



**What Clinicians Can Learn From Forensic Scientists  
Professor Roger Kneebone & Professor Ruth Morgan**

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Observations by a Clinician (Roger Kneebone)

This lecture forms part of a series entitled 'Performing medicine, performing surgery'. The lectures explore the idea that clinical practice takes place at an intersection between scientific knowledge, procedural skill and performance. The word 'performance' often sits uncomfortably with people who frame their work as an applied science. Yet performing is a central part of being human. It is how we interact with one another and how we express our individuality - our uniqueness - as people.

In previous lectures in the series I have explored how aspects of clinical practice can be illuminated through collaborations with expert performers outside medicine. Through conversations with leading practitioners in puppetry, conjuring, classical music improvisation, combat flying, polar exploration and high-end restaurants I have examined how clinical settings such as the operating theatre and the consulting room can be framed as sites where people perform. In this lecture I consider the role of the 'expert generalist' in bringing together perspectives on a complex problem, and building a coherent narrative which is fit for purpose.

I start with a personal perspective, outlining my own experience as a medical student, a hospital specialist and a general practitioner. In the early stages my focus was on acquiring, memorising and recalling facts. The first part of my traditional undergraduate medical course entailed internalising large amounts of factual information gained through lectures, textbooks and laboratory work. This was not yet related to individual patients with whom I entered a relationship of care. Instead it was depersonalised knowledge, framing anatomy, physiology and pathology as abstracted ways of thinking and knowing. I was assessed on the extent to which I could recall items of factual knowledge.

As my studies progressed, I developed a deeper range of knowledge about diseases and their treatments, then began to apply this knowledge to the patients I encountered in hospital. I fitted the patients I met into the diagnostic categories I was learning. At the same time I was developing a range of diagnostic and procedural skills. I learned how to examine the different systems of the body, to use a stethoscope and to develop my sense of touch to recognise disease abnormality and disease. I learned how to take blood, set up intravenous infusions and insert urinary catheters. Later on I learned how to operate, first as an assistant in a surgical team and eventually as a lead surgeon myself. By that time I had acquired a detailed knowledge of surgical science and extensive experience gained through practice. I was becoming a specialist.

Then things shifted dramatically. After completing my surgical training I decided to change direction and become a general practitioner (GP). At once I found myself in a different setting. As a surgeon, the patients I treated had been referred by other clinicians, who had identified a problem which surgery might help. Things were very different in general practice. As a GP, I was the first port of call, expected to deal with whatever my patients presented with. From having studied to become a specialist, now I had become a generalist.

At first the challenge seemed overwhelming. Every day I encountered issues I had either forgotten about or never learned. Patients might come with problems with their eyes or ears, mental health, childhood infections ... the list seemed endless. Even more challenging were the patients whose problem was difficult to define - people who had a feeling that 'something wasn't quite right', though they couldn't say exactly why. And often their problems weren't strictly 'medical', but were more about social problems, poor housing, noisy neighbours, employment issues or family tensions.

At first I struggled to make sense of all of this. I tried to fit each patient into the diagnostic categories I had learned during my career so far. But often this approach didn't work. My patients simply didn't fit the pigeonholes inside my head. Gradually I realised that in the complex, messy world of general practice I needed to start by focusing on each person, establishing an effective relationship and trying to make sense of their concerns. Only then could my patients and I start to think about ways forward and explore possible solutions. This was a collaborative process which depended on trust. It also entailed suspending my assumptions until I had a sense of the whole picture, then thinking about how to move forward.

I soon realised I had to become comfortable with recognising how little I knew and to find ways round it. Of course I had a firm basis of medical knowledge and knowhow, and I was confident in being able to recognise and treat common and important conditions. But every day I came up against the limits of my knowledge in fields outside my own. I needed to call on other kinds of expert for their opinion or advice. Then I had to interpret that advice. I had to piece together the parts of each jigsaw to make a picture that worked for my patient and for me. I had to become an interpreter and translator, connecting the perspectives of my patients with the languages of medicine, social care, housing and myriad others. I had to move from being a novice generalist toward becoming an expert generalist. I started to realise that that interpretation and translation was a skill in itself.

I was a GP for seventeen years before changing direction again and joining a university. Now, as an academic, I have been fortunate in encountering expert generalists in several fields outside medicine. From these encounters I have gained a sense of how such people approach their work. They share several characteristics. First, they have all established a base of knowledge and skill in their primary field, whether in science, medicine, law, the visual or performing arts or elsewhere. That process takes years, and it provides a bedrock for understanding the basics of a professional field. In that process they develop the ability to identify and abstract the essence of the work they do. A clinician or lawyer must establish the nature of a patient's or client's problem, while an actor or dancer must understand how to connect with each audience and capture their attention. They accept that they will never know as much as the experts they work with and they are able to tolerate uncertainty. And they develop the ability to improvise, to respond to each situation as it unfolds.

In order to work with people outside that primary field, generalists must develop what the sociologist Harry Collins refers to as *interactional expertise* - the ability 'to converse expertly about a practical skill or expertise, but without being able to practice it, learned through linguistic socialisation among the practitioners'. Collins distinguishes this from *contributory expertise* - being able to do the work yourself.

In the case of expert generalists, this entails being able to communicate with people who have different kinds of expert knowledge and understanding, creating a narrative that makes sense for whoever is at the centre of the setting. In my case that was my patients. In another setting that might be a defendant in a criminal court or those involved in an investigation into a dispute. Interactional expertise depends on being able to observe and pay attention to another person, interpreting their reactions and responding appropriately. This requires the ability to read and make sense of a complex situation and ensure that those who take part are communicating effectively - in other words, to perform.

When I encountered the forensic scientist Professor Ruth Morgan, I realised that her work too is that

of an expert generalist - someone who can link and make sense of perspectives from many specialist fields in order to establish a narrative of a crime. For her too, there is always more than one way of framing a problem, more than one way of making sense of evidence and of integrating the viewpoints of experts. Though our fields are very different, our challenges are much the same.

### Observations by a Forensic Scientist (Ruth Morgan)

Forensic science is a fascinating field. Not only does it bring together a whole range of different fields (from biology and chemistry to psychology and law, and many others in between) to reconstruct crimes, but it also sits at an intersection of a broad range of different stakeholders including investigators, policy makers, lawyers and the judiciary. This makes it a very complex field where science and people are interlinked in many different ways at each stage whether that is the crime scene itself, a forensic science laboratory, or the court. It is a fascinating world, because it has so many constituent parts which makes it a dynamic space.

In the course of a number of wide-reaching conversations that we have had the privilege to have over the last 3 years, we have found many points of synergy between the world of forensic science and medicine. Both disciplines deal with many unknowns and seek to interpret meaning in a single instance (whether that is a specific crime or a patient) from the foundation of knowledge and skills developed from considering the general population. They also both sit at the intersection of 'the science', the 'skills' and the 'performance' of the practitioner.

It often surprises people when I tell them that I started my journey in the discipline of Geography; the endeavour to understand physical environments and the societies and human actors within them. I developed an interest in reconstructing past environments which led to many hours developing skills in microscopy to analyse sediments. I trained with an inspiring academic, Dr Peter Bull, to see to what extent we could take these tools being used to reconstruct these past environments (where we were looking at timelines of 10s of 1000s of years) and apply them to the task of reconstructing crime events (timelines of 10s to 100s of days). We had some interesting breakthroughs in how we could reconstruct the journey history of a pair of shoes or a vehicle looking at various indicators in the sediments that we could recover from those exhibits.

A lightbulb moment for me came when I was working on a particular case file and as I was reading the judge's summing up of the case it became clear that the science evidence was critical to the verdict reached by the jury, but that the meaning of that evidence was based on assumptions rather than a robust evidence base. We did some experimental work to test those assumptions and what we discovered [changed the significance of that evidence completely](#).

Science evidence does not stand alone, it needs to be interpreted to assess what it means in a particular context. The skills of the scientist in identifying, classifying and interpreting clues are incredibly important for creating robust and accurate knowledge and insights. However, the way that the science is carried out, the way that we reach conclusions about what the findings from those experiments mean, and transposing those principles to specific clues to reconstruct a crime, are inextricably linked to the person 'doing' the science; the scientist, and critically to that scientist as a performer.

A number of themes have emerged as we have discussed our respective fields through the lens of performance and the scientist as a performer:

### Doubt and Uncertainty

Forensic science is a discipline that deals with doubt and uncertainty. We are looking to find answers to 'who' 'what' 'where' and 'when'. Yet forensic science does this in the context of the justice system which seeks answers to critical questions 'beyond reasonable doubt' to establish 'truth'. This can

create issues for forensic science where what we know and what we can see is always provisional, and evolves as new insights and new data are produced. This can be a real challenge when that science comes into the court, and there are similar challenges within medicine, as our knowledge develops and new insights cause us to re-evaluate previous hypotheses. The idea that it is generally failures that lead to breakthroughs is one that is foundational in science, and so creating the spaces for that failure and innovation in our fields is absolutely critical, even if it is very challenging to do so.

### Expertise in Science

Another key theme we have identified as we have discussed our respective fields is the role of the expert, and expertise in science. The scientist has the role of evaluating and weighing up what the insights or facts mean in a 'noisy' environment, whether that is considering a crime scene or a patient. There are many factors in play, some of which are relevant and many that may not be. The scientist in that situation must become skilled at translating and communicating the knowledge or facts in a way that is appropriately 'tailored' for each crime scene or patient.

There is clearly a relational aspect to this. In both of our fields it is really important to be able to 'read' the patient or case in order to identify where there are gaps that need to be filled (and who might be able to fill them), as well as being aware of the gaps that we cannot yet provide answer to. It is often the case that the expert is not just brought in to provide a solution to a pre-designated 'problem', but to work together with the patient, or the key actors in the crime reconstruction endeavour, to identify the primary issue or need and to then co-create the solution. These are critical aspects of expertise that must be deployed for the knowledge or facts we have to have traction and do good in the real world.

### Expert Generalists

One of the interesting observations that has come to light is that in complex interdisciplinary spaces such as forensic science and medicine, a lot of expertise is needed in core or primary fields. DNA analysis requires a huge amount of skill and expertise in biology and genetics; developing recognition tools requires great skill and expertise in computer science and automated image analysis; evaluating skeletal remains requires deep knowledge of anatomy and anthropology. However, to bring all these core fields of expertise together in a way that enables forensic science to fulfil its mandate of providing robust and accurate science for the court, there is a role for the expert generalist.

The expert generalist is often an unorthodox actor. Their expertise is often seen in developing an overview of the key challenge(s) and being able to connect and synthesise the critical insights from disparate fields to those challenges. This usually takes skills in observing and crucially listening to then be able to bring different experts together, make connections between different bodies of knowledge, and interpreting and communicating meaning to different people, across disciplines and beyond the science realm and into the real world.

### Science as an Instance of Performing

The key to unlocking how we can ensure relevant and ground-breaking science as we face the future, is to go beyond the 'insights' or 'facts' and consider how we can and should 'perform' science, and enable scientists to be skilled performers. Science is absolutely founded in observations, testing hypotheses, and revaluating those hypotheses in the light of the data that we have and the new data that can be generated. However, science is also happening within a community; it is profoundly situated in place, time and society. Considering the relational fabric of the scientific community, and the society in which that community sits, means that science goes beyond the physical 'performance' of tasks in a lab. It must consider how to engage with audiences such as other scientists within and beyond the primary discipline, investigators, patients, policy makers. To do that

requires being able to read what is happening and make judgements about what, how and - critically - when to communicate in both explicit and tacit forms.

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#### Further Reading

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