions do not themselves constitute a meaning system for us.

Robert Audi stated *"Even when structured by the pure forms of space and time, sensible representations do not yield knowledge until they are grasped in concepts and these concepts are combined in a judgement.... Judgement requires both concepts and intuition"*.[13] Our consciousness is presented with thought sensations that our minds actively process via interpretative concepts.

Immanuel Kant, 1724–1804, was an Enlightenment philosopher with famously rigid habits. He is relevant because:

- He distinguished between the phenomenal world of our experience and the noumenal world itself, which we cannot know.
- He argued for a "two step" model of knowledge – that individual facts must be nested within interpretive theories.
- He defined morality as our duty to only do right actions. He believed that he could define absolute moral laws, analogous to the absolute physical laws that govern the natural universe.

CI Lewis (an American philosopher, not to be confused with the British writer, CS Lewis) puts it like this: *"There are, in our cognitive experience, two elements; the immediate data, such as those of sense, which are presented or given to the mind, and a form, construction, or interpretation, which represents the activity of thought"*.[14]

Therefore, we construct knowledge by nesting individual "facts" (whether direct perceptual data or scientific measurements) within a broader conceptual context which we *construct*. In other words, we nest facts within theories. But these facts do not offer us an automatic conceptual context – we have to manufacture theories. Einstein, in a letter to Karl Popper, stated *"theory cannot be fabricated out of the results of observation … it can only be invented"*.[15]

Wittgenstein illustrated this point by means of his famous duck/rabbit diagram (Figure 1.2):[16]

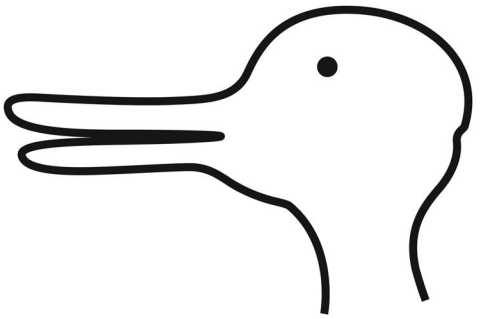

FIGURE 1.2 Wittgenstein's duck/rabbit

The actual sense data presented to us is just a single complex line and a dot. Our brains take this data and automatically generate theories about what the line and dot represent. In this instance, of course, there is a deliberate trick – we can interpret the diagram as *either* a duck *or* a rabbit. (But not both at the same time.) And, of course, we can only do this if we have previously seen both ducks and rabbits.

Wittgenstein's point is that we are not just "seeing" the diagram in some neutral sense. We are placing an *interpretation* on top of what we see. In Wittgenstein's words, we are *"seeing as …."*[17]

John Hick takes this point further when he claims that *"all seeing is seeing as …"* or that all conscious experiencing, including seeing, is *"experiencing-as"*.[18] For example, as I look out of my window now what I *actually perceive* is thousands of small flat green objects above a plane of tiny green linear fragments. It would take me a very long time to measure and describe them all. But what I instantly *see* is a tree on my lawn. I don't have to stop to work this out.

This *"seeing-as"* covers both direct perceptual claims – I see a tree on my lawn – and the many claims about reality which we cannot directly perceive, but that we deduce from perception-plus-concepts, e.g. theoretical relations such as $E = MC^2$.

Now, *seeing-as* is fine for everyday stuff. We don't think about it, and we don't *need* to think about it. This is my Neolithic brain interpreting the world well enough for me to do a bit of hunter-gathering or basic social interaction. But if we project ourselves into a more ambitious world of atoms and wavelengths – or diagnosis and therapeutic intervention – then we would be foolish to think that our ancient brains will automatically catch on.

So we construct theories from data – we *see as*. For the duck/rabbit, if we have only ever seen ducks, then we can only see a duck. If we have only ever seen rabbits, then we can only see a rabbit. So our theories will depend on our own perspective – usually relating to our own time and place.

Thus an ancient Egyptian, a mediaeval cleric and myself will all see the sun "rising" in the East each morning. (Common sense language has let us down already!) The ancient Egyptian will *see this as* clear evidence to support the "fact" that the god Ra has successfully fought against the powers of the night once more – the world has been granted another day. The mediaeval cleric will *see this as* evidence to support the "fact" that angels are moving the crystal spheres that surround our Earth, one of which carries the sun. And I will *see this as* an artefact of the "fact" that the Earth rotates as it circles the sun, the centre of our solar system.

Yes, it may well be that one of these three theories has more evidence to commend it than the others. But I can only see this from my privileged point of view. And it took us several thousand years to get there.

What about more novel or unusual "facts"? Imagine Wittgenstein's duck/rabbit as a jigsaw. But this jigsaw has no box and no picture. The construction of knowledge involves taking active decisions about how we put individual facts together – how we make them into a picture – and then deciding what that picture represents. Most real-world data can be put together to create patterns in different ways. Finding the right bits and then putting them together is the two-step model of knowledge offered by Kant. (And, inevitably, once we are done someone will offer us a few extra bits.)

We are bombarded with data. We would be overwhelmed if we tried to attend to it all. We therefore have to select aspects of a total sensory experience from which to generate the models that we believe to be relevant to us – we have to choose our bits of the jigsaw carefully. We cheat even in this process by relying on cognitive shortcuts, both in order to cope with the mass of operational tasks we must perform, and to cushion the emotional impact of our numerous daily interactions.

These shortcuts often have the effect of reinforcing our hypotheses, regardless of evidence, rather than suggesting new ones. None of us can cope with thinking about the whole world. We can only deal with the world by ignoring most of it. We select out the strands that we need. We construct knowledge by making up mental models that represent the world for us. When we get really good at manipulating a defined subset of this totality we define this bit as "fact". Our models of the world then determine our perception of reality.

We tend to put all these individually constructed facts together into some sort of overarching narrative that tries to make sense of them. This is our worldview. Worldviews tend to work by coherence – they fit facts together without too many awkward gaps or crashes – but it is rarely possible to "prove" or "disprove" a worldview as a whole. This matters because doctors and other healthcare professionals operate within their own worldviews which become a determining feature of their culture as *communities of practice*. A community of practice is a group of people who *"share a concern or a passion for something they do and learn how to do it*

better as they interact regularly".[19] In other words, a distinct subculture or tribe. And the worldview of medics may be very different from the worldviews of patients.

Because we cannot know the world itself, our observations and theories cannot ever be accepted as a final objective truth, but must remain open to doubt and reformulation. All knowledge is provisional.

ATTRIBUTION THEORY

Philosophy has always overlapped with psychology, never more so than here. We have a need to see our world as predictable and controllable. We therefore construct our personal worlds to work like this.

Attribution of cause is a normal human mechanism shared by doctor and dock worker alike. What is different is the nature of the evidence that is accepted as establishing a causal link. But once that link is accepted the causal attribution will be accepted as a "fact", and the world interpreted accordingly. As Richard Asher said *"ideas are much easier to believe if they are comforting.... Just as we swallow food because we like it not because of its nutritional content, so do we swallow ideas because we like them and not because of their rational content"*.[20] We are all of us somewhat too inclined to believe what we read in our favourite journals.

Therefore, however limited our true knowledge might be, we must accept that distortions imposed by our human psychology are not random – they push in particular directions. This is recognised in research as bias, and we will come across this further.

Whilst this is a book on philosophy, not psychology, we need to remember this major confounding factor and a myriad of other forms of bias every time we make, or examine, any truth claim.

RECOGNITION OF COGNITIVE BIAS

This is confusing as it can work both ways. Our truth-seeking processes are not only determined by rational principles. They are also influenced by our priorities and our anxieties.

So suppose I misdiagnose dyspepsia when the patient is actually having a heart attack. For a long time afterwards cardiac causes of epigastric pain would come higher up my list of differential diagnoses than would be justified by clinical reasoning alone. So a personal experience, whilst it teaches a painful but valuable lesson in diagnostic uncertainty, actually skews our diagnostic reasoning and is unhelpful. This is a variant of *"well my last case turned out to be...."* or *"well, I have a special interest in disease X and I reckon this might fit"*.

On the other hand, we teach students to actively check for "red flags". Thus a particular clinical feature may indicate only, say, a 3% probability of a malignant underlying cause with a, say, 50% probability of a particular benign underlying cause, yet we will prioritise chasing the less likely cause because of the serious consequences to the patient of missing this. We need to remember that Bayesian logic (see later) is only one part of our diagnostic sieve.

PHILOSOPHICAL SCEPTICISM – ARE FACTS AN ILLUSION?

Many moons ago, I used to do a regular Sunday evening shift for our general practitioner (GP; Family Physician[v]) out-of-hours co-operative. I would be driven around South London visiting patients with urgent medical problems who couldn't wait for their own GP on Monday. One week my driver had just seen the film *The Matrix*.[21] He was mind-blown by the possibility that maybe our world is just an illusion; that perhaps we were all plugged into a simulation. I explained that this was just an updated version of a two-millennium-old thought experiment,[vi] "Plato's cave".[22] Suddenly, my driver was interested in philosophy.

Plato, approximately 428–347 BC, imagined a world where prisoners are chained, facing a blank wall. Behind them is a fire. Between their backs and the fire, various objects are paraded casting their shadows on the wall in front of the prisoners. All the prisoners can see these shadows, so to the prisoners the shadows are reality, the only reality they can know.

To Plato, the world that we perceive is like this world of shadows. We cannot grasp the world itself because we are trapped by our limited ability to perceive and understand reality.

The Wachowski siblings (makers of *The Matrix*) were not the only ones to reflect on this analogy. Descartes observed that we have no independent guarantee that our perceptions truly mirror the world. He questioned whether our perceptions themselves could be created by an "evil demon", meaning that our image of the world was an illusion.[23]

René Descartes, 1598–1650, was an early enlightenment philosopher. He is relevant because:

- He identified the active nature of the process of perception which stands between us and any knowledge of the world.
- He was one of the first to set out the "hard problem" of consciousness – how can humans possess both self-aware minds and physical bodies?
- He was a rationalist and a sceptic, seeking to construct knowledge on a sure foundation.
- He was also an important mathematician and early scientist.

v In the United Kingdom, Family Physicians are called GPs. In most of the world the term Family Physician is used. In some places "General Practitioner" means a doctor with no postgraduate or specialist training, which is not the case for UK GPs. I will use the term GP from now on, with this caveat.

vi A "thought experiment" is an imaginary scenario or analogy created to make us think about how things might actually function in the world itself, e.g. "Schrödinger's cat" was not a proposal to put a real cat in a potentially lethal box, but it was a mental picture to help us understand the serious weirdness of the quantum world. Thought experiments are popular tools for philosophers.

More recently, the Princeton philosopher Gilbert Harman, 1938–2021, described his "brain in a vat" thought experiment. If a mad scientist kept an isolated human brain alive, but ensured that all biological sensory inputs were replaced with artificial sensory inputs, the brain would have no reason not to think it was no longer in a human body in the "real" world.

And how can I tell that my perceptions are not dreams or hallucinations? How can I demonstrate to myself that I am typing on a keyboard in the world itself, not just dreaming that I am typing?

Furthermore, much of our knowledge is dependent on memory. We now know that memory is not like a tape that we replay. It is more like an imagined dramatic reconstruction by our mind drawn out from a few fallible data points. An unreliable witness. Such are the fragile foundations of our knowledge.

But so what? The patient in front of me seems real enough. Well, it challenges us to be less accepting of what we think we know. These thought experiments are all examples of philosophical *scepticism*. In philosophy, scepticism takes an initial position of doubt and then asks for solid reasons as to why one should accept any truth claim. (How do we know that we are not all brains in vats?)

Scepticism is indeed the basis of proper science – a "null hypothesis" worldview that seeks to overcome challenge, rather than easy acceptance.

So – where does this leave facts? No truth referential system is completely immune from sceptical attack, and no, there is general system of knowledge without some prior unproven beliefs or assumptions, such as *"I believe there is a world out there"*. We will have to get by without certainty.

SECTION 2: WHY MIGHT WE BELIEVE IN FACTS?

A friend of mine is fond of saying *"I don't believe in facts, facts change"*. But is that a fact? After this first section, why might we be persuaded to believe in the possibility of facts? Let us first look at some of the categories of possible fact claims:

A priori facts

A priori means before one examines the specific case. An *a priori* proposition is one whose truth value can be validated independent of experience. Thus for the claim that "*carbon is an element that has an atomic number*" I do not have to examine a carbon atom before I know that this is a true statement, because I know that an atomic number is a basic property of any element. To say "carbon is an *element*" means carbon *must have* an atomic number.

Necessary facts are a subclass of *a priori* facts. I do not need to be persuaded that 1 + 1 = 2. This is a necessary fact that arises directly from the regularity of the universe and the meaning of the terms "1" and "2". Necessary facts are in some sense tautological, e.g. *"this bald man has no hair"*.

We are sometimes tempted to think that we have made an *a priori* diagnosis when we have simply labelled an issue presented to us: *"Doctor, I had a red area of skin on my arm. What can it have been?" "It sounds like you had a case of erythema"*.

A posteriori facts

A posteriori means after one examines the specific case. An *a posteriori* proposition is one whose truth value can be validated only by experience of the case. Thus for the claim that *"carbon is an element that has an atomic number of 6"* I can only know this to be true by investigating actual carbon atoms.

Thus *a posteriori* facts must be validated by a process of empirical verification. The philosophical meaning of empiricism is that it is a way of establishing a truth claim by means of direct experience (*"There is a tree in my garden"* – *"Yes, I can see a tree"*) or by experiment (*"Oak trees come from acorns"* – *"yes, I took sterile soil and planted an acorn and a young oak tree is now growing"*).

The alternative to necessary facts are *contingent* facts, which are a subclass of *a posteriori* facts.[vii] A contingent fact is a fact that could be other than it is. So *"I see a tree"* is a contingent fact – I only see the tree because someone once happened to plant it in my garden. Most purported facts that we deal with in healthcare are contingent facts.

FOUNDATIONAL TRUTH CLAIMS

We have probably all observed a toddler in a supermarket asking their parent *"but why, mummy?"* in seemingly infinite regress. The basis of a foundational truth claim is that any chain of reason or argument can only go back so far. Eventually there comes a point where one has to say, just like the harassed parent in the supermarket, well it *just is*.

Kurt Gödel (1906–1978), in his two incompleteness theorems, argued that no system of logic could be proven within its own terms. (He was arguing for systems of mathematical logic, but his arguments have been accepted as having a broader applicability.) The implication is that you must start with some basic assertion or belief that is outside of your system of logic.

The most famous foundational truth claim in philosophy would be that of Descartes. He attempted a sceptical regress similar to that of the toddler – why should I believe A, well because of B, but why should I believe B, etc.… His scepticism led him to doubt most of what he had previously thought he knew about the world. His regress ended with what he took to be an indisputable fact: *"I think … therefore I am"*.[24] (Even this of course could be questioned – how did Descartes know that it was himself that was doing the thinking?) Descartes then used his foundational belief that he was thinking being within a universe containing at least one thinking being to reconstruct, via deduction, a worryingly familiar picture of the world.[viii]

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vii Kripke argued that contingent facts could be *a priori*, but this is an unusual view, which he defends by the use of tautological arguments.

viii Given the lack of change in Descartes' model of the world following his sceptical inquiry, Kierkegaard doubts the validity of Descartes' scepticism, asking "*can it be true that they have ever doubted anything at all?"* Kierkegaard S. *Philosophical Fragments*. Trans Hong H & Hong E. Princeton: Princeton University Press, 1985: p82.

Foundationalism is a fundamental response to Gödel's theorem. A basic (or foundational) belief is one that is incorrigible and requires no further justification. Basic beliefs form the foundation for more complex beliefs built on top of them, but basic beliefs cannot be justified by the superstructure of these other beliefs. Thus, at this moment, the belief *"I seem to see a keyboard"* needs no further justification *for me*, although you could only have reason to believe it if you were offered some evidence.

But all systems of thought imply interpretations. Thus to me at this moment *"I seem to see a keyboard"* may indeed be a basic belief, but the same perceptual input would perhaps produce in Kant the belief *"I seem to see a strange carving"*, and perhaps to an Old Testament priest *"I seem to see a strange ephod"*. Thus the most immediate perceptual data presents itself to our minds within interpretative frameworks. Both Kant and Wittgenstein agree that perceptions are only meaningful within thought systems.

It bothered me greatly as a child that I had no proof of other minds, and that other people might in fact be sophisticated robots – how could I tell the difference? But a belief in other minds would be one example of a philosophically important *foundational* truth claim (i.e. claims that cannot be proven by rational argument and yet form the basis for a superstructure of a more complex belief system). Such foundational truth claims would include:

- There exists an external universe of which I am a part.
- I am a self-aware being.
- Other people have minds that are generally like mine.

Bear in mind the sceptical thought experiments about brains in vats and the possibly illusory nature of our experience. Bear in mind that common sense is as often wrong as it is right. Philosophy offers us no knock down argument against strong scepticism, but it teaches us to label these as foundational beliefs and then we generally tuck them away in the corner.

The possibility of foundational truth claims forms an important debate in philosophy, but less so in medicine. However, when we come to examine the nature of self-aware personhood later in the book then this issue again becomes relevant.

Also, we all, patients included, may have our very own "basic beliefs" such as *"I always fail"*, *"I am unlovable"*, *"I am better than others"*, *"I matter more than others"*, etc. A psychologist would call these core beliefs, but they have the same function in people's mental world as foundational beliefs have in our understanding of the outside world.

SECTION 3: PROBLEMS WITH LANGUAGE

To add a further twist to our problems of knowing things we must consider language itself. All our attempts to grasp some truth about the world itself will depend upon language. The 20th century saw an explosion in the study of language.[25]

Language (language as such, not English or French, etc.) is an inborn tool for cognitive modelling in the human mind. We construct a personal knowledge of the world by making cognitive models via the two-step process already described. These models are formed from language itself and create meaning systems for us. They determine our perception of reality.

It would be easy to think of language as something that exists to communicate thought, something that follows on from the thought itself. But all our attempts to think about what may be the case will depend upon language, indeed they will be constructed with language. Language is prior to and more fundamental than communication and is to be identified with thoughts themselves.

The inbuilt facility for language enables us to be human. It projects us into a world where we can perceive and create meaning. Language is the tool with which we generate our models of reality. Other than simple states of feeling or emotion or immediate perceptual sensation we cannot think about the world without language, whether spoken or in our head. Our models of reality are the only hold we have upon the world. It follows that language is an immensely important determinant of our understanding of the world. Our world and our language are, in a sense, the same thing.

Consider the two step model of knowledge that I have described. Almost all the initial observational inputs or bare facts will be offered in the form of language. All the construction of models that will follow on will be in the form of language. (By "language" I include mathematical terms and equations, such as $E = MC^2$.)

Language is secondary to our direct experience of the world. It is the way we chop the world up into manageable elements. We then put these elements together into explanatory models.

But language does not directly represent the world itself – not even bits of the world itself. Firstly, again we will be limited by our *seeing-as*. I am told that none of India's 22 main languages has a word for "depression".[26] We may have difficulty seeing a thing if we have no word, thus no concept, for it.

But more to the point, even for parts of the world itself for which we have words, our words will rarely have a fixed, unambiguous and universally agreed meaning. (And some words drift in their meaning under cultural pressures – "water closet" is too crude, so it becomes "toilet" which previously meant a washing facility, but then "toilet" is too direct for polite company, so becomes "restroom", etc. There is a similar drift in meaning for many words describing disabilities.) Except for technical terms with rigidly defined meanings, a word cannot be said to represent a part of the world itself.

At the time of the Enlightenment the Idealists, as typified by Berkeley, pointed out that, as Kant had claimed, humans have no direct access to anything other than their thoughts and yet we appeared to inhabit a fully functioning world. Thus, unlike Kant, they concluded that the world was ultimately made of thought, and that the "physicality" of matter was an illusion. The world was thus the sum of all thoughts, whether by that we mean all human thoughts or whether we include the thoughts of others such as God.

In the 20th century Wittgenstein went further than Berkeley. However, Wittgenstein is not easy to fully characterise for two reasons. Firstly, his views clearly change between his first book, the *Tractatus,* and his later work.

Ludwig Wittgenstein 1889–1951 was born in Vienna, into a wealthy but troubled family. He came to United Kingdom to study aeronautical engineering but became fascinated by mathematics and logic, becoming a pupil of Bertrand Russell and ending up as a philosopher. He is relevant because:

- In his *Tractatus Logico-Philosophicus* he redefined the possible scope of philosophy.
- He argued that philosophical problems were in fact problems of how language is used, not open to a more fundamental resolution.

Secondly, his writings remain problematic because the only work he published was the *Tractatus*. He himself did not edit his later works, which were constructed posthumously from his own and his students' notes.

The *Tractatus* famously starts with Wittgenstein's statement: *"the world is the totality of facts, not of things"*.[27] Thus Wittgenstein acknowledges that we live in the phenomenal world with no access to the world itself.

Wittgenstein goes further still, and, to use Kantian language, takes the view that if we have no access to a noumenal world then such a concept should be abandoned as a part of our notion of the world. Thus we are left with the phenomenal world only.

Wittgenstein links thought with language. Thus for the later Wittgenstein[ix] we are left with the world of our language as our only reality. Wittgenstein states *"When we say: 'Every word in language signifies something' we have so far said* ***nothing whatever***" (his original italics emboldened).[28] Claims of external reference are thus not so much seen as wrong but as *meaningless*, as they are by definition untestable. In denying that language tracks any external reality beyond itself Wittgenstein is often considered an anti-realist – a term I will explain shortly.

To Wittgenstein the reality that we construct through language is shared as language systems within communities. Language systems thus become shared thought systems, so Wittgenstein comments *"to imagine a language means to imagine a life-form"*.[29] He uses the term *"language-game"*, stating that *"the term* ***'language-game'*** *is meant to bring into prominence the fact that the* ***speaking*** *of a language is part of an activity, or of a life-form"* (his original italics emboldened).[30] By language game, Wittgenstein was not suggesting what we say is trivial or playful. He is suggesting

ix There is debate as to the degree of difference between Wittgenstein's early views, as expounded in the *Tractatus,* and his later views, for example, as seen in his *Philosophical Investigations*.

that language forms part of systems of thought, and that our thoughts must then follow the rules, similar to the moves possible for a chess piece.

As language-games spring from life-forms they are self-defining and self-justifying, albeit within a specific cultural context. Reality is seen as only that which exists within the language-game. Truth claims within such a system do not need any justifying grounds from outside the system. Or as DZ Phillips puts it, *"to say that x is a fact is to say something about the grammar of x"*.[31] Thus, a patient's claim that alternative treatment X is *"natural"* is offered up as needing no further justification. Within that particular "alternative" language game, natural is by definition good. (OK, at this point I confess – I occasionally used to reply that *"cholera, shark bites and plague are all natural but that doesn't mean they are good"*. My killer line never worked once.)

The concept of language games is very relevant in thinking about the nature of health itself – see Chapter 11. But it is also increasingly relevant in inter-professional working. One healthcare discipline may be working within different concepts and different models from another, even when they use some of the same words. Unless we understand the difference in the overarching models being constructed by the use of a given language system then we will talk across each other. Remember, the concept of a language game is not trivial or playful. Each side will "know" that the other is wrong because they are not using language within the language games the other takes to be correct.

So an obstetrician may "know" that the midwives on the labour ward put babies' lives at unnecessary risk by downplaying potential signs of early foetal distress. Whilst the midwives "know" that the obstetrician asserts unreasonable power over women by excessive biomedical intervention in a natural process. One is using evidence and language from a predominantly biomedical model of childbirth. The other is using evidence and language from a predominantly postmodern feminist analysis of patients' lived experience. Each "knows" that the position of the other is not well judged and is detrimental to patients' interests. Speaking across the divide in conflicting language games can never resolve the issue – indeed it will further entrench both narratives.

Even within a discipline there may be differences in the use of language between us. This can have the effect of making language "fuzzy" in terms of exact meaning.

Conclusions

All knowledge is constructed in the form of hypotheses, which may or may not be true.

We can never grasp the world itself – we are limited to our constructed models of the world.

There are different ways of constructing knowledge, but all knowledge involves a two-step process that nests individual pieces of data within models of how we see this part of the world working.

REFERENCES

1. Brecht B. *Galileo* (play), 1938. Trans Charles Laughton. Ed. Bentley E. *Works of Bertolt Brecht* Ser. New York: Grove Press; 1966.
2. Twain M. *A Connecticut Yankee in King Arthur's Court*. New York: Harper & Brothers; 1889: p421.
3. White A. *The Penguin Dictionary of Philosophy*. Ed. Mautner T. London: Penguin; rev 2000: p174.
4. Chiffi D and Zanotti R. Knowledge and belief in placebo effect. *Journal of Medicine and Philosophy*. 2017; 42: 70-85. Doi: 10.1093/jmp/jhw033
5. Nagel T. *The View from Nowhere*. Oxford: Oxford University Press; 1986.
6. Nagel T. 'What is it like to be a Bat?' *The Philosophical Review*. 1974; 83: 435-450.
7. Sagan C, in the Introduction to: Hawking S. *A Brief History of Time*. London: Bantam Press; 1997: p ix.
8. Nagel T. *The View from Nowhere*. Oxford: Oxford University Press; 1986: p90.
9. St Paul's first letter to the Corinthians, chapter 13, verse 12. King James Version of the Bible.
10. Kant I. *Prolegomena to Any Future Metaphysics*. Section 13, note II. (my paraphrase)
11. Pinker S. *How the Mind Works*. Allen Lane, London: Penguin Books; 1998.
12. Kant I. My loose translation. This is commonly translated as "intuitions without concepts are blind, concepts without intuitions are empty". By "intuitions" Kant means direct sense perceptions. Kant I. *Critique of Pure reason*. 1781. Part II, section 1.
13. *Cambridge Dictionary of Philosophy*. Ed. Audi R. Cambridge: Cambridge University Press; 1999. Article on Kant.
14. Lewis CI. *Mind and the World Order*. New York; 1956: p38.
15. Einstein's letter to Popper, quoted as appendix to *Logik der Forschung* 1934, translated as *The Logic of Scientific Discovery*. London: Hutchinson, 1959.
16. Wittgenstein L. *Philosophical investigations*. Trans Anscombe G, 3rd edn. Oxford: Blackwell Publishing; 2001: p168. The image was first produced by an anonymous Illustrator, 1892. Welche Thiere gleichen einander am meisten? *Fliegende Blätter*. Braun & Schneider, then popularised by *Jastrow, J. (1900). Fact and Fable in Psychology. Boston: Houghton, Mifflin and Co. [Permission requested from Blackwell publishing.]*
17. Wittgenstein L. *Philosophical Investigations*. Trans Anscombe G, 3rd edn. Oxford: Blackwell Publishing; 2001: p168.
18. Hick J. *An Interpretation of Religion*. Basingstoke: Macmillan Press; 1989: p140.
19. Wenger-Trayner E and Wenger-Trayner B. *Introduction to Communities of Practice. A Brief Overview of the Concept and Its Uses*. https://wenger-trayner.com/introduction-to-communities-of-practice/ accessed 21/7/22, 2015.
20. Asher R. *Talking Sense*. London: Pitman Medical; 1972: p47.
21. *The Matrix*. Film, 1999. Written and directed by the Wachowski siblings.
22. Plato. *The Republic*. Many modern editions. 514a–520a.
23. Descartes R. *The Philosophical Writings of Descartes: Vol II*. Trans Cottingham J, Stoothoff R, Murdoch D. New York: Cambridge University Press; 2008: p428.
24. Descartes R. *Principles of Philosophy*. 1644. Many editions. 1:7.
25. Sebeok T. *A Sign is Just a Sign (Essays)*. USA: Indiana University Press; 1991.
26. Liberman M. *Language Log*. September 8, 2020. https://languagelog.ldc.upenn.edu/nll/?p=48406
27. Wittgenstein L. *Tractatus Logico-Philosophicus*. London: Routledge; 1961: 1.1.
28. Wittgenstein L. *Philosophical Investigations*. Trans Anscombe G, 3rd edn. Oxford: Blackwell Publishing; 2001: p6e.
29. Wittgenstein L. *Philosophical Investigations*. Trans Anscombe G, 3rd edn. Oxford: Blackwell Publishing; 2001: p7e.
30. Wittgenstein L. *Philosophical Investigations*. Trans Anscombe G, 3rd edn. Oxford: Blackwell Publishing; 2001: p10e.
31. Phillips DZ. *Grammar and religious belief*. From *Philosophy of Religion a Guide and Anthology*. Ed. Davies B. Oxford: Oxford University Press; 2000: p109.

CHAPTER 2

Epistemology part II: Reasoning – ways of knowing

Chapter summary

Although we construct knowledge via fragile and fallible mechanisms, some ways of knowing are still better than others.

"We are like sailors who have to rebuild their ship on the open sea, without ever being able to dismantle it in a dock and reconstruct it from the best components."

Otto Neurath[1]

"Even though there are no ways of knowing for sure, there are ways of knowing for pretty sure."

Lemony Snicket[2]

INTRODUCTION

Chapter 1 might make us despair about *really* knowing anything. Good. Clearing away false certainties is a necessary place to start.

So will this chapter offer us new certainties? Of course not, but it will lead us to a more realistic place of provisional knowledge. No knowledge claim other than necessary truths will score 100% for certainty (including this one), but some will score much higher than others.

So let us look at the different ways that knowledge claims may be achieved and defended.

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DEDUCTIVE TRUTH CLAIMS. 1: SYLLOGISMS

Some *a posteriori* truth claims may be established by deduction. A syllogism is a form of reasoning where a conclusion is a *necessary* deduction from two initial premises that are agreed to be true.[i] John Stuart Mill gives a classic example of a syllogism:

Premise 1: All men are mortal.
Premise 2: Socrates is a man.
Conclusion: Therefore Socrates is mortal.[3]

So in this case if the empirical claim that *"all men are mortal"* is true, and the empirical claim that *"Socrates is a man"* is true, then this leads to the necessary deductive conclusion that *"Socrates is mortal"*.

This example is of course a trivial ABC exercise. But even in such a childish example we may start to pick holes. What do we mean by mortal? Might not Socrates be thought to be immortal with respect to his undying fame? OK, so I need to tighten my specification to read as physical mortality. And of course the claim "Socrates is a man" is sloppy thinking – Socrates *was* a man but is now, presumably, a much dispersed corpse. And what of the claim "all men are mortal"? Trans-humanists hold that humans might soon become immortal in some form, whether as genetically altered biological organisms or as minds downloaded to another form, such as a computer network. So even straightforward deductive claims, such as a medical diagnosis, need their premises and conclusions to be very tightly specified.

Medicine and healthcare tend to deal with complex situations where the details are key and often in dispute, or frankly unknown. Therefore, whilst the form of a syllogism may be an important model for some forms of rational thinking, for example, in checking the out validity of a research question, it may be less reliable in clinical practice.

DEDUCTIVE TRUTH CLAIMS. 2: COHERENCE AND PROBABILITY

Deduction is an appeal to necessity. If one (or more) state of affairs is the case then we can deduce another state of affairs *must* be the case. The basic form of a deduction has been illustrated by reference to syllogisms:

If A, ***then*** X.
Or ***If*** A, and ***if*** B, ***then*** X1 (a classic syllogism).
Or perhaps ***if*** A, and ***if*** B, and ***if*** C, ***then*** X2.

Looking back at Mrs Jones from the Chapter 1:

Situation 1a:
Thus ***if*** Mrs Jones' hip X-ray shows a new and abnormal irregular gap between the femoral head and the trochanter ***then*** Mrs Jones must have a fractured hip.

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i The Oxford English Dictionary defines a premise as: "A previous statement or proposition from which another is inferred or follows as a conclusion".