

most economical course or there is no other suitable alternative. At present, attention is concentrated on four main topics: artificial recharge of aquifers; river regulation; desalination; and automatic data processing. Studies have been initiated to define those areas where recharge might be undertaken, particular attention being paid to ground-water conditions in the London basin. On the dissolution of the Department of Scientific and Industrial Research, the Board assumed responsibility for the grant of £33,000 to the Water Research Association to investigate the present state of technology on desalination and the economic feasibility of desalination in Britain.

A final chapter of the report looking at the year ahead admits that there must be a strong initial presumption

against any development which might damage the appearance of the National Parks or interfere with public access. Nevertheless, after agreeing that some areas should be held against any development, the Board claims that the total area of the Parks is too large to be sacrosanct from any change. While it maintains that before a firm proposal is made affecting a Park, every possible alternative must be explored and that sometimes such search has not been enough, it adds that it may sometimes be necessary to allow development within a National Park. Clearly the Water Resources Board is another public authority seeking to judge its own cause; certainly its activities will need to be carefully watched.

TRACHOMA

TRACHOMA, one of the most widespread of all diseases, is believed to affect 400–500 million people and is the greatest single cause of blindness and impaired vision. The disease is defined in the third report of the World Health Organization Expert Committee on Trachoma (1962) as a “specific communicable keratoconjunctivitis, usually of chronic evolution, caused by an agent belonging to the psittacosis-lymphogranuloma-trachoma (PLT) group of atypical viruses, and characterized by follicles, papillary hyperplasia, pannus and, in its later stages, cicatrization”.

The most recent and complete survey of the global distribution of trachoma is that by Bietti, Freyke and Vozza. In their review, which cites more than 1,100 references to the literature, the fallibility of much of the available statistical information is emphasized; the authors point out that the data provided by health authorities of various countries are based on diverse criteria, making comparisons between countries extremely difficult. Among the methods of collecting information they cite compulsory notification of all cases, estimates based on investigations of the causes of blindness or on the proportion of patients with trachoma attending hospitals and dispensaries, and routine examinations of school children, military recruits or expectant mothers. They rightly consider that the only reliable method is a properly conducted sampling survey by competent ophthalmologists.

Early in 1959 a team began work at the Medical Research Council Laboratories in the Gambia, using a specially designed laboratory building generously provided by the Wellcome Foundation. Their investigations have been described in a monograph*.

The eyes of all 401 inhabitants of the Gambian village of Marakissa were examined to determine the prevalence of trachoma and other external eye diseases. All subjects were examined clinically; the presence of trachoma/inclusion conjunctivitis (TRIC) agent was sought in conjunctival scrapings by inoculation into chick embryos, and by examinations for inclusion bodies; the ocular bacterial flora were also investigated. Classes of the population found to be of particular interest in this initial survey were subsequently re-examined. Ancillary investigations of special relevance to trachoma were also undertaken.

In the first survey TRIC agent infection was found to occur as early as the first year of life: the incidence of clinical trachoma increased to a maximum of 91 per cent in the 5–9 year age group, and afterwards declined progressively with advancing age. It was most commonly acquired after the second year of life, which suggests that

it may be transmitted by close contact with other young children.

More than 80 per cent of the inhabitants had some form of ophthalmic abnormality. Although severe post-trachomatous sequelae were comparatively rare, severe visual defect caused by trachoma was found in 2.5 per cent of the population. No case of complete blindness was attributable to trachoma alone.

The isolation method proved more reliable than the finding of inclusions for demonstrating TRIC agent in the conjunctiva. Thus, in the first survey, virus was isolated from 69 per cent of subjects with second-stage trachoma, whereas inclusions were found in only 47 per cent. The proportion of virus-positive subjects diminished as the disease progressed and with advancing age. TRIC agent was not detected in those with healed trachoma, in normal subjects, or in those with eye diseases other than trachoma. These findings suggest that most, if not all, trachoma in this area is caused by infection with TRIC agent, and that there is no ‘carrier’ state in non-trachomatous subjects.

The first stage of trachoma may last for 1–2 years, and the second stage from 3 months to at least 2 years. Pannus was present in less than half those with first-stage trachoma, but its incidence increased in the later stages, suggesting that in the Gambia its onset may be considerably delayed. When present it was often not pronounced, and slight neovascularization may disappear without trace. Seasonal variation in climatic conditions did not appear to affect the severity of active trachoma.

The eyes of 79 babies born in Marakissa over a period of three years were examined at frequent intervals for periods up to 2 years or more. Evidence of TRIC agent infection in five infants shortly after birth and isolation of TRIC agent from the genital tracts of three of the mothers suggested that the infants’ ophthalmic infection was acquired at birth; in three infants the resulting disease resembled trachoma rather than inclusion conjunctivitis. In eleven other infants, laboratory confirmation of TRIC infection was obtained at times varying from 2 to 24 months after birth. The signs of inflammation at the onset of infection were less severe than in the new-born children; the subsequent course was characterized by the infrequency and late appearance of corneal lesions, and by a relatively high rate of spontaneous cure. These findings support the view that, in some countries at least, there is no clear demarcation between trachoma and inclusion conjunctivitis syndromes.

Only 4 of 384 people tested had bacteriologically sterile conjunctivae (one of these had only one sterile conjunctiva). The potential pathogens most frequently isolated were streptococci (53 per cent of subjects), staphylococci (40 per cent) and haemophilus bacilli (3 per cent). All these bacteria were isolated more frequently from younger than from older people, and more frequently from trachoma

* Medical Research Council. Special Report Series No. 308: *Trachoma and Allied Infections in a Gambian Village*. By Shiona Sowa, J. Sowa, L. H. Collier and W. Blyth. Pp. vii + 88 + 6 plates. (London: H.M.S.O., 1965.) 20s. net.

matous than from non-trachomatous subjects. Overt bacterial conjunctivitis was rare, and there was no clear evidence that these micro-organisms affected the course of trachoma.

In the search for methods of preventing bacterial contamination of chick embryos inoculated with conjunctival scrapings, it was found that neomycin was much more effective than streptomycin. Unlike polymyxin B, neomycin did not appear to inhibit the growth of TRIC agents. A TRIC agent from the eye of a new-born baby, and one from its mother's genital tract, grew unusually readily in mouse brain. Attempts to use hydrocortisone as a 'provocative test' in cases of suspected trachoma were unsuccessful. Neither skin tests nor complement

fixation tests with group antigen were found to be useful in the diagnosis of trachoma. Tests of the survival time of trachoma agent on cloth suggest that recently infected fomites may be a source of infection. Attempts to isolate TRIC agent by direct inoculation of known virus-positive conjunctival material into HeLa cells were unsuccessful. Cytological examination of conjunctival scrapings from 180 consecutive subjects with and without trachoma showed that active trachoma was usually characterized by degenerative changes in the epithelial cells, and by the presence of polymorphs and lymphocytes in quantity. Plasma cells occurred more frequently in the earlier stages of the disease. The conjunctival cytology returned to normal with the onset of healing.

CHEMICAL ENGINEERING EDUCATION AND PRACTICE

A *SECOND Survey of Chemical Engineering Education and Practice*, by R. Edgeworth Johnstone and C. B. Lax, was to discover the academic subjects used by a chemical engineer in the course of his daily work (*Chem. Engr., Lond.*, 195, CE7; 1966). A previous survey on identical lines was used as a guide in designing the chemical engineering syllabus at Nottingham University (Johnstone, R. Edgeworth, *Trans. Inst. Chem. Eng.*, 39, 263; 1961).

Not surprisingly, report writing, economics and management are the most frequently used skills, but it is cheering to university teachers to know that scientific and mathematical subjects account for 69 per cent in the frequency table (on right). Of course, this does not tell us what proportion of professional men's time is spent on science, but it is good to know that science is not, as we are sometimes told, early abandoned by those in industry.

The present and the earlier surveys produced very similar results with few changes over the five-year interval; no one is surprised that mathematics and computer programming are now more frequently used, but it is puzzling that materials science should at present be less popular.

Table 1 shows a comparison between the survey results and the Institution of Chemical Engineers' standard syllabus *Scheme for a Degree Course in Chemical Engineering*, of which a revised form has just been published.

Table 1. THE SURVEYS COMPARED WITH THE SCHEMES

	Surveys		Schemes		
	(Relative frequencies)		(Percentage weightings)		
	1960	1965	1959	1965	
				Chemical process	Design
Chemical engineering science	42	40	45	49	50
Pure science	20	20	19	18	12
Social science	19	19	4	3	5
Communication	11	12	11	10	10
Other engineering science	5	4	10	3	8
Mathematics	3	5	11	17	17
	100	100	100	100	100

The Surveys and the Schemes give remarkably similar distributions between subjects, except for mathematics and social science; but it is clear that a university course in chemical engineering should have a good deal of mathematics to support the other subjects, and this accounts for its high weighting in the Schemes.

How far such surveys should be used in designing curricula is a matter for debate. The Surveys show us what the practising engineer uses, and the Schemes give the professional body's considered opinion about the curriculum. Let us hope that those who devise curricula will read all this material but not feel constrained by it; they should rather be encouraged to innovate and experiment with new courses. The picture might be a wide variety of courses to meet the differing needs of industry, and to suit the talents of particular teachers in individual schools of chemical engineering. J. F. DAVIDSON

REVIEW OF BRITISH ELECTRICAL MANUFACTURE

THE presidential address of Mr. L. Drucquer to the Institution of Electrical Engineers, delivered on October 7, 1965, took the form of a general review of the British electrical manufacturing industry. While the first part of the address dealt with considerations relating to the industry as a whole, detailed attention was confined to the manufacture and utilization of industrial electrical machinery, particularly with reference to three basic industries—metals, mining and shipbuilding.

Following a brief comment on the historical development of electrical manufacture in the course of which he observed that "The advent of the controlled semi-conductor, the thyristor, has sounded the death-knell of the d.c. generator", Mr. Drucquer turned to consideration of various statistics of industry during the 10-year period 1953-63. Considering first the numbers of persons employed in certain industries, the trends throughout the period had been, on the whole, downward for coal, textiles and shipbuilding. Metal manufacture and

chemical and allied industries had remained almost constant while the electrical industry had increased fairly steadily to achieve a 40 per cent growth. This was approximately ten times the percentage growth of the total of all manufacturing industries for the same period.

Comparing the utility services, water, electricity and gas, electricity showed a rise of 21 per cent—more than three times that of the total for the three utilities.

Taking the year 1954 as a basis of 100, the index of production for electrical manufacture had increased to 167, a value approached only by the chemical industry with an index of 160. If, as a measure of productivity, the ratio between the index of production and the number employed in the industry is taken, it is found that the increase for electrical manufacture for the 10-year period is 27 per cent—a figure exceeded only by the chemical industry.

Taking the number of persons employed in electrical manufacture divided into electrical machinery, radio-