matter and of antimatter will tend to grow by diffusion, and also explain the existence of the 3K microwave background, presumably by the accumulation of radiation from annihilation by diffusion. Another possibility is that quasars may represent circumstances in which matter and antimatter are being annihilated on a substantial scale. It will be interesting to see how this impressive programme is eventually worked out, although Dr Omnès's colleagues will also, to begin with, be anxious to be sure that his assumptions—many of them drastic—do not implicitly neglect some essential characteristic of matter and antimatter—the possibility of annihilation, for example.

POWER

Electricity Twenty Years On

from a Correspondent

THE Society of Chemical Industry spent last week looking into the future. From July 7 to 11, members gathered at Lancaster for a symposium on new horizons for chemistry and industry in the 1990s. Proceedings opened with a session on electricity and power, which was introduced by Professor R. Spence (University of Kent, Canterbury). He described the nuclear process industry which has grown up in Britain to manufacture fuel elements for nuclear power stations. This industry is one of the largest and most advanced in the world; the Springfields plant has a turnover of £30 million per annum. By 1990 installed nuclear power capacity in Britain could be almost twenty times today's figure. If the estimated world nuclear capacity in 1990 (10^6 MW) were to be generated entirely from thermal reactors, the known world reserves of low cost uranium would be completely inadequate. Although the fast breeder reactor, which is expected to utilize about 70 per cent of the uranium supplied as against 1 per cent in thermal reactors, should be in commercial operation by 1990, the world requirement for uranium will still be uncomfortably large in relation to present low cost reserves. The extraction of uranium from seawater may then become an economic proposition.

The economics of electric powered transport, including motor cars driven by batteries and fuel cells, were discussed by K. R. Williams (Thornton Research Centre). Compared with the internal combustion engine, electric batteries have very low power/weight ratios, and the resulting inferior performance could outweigh the benefits in cities of silence and the absence of pollution. A methanol/air fuel cell, which could propel a high performance vehicle more cheaply than can the petrol engine, could be developed by the mid 1970s. Successful cells giving 500 W power have already been built at the Thornton Research Centre.

In data processing and communications the development of opto-electronics, with hybrid components involving both optical and electronic devices, should rival present solid state devices. The laser is likely to have as great an effect on everyday life as television has had. Professor D. J. Bradley (Queen's University, Belfast) described a cheap flashlamp pumped dye laser developed at Belfast. This system, which produces megawatts of power in a frequency tunable beam, could be important in chemical analysis and processing long before 1990. The potentialities of high power lasers for triggering fusion reactions were also discussed but with considerable scepticism.

Talking about new materials for electrical conduction and superconductors, P. F. Chester (Electricity Council Research Centre, Capenhurst) described the replacement of copper by aluminium, and by sodium coextended with a polyethylene sheath to give a simple, lightweight flexible conductor with considerable economic and practical advantages. Although superconductors have specialized applications such as in magnetic coils for bubble chambers or particle accelerators, they do not at present seem economically attractive for power transmission lines. But a material with a transition temperature above 77 K (liquid nitrogen temperature) could change the situation drastically.

LIPIDS

A Place for Chlorine

IF carbon tetrachloride, DDT and polyvinyl chloride are typical, organic chlorine compounds would seem to have distinctly non-biological connotations. Of course, the chloride ion is accepted as a necessary electrolyte in every living cell, but covalently bound chlorine is associated with toxic substances, plastics and the like. Natural compounds which contain chlorine are limited to a few exotic substances isolated from fungi and to certain antibiotics. The finding of a class of lipids which contain chlorine, now reported by J. Elovson and P. R. Vagelos (*Proc. US Nat. Acad. Sci.*, **62**, 957; 1969), may have greater significance.

Elovson and Vagelos apparently discovered these compounds during a routine investigation of fatty acid biosynthesis in the alga *Ochromonas danica*. Cell free extracts of this organism lacked the capacity to build long-chain fatty acids from malonyl-coenzyme A and inhibited the same process when added to other systems. Other properties were reminiscent of certain detergents which block enzyme reactions, but isolation and partial characterization revealed the presence of previously unknown compounds, now classed as chlorosulpholipids.

A culture of the organism yielded cells in which about 15 per cent of the lipids were of this type. Lipids were extracted from the cells using conventional solvents and the sulpholipid fraction was hydrolysed to yield a mixture of diols. Trimethylsilyl derivatives of these were analysed by gas–liquid chromatography coupled with mass spectrometry. Examination of the mass spectrograph prompted the idea that some of the sulpholipids contained chlorine.

Further analysis was facilitated by growing the cells on radioactive chloride or sulphate. Crude diols from the unfractionated lipids produced in these cultures were resolved by thin-layer chromatography. The pattern of bands—which were located by autoradiography—was simpler than that of the gas chromatographic peaks and it was not difficult to correlate the two. Combining the various R_F and m/e values, Elovson and Vagelos were able to describe an impressive array of fatty acid derivatives, and concluded that *O. danica* elaborates a mixture of docosane and tetracosane disulphates containing up to six chlorine atoms substituted for hydrogen atoms. These compounds may well turn out to be more than mere collectors' pieces and enlightenment on their biosynthesis and function will be awaited with interest.