

Chapter 9. What is occupational hygiene, and does it need a society?

Mr Harvey goes to Harvard...

In previous chapters, we have looked at how the stories of lead, silica, and coal in the 20th century illustrate the growing understanding and control of risk. We now go back to the middle of the 20th century to see how people doing research and those applying it came together in the foundation of BOHS, and the attitudes that got in the way.

After World War 2, the Rockefeller Foundation in the United States gave financial support to public health internationally, and in 1952, Bryan Harvey, a District Inspector of Factories in Oldham, used a Rockefeller Fellowship to go to Harvard to do a master's degree in occupational hygiene. We do not know what inspired him to do this, but in a 1986 interview with Mark Piney, he described it as "an enormous eye-opener...the Americans had all the knowledge and none of the means of enforcing it".¹



Fig.9. 1. Bryan Harvey in his BOHS presidential year (1976-7)

Bryan saw in the US a strong occupational hygiene profession based on measurement and control. The American system was influenced by a compensation culture backed by an insurance industry. This contrasted with the well-established British system of centralised regulation, and enforcement by inspectors using their judgment usually unsupported by measurement. The American insurance companies wanted evidence, and "enrolled the services of the engineer and the chemist to control the health hazards of industry". This produced an occupational hygiene profession, which was almost non-existent in Britain.² The quotation comes from an article that Bryan wrote in the British Journal of Industrial Medicine in 1954, on his return. He had seen that the American professional hygienists placed "a good deal of concentration on methods of air analysis in order to determine the amount of contaminants in the atmosphere", which "involves serious academic training". The

concentrations measured were compared with “theoretically allowable maximum concentrations”, that is, the ACGIH list of Threshold Limit Values, which had been available since about 1940. Bryan argued that “if contaminants are to be controlled mechanically there must be a standard of atmospheric cleanliness to work to, a tacit rejection of 100% purity.”



Fig. 9.2. Jerry Sherwood in his BOHS presidential year (1966-7)

...but some stay at home

Bryan was one of four Britons to use Rockefeller Fellowships for hygiene training around that time. Another was RJ (Jerry) Sherwood, who had been at Harvard in 1949, and on his return became a hygienist with the Slough Industrial Health Service (described below). Jerry had reached similar conclusions about the Inspectorate's methods. With colleagues he wrote in 1953 that Factories Act required control of dust and fume “likely to be injurious or offensive”, but the Factory Inspector had no way of knowing what this meant quantitatively or measuring when it had been achieved, which “must depend on making an intelligent guess.”³ Jerry outlined how an inspector might manage to get the help of one of the scarce Chemical, Engineering, or Medical Inspectors, but the Inspectorate did not have its own laboratory.

If we look back forty years before this, we can see what the Inspectorate had lost. In 1910, G Elmhirst Duckering, a Factory Inspector and chemist, had proposed that instead of the Inspectorate's Special Rules for each industry, “the most scientific way” would be to impose a limit and leave it to the manufacturer to decide how to achieve it.⁴ Two years later, Thomas Legge applied Duckering's measurements to calculate an acceptable daily dose of lead,⁵ which Mark Piney has shown corresponded to an exposure limit of about 0.2 mg/m³.⁶ In 1923, the big Factory Inspectorate study of metal grinding had included 91 gravimetric and 123 dust-count measurements.⁷ As Bryan wrote of what he had seen in America, “Most of the techniques are well known in this country; their

novelty lies chiefly in their widespread use, and their acceptance often without qualification as a measure of industrial conditions.”

Bryan Harvey wrote a report to the Chief Inspector about his American experience, and recommended sending a limited number of inspectors there for training in occupational hygiene, and using British universities to teach statistics and air sampling techniques. We know from the record of his interview in Mark Piney’s thesis that Bryan’s recommendations were not well-received. A senior factory inspector said to Harvey, “We’ll have to knock all these silly American ideas out of you head, won’t we?”, and when Harvey requested some smoke and carbon monoxide tubes, the Chief Inspector wrote to Harvey’s Superintending Inspector, “Will you please instruct Mr Harvey that he should not interest himself in matters that are not his concern and that he should get on with the work for which he is paid?”.⁸ Bryan remained at Oldham another six years, which may have been frustrating, but he was then promoted, and eventually became Chief Inspector himself in 1972, in time to introduce some new methods. (He became President of BOHS in 1976.)

I have not recorded this to shame the Factory Inspectorate. In their time Duckering and Legge had been equal to the best in the world in hygiene techniques, and in practice were applying the occupational hygiene structure of Recognise, Evaluate, Control, even if it was not explicitly stated. But by the time BOHS was founded in 1953 it seems that inspectors were not encouraged to see measurement as an important part of their job. Bryan Harvey himself is testimony to individual interest in the subject, but in 1953 the official emphasis seems to have been against quantitative evaluation.

“The present status of industrial hygiene”

As a glimpse of attitudes outside the inspectorate, we have two papers given in the US which review occupational hygiene in Britain, by founders of BOHS, Thomas Bedford and Clifford Warner. Tom Bedford became first president of BOHS, and has two awards named after him, and Cliff Warner, the fourth president, gave his name to the annual Warner lecture. Tom’s emphasis in his 1939 review was on the work on industrial fatigue, hours of work, and output during and after WW1, and on industrial psychology and physiology, and his output measure seems to have been industrial efficiency, not health.⁹ He does also write about lighting, heating and ventilation, noise, and other topics, but there is no mention of the pioneering work by Legge and colleagues. In his 1974 Yant lecture, Cliff Warner also emphasized the fatigue work; he does not mention the Factory Inspectorate pioneers either, but on the contrary says “The whole trend of thought on matters of industrial or occupational hygiene in Great Britain started seriously in 1915”.¹⁰

Tom Bedford got his second chance to review the field in late 1953, at BOHS’s inaugural conference, when he gave his presidential address on “Occupational Hygiene in Great Britain”¹¹. This was published with other papers from the conference in the British Journal of Industrial Medicine. Tom reviewed the history of British factory legislation aimed at improving health and welfare, and this time mentioned Legge “to whom industrial hygiene in this country owes an immeasurable debt”, and to the Factory Department’s “war on industrial diseases”. But he again goes into detail on the work on industrial fatigue. On teamwork, he sees the physicist, engineer, medical scientist, physician and psychologist working together, a coalition of experts, and does not mention the

professional hygienist with sufficient practical knowledge of all these fields to apply the background work of the specialists. This is instructive when we see how BOHS developed.

I am not trying to be critical of these pioneers, but to illustrate attitudes of our founders.

Better news

However, it would be a mistake to think that the principles of occupational hygiene were not being applied anywhere. We have seen in previous parts how a death-rate of hundreds per year in the lead industry had been reduced to a trickle, and in the early 1950s the pneumoconiosis rate in the coal industry was falling fast. In Chapter 8 I summarized the National Coal Board's very big Pneumoconiosis Field Research programme, to derive safe exposure limits for coal dust, which made big use of Bedford and Warner's pioneering research.¹² These improvements had been brought about through research on the causes of the disease and application of controls supported by better measurement methods. We know of other research being conducted at the London School of Hygiene and Tropical Medicine, and at Medical Research Council units.

In private industry, Imperial Chemical Industries had published in 1952 a "Handbook of Industrial Hazards" with a list of concentrations of 151 substances which could cause illness or indicate unsatisfactory conditions.¹³ The Handbook also included 52 substance sheets on symptoms and treatment. The 17 authors were all medical officers in various parts of ICI, and there is no reference to any other profession. The table of "toxic concentrations" is credited to the "I.C.I. Industrial Products and Health Research Committee", but we do not know who was on that. The substance sheets give details of the appropriate personal protection, and occasional general references to enclosure or ventilation, but the structured and detailed hygiene advice given in his 1912 book by Thomas Legge, a physician acknowledging the support of engineer and chemist colleagues, seems to have been forgotten here too.

A better team?

A more positive picture is painted in the paper on the Slough Industrial Health Service, quoted earlier, which was published in the British Journal of Industrial Medicine in July 1953, three months after BOHS's first official meeting.¹⁴ This was significantly titled "An occupational hygiene team". The first-named author was Peter Nash, a physician who had had some training at Harvard. Jerry Sherwood, a co-author, was an engineer, and was one of the four already mentioned who had done the Harvard industrial hygiene master's degree. The third author was Joan Bedford, Tom's daughter. The Slough Service had been established in 1947 to service the developing industries in that area. The paper describes how the occupational hygiene team was set up in 1949, when Sherwood was sent to Harvard. Occupational hygiene is described in the paper as "the measurement and control of the working environment with the object of safeguarding the health of people at work". The authors illustrate how this was applied to various substances they encountered, including asbestos and benzene. There are detailed descriptions of observation and control, but measurement is central, using a specially-equipped laboratory they had been able to establish at the London School of Hygiene and Tropical Medicine. The "standard of atmospheric cleanliness" that the Slough team used was the ACGHI TLV list. The team included a physician and chemist, but they were not working

with the wide-ranging coalition of experts that Tom Bedford seemed to envisage, but instead with Jerry Sherwood as a comprehensively-trained occupational hygienist.

However, the paper was published because the Slough team was such a rare phenomenon – perhaps a unique one in Britain. Also it must be said that Jerry Sherwood was a hygienist of rare experience and ability. However, most workplaces never had their hazards professionally considered by anyone, and probably managements did not usually see the need.

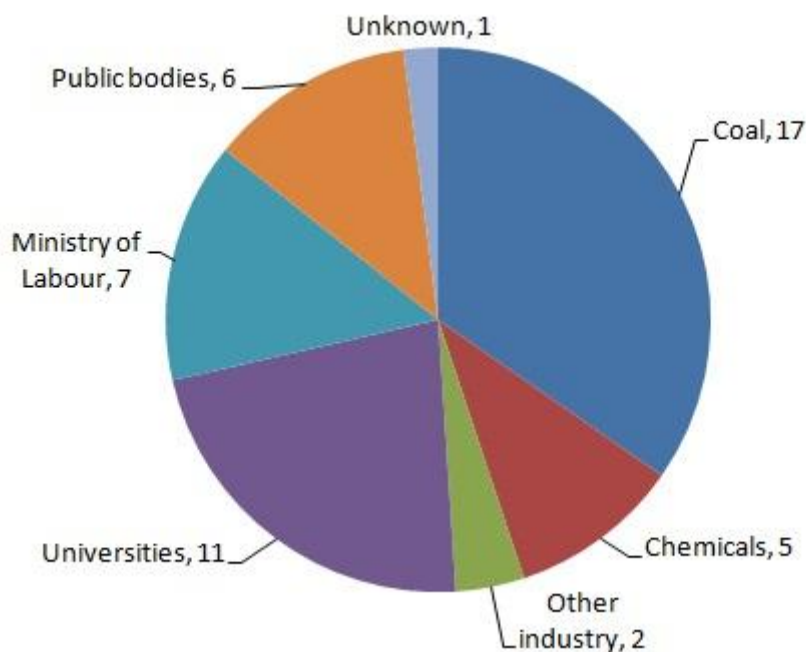


Fig 9.3. Affiliations of the 49 founder members of BOHS in June 1953. “Coal” includes 5 people from the National Coal Board, 2 from the Safety in Mines Research Establishment, and 10 from the MRC Pneumoconiosis Research Establishment (PRU); “Chemicals” includes 3 ICI Ltd and 2 Association of British Chemical Manufacturers; “Universities” includes MRC units except for PRU; “Ministry of Labour” includes 2 Factory Inspectors; “Public bodies” includes other nationalised industries and Government research establishments. Surprisingly, there was no one from the iron and steel or other metalworking industries.

BOHS gets under way, but the profession still struggles

The initiative for the foundation of BOHS came from two other people who had done the Harvard training, the third and fourth of those we may call the Harvard Four. They were young engineering lecturers, David Hickish and Peter Isaac. After graduation, David had done an electrical engineering apprenticeship, and then became an engineer with the Post Office. In 1949 he was appointed Lecturer in Industrial Hygiene at the London School of Hygiene and Tropical Medicine.¹⁵ We do not know what his previous experience was that led to this, or what courses in the subject that the School was then offering. Whatever the background, David took up his Rockefeller Fellowship to study industrial hygiene at Harvard in 1951, and there met Peter Isaac, who had been a railway engineer but had become a public-health engineering lecturer at King’s College, Newcastle-upon-

Tyne (later to become Newcastle University). Peter Isaac's account was published in the BOHS history "The First Forty Years". They had the opportunity to visit industrial plants to see occupational hygiene at work, and the Annual Conference of the American Industrial Hygiene Association (AIHA).



Fig 9.4. David Hickish in his BOHS presidential year (1967-8)

On their return to Britain in 1952 Peter and David approached Tom Bedford, who was then head of the MRC Environmental Hygiene Research Unit at the London School of Hygiene and Tropical Medicine about forming a British association. Bedford was very supportive, and wrote to all those he knew working in the field. The result was a meeting at the School on 21 January 1953, attended by 37 people, all men, six of them from the Factories Inspectorate or its parent Government Department. A committee was formed to make the arrangements, and the inaugural meeting of what became BOHS was held at the School on 27 April, under the chairmanship of Tom Bedford, who was elected President. Peter Isaac became Secretary, and David Hickish Treasurer. By the end of June, BOHS had 49 members. Its first conference was held in November, opened by the Minister of Labour and National Service, and attended by the President of AIHA.

Despite this promising start, the need for occupational hygiene was not very obvious to industry. Of the first 49 members, there were ten members of the MRC Pneumoconiosis Research Unit, and seven others associated with coal (Fig.9.3). Seven were in the Factory Inspectorate or elsewhere in the Ministry of Labour. Of the Harvard Four, Hickish and Sherwood were listed under the London School of Hygiene, and Isaac at University of Newcastle; Harvey was not yet a member of BOHS, but may still have been in the USA. Only seven of the 49 were in private industry, of whom two were employed by the Association of British Chemical Manufacturers and three were in ICI.

So BOHS got under way, spreading knowledge of risks and ways of dealing with them, but with only a handful of trained hygienists. We shall see in a later chapter that in some areas the Society rapidly

had an international impact, but that the wide recognition of the occupational hygiene profession was much slower.



Fig.9.5 Peter Isaac in his BOHS presidential year (1962-3)

¹ Piney M *The development of chemical exposure limits for the workplace*. PhD Thesis, University of Aston in Birmingham, October 1989. Pp 241-244. . <http://eprints.aston.ac.uk/13342/>

² Harvey B (1954) Some personal observations on industrial health in the United States of America. *Br J Ind Med* 11:222-226

³ Nash PH, Sherwood RJ, and Bedford J (1953) An occupational hygiene team. *Brit J Industr Med* 10(3): 202-206, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1037481/>

⁴ G Elmhirst Duckering, *Report on an Investigation of the air of work-places in potteries*. In: *Report of the Departmental Committee appointed to enquire into the dangers attendant on the use of lead and the danger of injury to health arising from dust and other causes in the manufacture of earthenware and china and in the processes incidental thereto, including the making of lithographic transfers*. Volume 2, Cd 5219, London: HMSO, 1910. Quoted by Mark Piney, *OELs and the effective control of exposure to substances hazardous to health in the UK*, HSE, 2001

https://www.researchgate.net/publication/34991777_The_development_of_chemical_exposure_limits_for_the_workplace

⁵ Legge TM and Goadby KW, *Lead Poisoning and Lead Absorption*. London, Edward Arnold, 1912, p 207. <https://ia600209.us.archive.org/35/items/cu31924003449752/cu31924003449752.pdf>

⁶ Mark Piney, *The development of chemical exposure limits for the workplace*. Ph D Thesis, University of Aston, 1989. <http://eprints.aston.ac.uk/13342/>

⁷ Macklin EL and Middleton EL. *Report on the grinding of metals and cleaning of castings, with special reference to the effects of dust inhalation upon the workers*. London, Her Majesty's Stationery Office (for the Home Office), 1923.

⁸ Piney M *The development of chemical exposure limits for the workplace*. PhD Thesis, University of Aston in Birmingham, October 1989. Pp 241-244 . <http://eprints.aston.ac.uk/13342/>

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- ⁹ Bedford T. *The present status of industrial hygiene in Great Britain*. In: Proceedings of the Sixth Pacific Science Congress, Vol VI, Berkeley, Stanford and San Francisco, July 24 to August 12, 1939.
- ¹⁰ Warner CG (1974) Fifty years of British occupational hygiene. *Am Industr Hyg J* 35:381-390
- ¹¹ Bedford T (1954) Occupational hygiene in Great Britain. *Br J Industr Med* 11(1):50-54.
- ¹² T Ogden. Topics in the history of British occupational hygiene, Part 8. What coal taught us about dust measurement.
https://www.academia.edu/41703111/Topics_in_the_History_of_British_Occupational_Hygiene_Part_8_What_coal_taught_us_about_dust_measurement
- ¹³ Imperial Chemical Industries Ltd, *Handbook of Industrial Hazards*. ICI Medical Dept, 1952. (No location given)
- ¹⁴ Nash PH, Sherwood RJ, and Bedford J (1953) An occupational hygiene team. *Brit J Industr Med* 10(3): 202-206, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1037481/>
- ¹⁵ *The First Forty Years* Peter Isaac, Editor. Derby, The British Occupational Hygiene Society, 1993. ISBN 0 9520332 0 8.