WHAT MAKES A GOOD FORENSIC SCIENTIST?

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The background briefing given to me for the Founder's Day Lecture of the California Association of Criminalists specifies that "The Lecture was intended to be an in-depth treatment of a significant or developing, even challenging or controversial, area of forensic science."

This makes the prospect of giving the lecture a very attractive one, particularly for a forensic scientist who is in the third age and who is no longer directly involved in those governmental institutions in the United Kingdom which are traditionally antipathetic to the production of revolutionary views by their employees.

. Furthermore, the subject is not of my own choosing and this is a good thing because I believe that a product should be the reaction to free consumer choice rather than a reflection of the pet likes, dislikes and theories of the producer, in this case myself. Finally, of course, being presented with a problem by someone else makes one think, which is a very good thing.

What makes a good forensic scientist? Firstly, of course, he or she must have the mental and physical equipment produced both by heredity and environment. The only advice I can offer here is "choose your parents carefully" but, assuming soundness in mind and body one should go on to profit from education and training as much as one can. This must include that most important type of education, self education. The good forensic scientist never stops searching and learning, not only in the specialist field where he or she excells but in the constant re-examination of the backdrop against which a particular expertise is employed.

The late Lewis Charles Nickolls, Director of the Scotland Yard laboratory, used to tell the story of the forensic scientist who, when giving evidence in a paint transfer case, described at length how the paint sample from the scene matched that from the defendant in a plethora of chemical and physical characteristics but omitted to tell the court that they were of different colours. Although doubtless apocryphal the story, like all good

apocryphal stories, illustrates an important point. One has to be wary and circumspect and approach any problem with an open mind before applying any specialist expertise.

THINKING AROUND A PROBLEM

Passing from the apocryhal to the actual, some years ago it fell to my lot to conduct interviews with about a dozen forensic scientists who, during their daily work, were concerned with the characterisation of bloodstains. One of the questions I asked them was "what is the most common combination of ABO blood groups in pairs?" This question was further illustrated by rephrasing it and saying "if liquid blood samples arrive at the laboratory, from two different people, what is the most probable combination of ABO blood groups they will yield on grouping?".

Most of them got it wrong. But even making allowances for the natural tension in an interview it appeared that individual scienists viewed each of their blood grouping cases in isolation since, although each scientist was well aware of the population frequencies of the different ABO groups, and also of other group systems, and indeed of the various combinations amongst these systems, the question I posed was one they had not considered before.

The commonest answer I received was that two group O samples was the most common pair. At first sight this would appear to be both reasonable and obvious since group O is the commonest ABO blood group in the United Kingdom (about 46%) with group A trailing a few percentage points behind (about 42.%).

The point of telling this story is that examination of laboratory records would have shown that the combination AO was almost twice as frequent as OO in those cases where samples of blood were received from both complainant and suspect. Yet this fact, in some cases, had not sunk in during years of work in the field.

GOOD COMMUNICATIONS

It is one of the most regrettable trends in recent years, in the United Kingdom at any rate, that the communication lines between the investigator and his scientific adviser have become stretched and weakened. Forensic scientists are not academics searching for knowledge for its own sake but applied scientists, seeking to apply knowledge in real situations each of which is, in detail anyway, unique.

It is because of this that any reduction in the scientist's involvement at the scene, or in detective conferences, is to be deplored and the good forensic scientist gets up front in the investigation whenever he can. He must know, equally with the

investigator himself, that the first law of crime investigation is "interfaces alter cases". If you pass information through several stages you can be sure that the more stages there are the less chance there will be that the information will escape corruption.

But the perfect system is yet to come. There will always be cases where you get only half the story and the good forensic scientist is adept at spotting those instances in which this has happened. How does he do this? Quite simply by learning as much about the other man's job as possible and from this, gleaning what is most likely true and what is worth checking before it is accepted. L. C. Nickolls' story about the paint analysis, given earlier, is an excellent illustration of the blinkered approach. But there are many more illustrations and you can doubtless think of some yourself. However I will satisfy myself by giving just two.

A detective was driving his car his car along a highway in Yorkshire when he spotted a large truck ahead of him being driven in an erratic manner. He concluded that the driver was unfamiliar with the controls and so had probably stolen the vehicle. He radiod into his control room and had the truck stopped by a police traffic car. The traffic man spotted the driver as a drunk.

Now take a similar example in the laboratory. An old lady was knocked down and killed by a hit-and-run driver. She was carrying a basket of eggs at the time and scrapings taken from the radiator grill of a suspect car were sent in to the laboratory to check for the possible presence of egg residues. The forensic scientist applied a variety of analytical techniques to the glutinous substance submitted and obtained various results which suggested, but did not prove, the presence of egg protein. The matter was resolved when a colleague who worked in the field of body fluids suggested that he try a precipitin test on the material. This he did and found that the material gave the reaction of bird protein.

THE WIDENING OF EXPERTISE

This curiosity about related fields of expertise is a hallmark of the good forensic scientist. He may, of course, meet with a wall of suspicion. "Is this guy trying to take over my job?" But he must overcome such obstacles and convince the suspicious colleague that the more he knows about a co-worker's specialty the more likely are problems in that specialty to finish up on the right bench or in the right in-tray.

In the various laboratories I have directed I have adopted this attitude, sometimes against initial stiff resistance, because we are all creatures of habit. In one laboratory I arranged that

all those staff who gave evidence in safebreaking cases were given practical lessons in how to open safes using both explosives and thermic lances. This led to one wit asking me if it was part of training for retirement.

In another of my laboratories I organised a petrol bomb throwing session (at the fire brigade training school I hasten to add) for all those laboratory scientists who gave evidence in such cases. This was not merely a fun day. Think of the powerful position it puts the witness in when defence counsel heaves himself out of his seat to cross examine and incautiously starts by saying "Dr Bloggs, have you ever thrown a petrol bomb?"

The New Zealanders seem to be masters in this commonsense approach. For example some time ago they demonstrated, rather heroically I thought, the backward fragmentation of breaking glass using a hammer and time-lapse photography. Not satisfied with this alone they went on, some years later, to examine petrol fires in enclosed rooms by experiment. I remember writing an enthusiastic editorial in the Journal of the Forensic Science Society (1971, Vol.11, No3.) lauding this approach, only to be asked by a colleague, that since he was a specialist in sexual offences, what did I suggest he did to gain practical experience?

The late Elliott Hensel was a warm advocate of this practical approach and I commend you to his editorial in the Journal in January 1974 (Vol.14,No.1). Using as his text Lord Peter Wimsey's complaint that "we never learn how to do anything useful in school, like how to pick a lock", Elliott went on in his pungent style to advocate the ability to contrive instrumentation, reagents and techniques out of what is available when the circumstances demand it. Perhaps some of the examples he gives will appear dated in the microchip age but the principles are as strong as ever although with the tendency we have to give new names to old ideas we call much of it "lateral thinking".

Do not interpret anything I say as advocacy of a return to a golden age which never existed. Believe me I appreciate the word processor as much as anyone and there is no doubt in my mind that the advent of the dedicated computer in instrumental analysis allows us both to obtain more accurate results, and more of them, and to assess their worth in a way far more penetrating than ever before. But all this wonderful instrumentation is only of value inasmuch as we can see its place and function within the requirements of modern society. We must not "become the slave of what our slaves create".

INTEREST IN THE COMMONPLACE

So what does the good forensic scientist do to avoid being

swept away by the flow of modern technology. My answer is simply this. The good forensic scientist maintains a compulsive interest in the commonplace. This means that besides his own specialty and those of his colleagues he must maintain a concern for the "ordinary".

About twenty years ago my laboratory received a sample of blood for alcohol analysis. We reported a nil alcohol content. It subsequently transpired that this sample was a substitute for the genuine sample which had a high alcohol content. Furthermore it was highly probable that the individual who had made the substitution was a police officer.

Police enquiries led nowhere until some weeks later one of my staff suggested that the writing on the label of the falsified sample, which was in block letters, might be that of an officer who had previously submitted genuine samples to the laboratory. If so, he suggested, we might be able to establish his identity by comparing the falsified sample label with a series of old sample labels recovered from the laboratory stores. We went ahead with this idea and identified the individual in question. This was hardly a part of our technical expertise, we didn't even have a document examiner on our staff, but it worked. This idea occurred only to one member of staff in the whole laboratory.

This habit of curiosity can be extended without limit. It is the distinguishing feature of the good investigator irrespective of whether he be a police officer or a scientist. The basic theme is that the more one is acquainted with the commonplace the more one is able to identify pattern. Is this not what happens in medical diagnosis and in everything from oil prospecting to company take-over bids?

When the experienced scene of crime examiner sees the body of a woman and he opines that he feels that the husband was not responsible because of the position the body was left in, would this opinion be of any value without an extensive background in training and experience against which to match his assessments? A good scene of crime examiner may well be a first class laboratory worker too, and I'll bet that one reason he is the one is because he is the other.

Many years ago I attended the scene of a murder where the male victim had been strangled. The body lay at the side of a dirt road on his own property in the countryside, adjacent to his fallen motorcycle. We thought at the time that he had probably been dislodged from his motorcycle by a trip wire before being killed.

A few yards from the body, near to the workshop of the deceased were the remnants of a bonfire and in the burned debris was a large, charred, coil of stout copper wire. This seemed to have no particular significance at the time and the Scotland Yard officer running the investigation formed the provisional view, when the investigation was a day or so old, day that the

accused's wife was not involved in the killing because, among other things, she had a watertight alibi.

A few weeks later the case was cracked by a combination of well- designed enquiries, good laboratory work and an element of luck. The wife was responsible for her husband's killing. She had arranged the killing of her husband by a third party and then provided herself with an alibi. But the point of telling the story is that, in all the quarter century since this case occurred, I have regularly asked myself why we so easily dismissed the coil of copper wire as being of no significance. Why, in fact, did we dismiss it as commonplace? I'll know better next time!

THE PREPARED MIND

The good forensic scientist should cultivate serendipity, the knack of making happy discoveries by accident. Put another way he must remember that fortune favours the prepared mind as is so well illustrated by Fleming's discovery of Penicillin. When that particular spore of Penicillum notatum floated through the window of St Mary's Hospital in London and landed and grew on the bacterial culture plate, and its secretions lysed the adjacent gram positive bacteria, do you think that this was the first time such a culture plate had become infected in this way? I very much doubt it. But Fleming did two things: he noticed it and he asked himself why? Then he experimented and described the phenomenon in such a way that people saw the significance of the discovery.

On a much more modest scale I made such a discovery myself. In the early nineteen seventies I took out a patent on a substance which I called Lycode. This was nothing more than common lycopodium spores coloured with basic dyes. They were designed as constituents of tagging powders and, as such, have been used since that time. However I noticed that these brilliantly coloured spores adhered to fingerprints on paper and, some years later, I tried a series of experiments to see if they could profitably be used as fingerprint powders.

Remember, if they could be used as such, what an advance this would be in fingerprint technology. My observations showed that they would not only reveal fingerprints brilliantly but the method was totally non-destructive. A simple wipe with a tissue after photography, and all trace of the adherent Lycode disappeared from the document. We found that the phenomenon was dependent upon the traces of grease on the fingers and we also found, rather unfortunately for the proposed technique, that it took only a day or two for the traces of grease to diffuse into the paper and become ineffective. Thus it wasn't a very good fingerprint method!

But in the course of the experiments I made yet another accidental observation. In manipulating a sample of Lycode powder back into the bottle I used a sheet of paper from which some pencilled words had been removed by an eraser. The individual marks of the eraser strokes showed up brilliantly and, furthermore, it proved to be a technique that could be used long after the eraser had been used on the paper. Thus was born another document examination technique

MANAGEMENT AND SCIENCE

The good forensic scientist fights against the idea that managerial and administrative functions are somehow superior to work as a scientist. Don´t mistake my view. Management aptitude is a most valuable gift for anyone to possess but the good forensic scientist does not acquire this at the expense of degrading his professional expertise.

One of the saddest sights one can witness nowadays is a laboratory where senior scientists have become convinced that professional advancement is conditioned by management responsibilities. In some of these locations administrative work can prevail to the extent that scientific work may be left to junior technicians who only half understand what they are doing and see no point in understanding, since it brings so little reward.

Happily there are some optimistic signs characterised, in part, by those highly competent forensic scientists who have gone private. I know of no case in the United Kingdom when this has happened and the individuals concerned have subsequently regretted it. The lawyers like it too because they have learned to expect more informative case reports from private forensic scientists than they receive from official laboratories.

It seems to be an unavoidable concomitant of official laboratories, in England and Wales at any event, that the pressure of case work is such that scientists do not have the time to match the quality of their report writing to the quality of their scientific work. However it would be easy for me to become too deeply involved in this subject and I will leave it simply by saying that the good forensic scientist gets to know as much as he can about his the profession as it is exercised in other countries.

Given that economic factors, national character and a particular pattern of legislation produce local distinguishing features, the problems treated are nevertheless largely the same in all countries. A trip to the United Kingdom, Federal Germany or Australia (I choose the examples at random) may not only yield new ideas and new techniques but also point out the mistakes to avoid!

THE NECESSITY TO WRITE

The good forensic scientist writes as much as he can. The written word is complementary to the spoken and I would be the first to admit that it can never replace speech. But even if what one writes never gets published it is remarkable how well the discipline of writing clarifies one's ideas.

"Everyone can write" is perhaps going a bit too far but certainly most of us can. I spent many hours during my fifteen years as founder editor of the Journal of the Forensic Science Society wheedling, cajoling and threatening authors, and potential authors, to produce publishable material. The overwhelming impression I finished up with was that nearly all my victims were quite convinced that they could not write. Yet most of them, when committed and with an approaching deadline, managed to produce at worst, creditable and at best, excellent prose.

Is there a case here for using the old English court system, as practised in murder trials many years ago, when the jury were confined "without meat, drink or fire" until they produced a verdict. A modern version might be "Bloggs you produce x thousand words on so and so, by such and such a time, or you're out of a job". Isn't that what the film moguls used to do in Hollywood? At least once in a lifetime it should happen to us all. That would break down any inhibitions about writing.

Those of us with the temerity to write books are, of course, exposing ourselves to special criticism. Disapproval comes particularly from those who have the knowledge and ability, but not the application, to write. It doesn't matter. Get into print. Your book will receive at least one good review and, with a little cunning, that can be used to convince the world that it is marvellous. You might even make a little money.

Remember too that forensic scientists from the developing countries cannot usually afford to travel abroad and books are a partial substitute for travel (equally travel abroad is only a partial substitute for books). As Elliott Hensel titles one of his editorials in the Journal, "Don't forget them in Swahililand".

We owe it to those of our colleagues who are less fortunately placed than ourselves, to write as well as we can and to write a lot. Remember it does not all have to be sharp edged algorithmic stuff, and in many cases it is better that it is not. The knowledge of which button to press, but not of those circumstances in which it is valuable to press it, can be worse than no knowledge at all.

PHILOSOPHICAL CONSIDERATIONS

There are many other things that the good forensic scientist should know and do but I have time only for two of these. The first of these is that the good forensic scientist, albeit very busy with practical problems, should spend at least a little time, if not daily then at least regularly, thinking and talking about concepts.

What is "forensic science"? Is it just a collection of miscellaneous techniques which produce results that may be useful in crime investigation and in the trial process, or is it an entity with a distinctive nature of its own? To think and talk about the problem is not just an academic luxury. Unless we continually refine our ideas by standing back from the specific problem in hand and asking "why?", in addition to "how?", we shall lose sight of purpose and our work will lose much of its relevance.

One of my current projects which, not faced by a deadline, is progressing more slowly than it should, is a monograph entitled "A Forensic Paradigm". In this I attempt to distil the essence of forensic science. Perhaps one day the monograph will be published but, in the meantime, anyone who has been thinking about the matter, and committing notes to paper, can have the title. Perhaps it will stimulate them to produce something publishable which, in turn, will prompt me to complete my own work. Unfortunately workers in the field have been very few.

What all this means is that the good forensic scientist should think about forensic science in all its aspects, not only as a series of applications of biological, chemical and physical methods but also as a matter of "How We Think". That, of course, is the title of a famous book(1), written in 1909, by John Dewey, Professor of Philosophy at Columbia University and, happily, still in print. The good forensic scientist fills the unforgiving minute by reading Dewey. It is a book which can be read and re-read with profit.

THE DESIGN OF CRIME INVESTIGATION

Finally let me ask all good forensic scientists, in whatever field, to consider the aplication of the scientific method to the organisation of crime investigation itself. This is to say in the optimisation of the investigation process, in the strategy and tactics of what line of inquiry to follow, in considering the nature of Information and Evidence, in the designing of the Frame of the investigation with reference to the Form of the constituent elements and classes which make up the Frame. How to set up some systems and avoid others, how to use laboratory assistance in an optimum fashion and how to transfer information effectively.

All these considerations are the daily concern of the good investigator, including the good forensic scientist. They are not airy fairy philosophical self indulgence but questions which are absolutely basic to an investigation in order that we may maximise its efficiency and minimise the cost to the taxpayer.

I have no time left to talk about these matters but, fortunately, I have just written a book(2) on the subject. It's nowhere near as good as Dewey but then few books are as good as Dewey. If all you remember from this lecture is "read Dewey" you have not wasted your time. If, in addition, you remember "read Kind" I shall be most pleased.

REFERENCES

Dewey J. "How We Think", 1909 and subsequent editions, D. C. Heath, ISBN 066-9-20024-7

Kind S. S. "The Scientific Investigation of Crime", 1987, Forensic Science Services, Harrogate, ISBN 0-9512584-0-0