pendium of knowledge, not only of mental illness in industry, but of industrial psychology.

For the British reader the principal drawbacks of an otherwise excellent textbook are unavoidable owing to national differences: the problems of British trade unions, for example, are not those of American ones and alcoholism would hardly be considered a major problem amongst workers here as it appears to be in the United States. Addiction to neologisms is evident, such as "psychophysiology" in place of "psychosomatic".

One could wish, too, that Professor Ross, skilled as he is in the fields of psychiatry and psychology, might have recognized his limitations in the field of literature. Throughout his book are scattered quotations from the great—Plato, Shakespeare, Kipling, and Hippocrates, which, to say the least of it, are overworked. Presumably the point of introducing quotations is to produce a striking effect, but if they are such that even those with minimal knowledge can recognize them their point is wasted. One moves from "To be or not to be . . ." to "Malt does more than Milton can to justify God's ways to man"; the whole gamut of the emotions (as Dorothy Parker once said) from A to B.

Professor Ross's book, so long as he keeps away from Eng. Lit., is a most valuable contribution to industrial medicine, and particularly so since on the whole it emphasizes the normal rather than the abnormal.

J. A. C. BROWN


This slim volume of 64 pages is the fifth of a series written under the general direction of a committee of chemists and published by the Italian National Institute for the Prevention of Industrial Accidents and Diseases. Works already published include (1) "Nitrous Fume"; (2) "Noise"; (3) "Carbon Disulphide"; (4) "Naphthalene and its Homologues", "Naphthaol, Naphthylamines, and Halogenated, Sulphonated and Nitroso Derivatives of Naphthalene and its Homologues"; (5) "Tetraethyl Lead". The following are being prepared (6) "Phosgene"; (7) "Radium"; (8) "Petrol and Petroleum Ether"; (9) "Glycol, Nitroglycerine, and their Derivatives".

The general physical and chemical properties, toxic action, and the maximum allowable concentration of lead tetraethyl are first described.

0.2 mg/m.³ produces evident symptoms in one hour.

0.1 mg/m.³ is not tolerable for repeated exposures.

0.014 mg/m.³ is the American limit for an eight-hour working day but must not be regarded as more than the upper limit of toleration. In practice the atmospheric concentration should be well below this.

It is probably not generally known that lead tetraethyl was discovered over 100 years ago, its anti-knock properties being discovered only some 35 years ago. It is colourless, oily, strongly refractile, inflammable (yellow-orange flame with blue-green border), almost insoluble in water but easily soluble in fats, oils, and lipoid solvents. The lead in lead tetraethyl cannot be precipitated by alkalies but reacts with certain metallic and non-metallic chlorides and decomposes in the air and in sunlight.

The toxic effects depend upon the ready solubility of the compound in the lipid of the central nervous system. The L.D. 50 for mice is about 3 p.p.m.; deaths occur between the 14th and 20th days of daily exposures to this concentration of 10 minutes.

Daily skin applications of 0.1 ml. to dogs lead to nervous symptoms and great depression on the 12th day and death on the 21st day.

Although the vapour pressure of tetraethyl lead is low, the important point for the toxicologist is that air saturated with it contains about 5 mg. lead per litre. Tetraethyl lead poisoning nowadays occurs among cleaners and repairers (skin absorption and inhalation) of storage tanks for leaded petrols. Symptoms include insomnia, anorexia, restlessness, asthenia, nausea, hallucinatory and excited states. Signs include loss of weight, hypotension, vomiting, tremor, ataxia, psychomotor disturbances (for some recent cases see Walker and Boyd, 1952, Lancet, 1467). The hazards of manufacture and blending are apparent from the stages in the process, namely, preparation and reaction in an autoclave of ethyl chloride and a granulated Na-Pb alloy; transfer from autoclave to a still and steam distillation of tetraethyl lead; washing, mixing with a calculated amount of ethylene chloride or bromide and a dye; pumping of product to a decanting apparatus; filtration; automatic drumming in the open air.

From the nature of the reaction

\[ 4 \text{C}_2\text{H}_5\text{Cl} + 4 \text{NaPb} \rightarrow 4 \text{NaCl} + \text{Pb(C}_2\text{H}_5)_2 + 3 \text{Pb} \]

it is obvious that the lead remaining after distillation of the tetraethyl lead must be recovered from the sludges by removing the salt with water, fusing the lead, and casting it suitably for use in the preparation of fresh Na-Pb alloy. The authors, in an evaluation of the various hazards, give the general principles of safe working, illustrated by diagrams and photographs of process and plant, and give the M.A.C. for ethyl chloride as 1 p.p.m. which must be a mistake, but proper attention is drawn to the hazard of its escape carrying some tetraethyl with it from ducts, flanges, pumps, and storage vessels. In addition to the hazard of transfer of the alloy to the reactors, there is also the great hazard of temperature control in the latter. Safety pressure-valves, to obviate explosions, should discharge into stacks sufficiently wide and high to eliminate any possible danger to the plant and personnel.

The passage of the crude product from the horizontal reactor to the still below is, perhaps inevitably, attended by a certain very small diffusion of tetraethyl lead vapour into the atmosphere of the plant. Automatic control of temperature, pressure, and flow keeps the number of workers small but some operations must still be carried out by hand, e.g., the emptying of the reactors, steam regulation and flow of cooling water, and above all, perhaps, the filling of drums. In an illustration of the latter operation a worker is shown, wearing long rubber gloves, top boots, overalls, and filter respirator. Automatic filling and weighing are followed by the delicate operation of emptying and detaching the filling pipe, the
whole operation being done either in the open air or in a
strongly draughted chamber. The smallest splash of
tetraethyl lead on a worker is immediately treated with
petroleum and neutralized with CaCl₂.

Great stress is laid on the provision in the factory of a
daily meal of about 1,700 calories; the rotation of
workers so that intervals of 24 hours between exposure
periods are assured; routine clinical and urinary examina-
tion; immediate treatment on the least sign of intol-
eration; provision of protective clothing and appliances,
baths, showers; washing and sterilizing of working
clothing; continuous chemical analysis of the atmosphere
(the method is given for atmospheric samples, for bio-
logical liquids and for fuels).

With a discussion of the theory of anti-knock agents
and of the hazards to be met with in places other than
tetraethyl lead factories where leaded fuels are used, this
monograph gives an indication of perhaps the most
useful way in which the technology of hazardous
industrial processes can be brought to practitioners
of industrial medicine without over stress to the already
busy mind.

M. W. GOLDBLATT

Industrial Toxicology, 2nd ed. By Lawrence T. Fairhall.
(Pp. xii+376. 80s.) London: Ballière, Tindall & Cox;
Baltimore: The Williams & Wilkins Company. 1957.

The review of the first edition of this book (Brit. J.
industr. Med., 1950, 7, 146) described it as an extremely
valuable and well-documented summary of information
on a great variety of compounds. The second edition
has repaired some of the omissions to which attention
was drawn in the above review.

While faults on matters of detail are easy to find in a
book of this kind, the major criticism of this edition is
that it is not up to date. Surprisingly perhaps, this applies
especially to the sections on analytical methods, to
which subject the author had made so many contributions.
There is little reference to the literature after 1950. For
example, there is no mention of modern and improved
methods for estimating copper.

On the toxicological aspects, condensation is particu-
larly difficult but on the whole an adequate picture is
presented so that the reader gains the correct general
impression of the potentialities of a particular compound.
It is perhaps surprising to find that the author was still
not convinced that beryllium itself is a toxic ion despite
the wealth of experimental evidence to the contrary. His
comparison between TEPP and parathion suggests that
he was not fully conversant with the mode of action of
these poisons. No reference is made to recent papers on
nickel carbonyl or dimethyl Nitrosamine. It is difficult to
see why a paper describing the ineffectiveness of BAL in
treating experimental chloroform poisoning earned a
niché. Clearly there is a place for a book of this kind and
it is to be hoped that someone will take up the torch,
for Dr. Fairhall's death was reported soon after this
edition appeared.

J. M. BARNES

Particulate Clouds: Dusts, Smokes and Mists. Their
Physics and Physical Chemistry and Industrial and
Environmental Aspects. (Pp. xix+425; 8 plates and text

A complete understanding of the behaviour of suspen-
sions of fine droplets and particles in gases is a highly
specialized study, demanding a wide knowledge of
mathematical physics. The literature extends over a
great many years and is widely scattered in journals and
reports published in many parts of the world. Some of
it is not readily accessible to the majority of workers,
and the authors are to be congratulated in bringing
together such a wealth of information in one book. They
start by clarifying our ideas about the somewhat conf-
fusing terminology in this field, and make use of the
term "particulate clouds" to describe "any type of
suspension of particles in a gaseous medium regardless
of the nature of the suspended material but excluding
particles of such large size that they settle very rapidly."

It is interesting to learn the original definition of the
term aerosol, and to find a proper interpretation of the
various uses of the word "smog".

Part I deals with the basic physics and physical
chemistry of particulate clouds, covering their produc-
tion, physical characteristics, optical properties, coagu-
lation, deposition and filtration, sampling and estimation
and diffusion into the atmosphere. It requires a fairly ex-
tenitive knowledge of mathematics to follow through the
theory presented in this section, but research workers and
those engaged in the measurement of dust in industry
will find within it a valuable exposition of the develop-
ment of all types of sampling apparatus. The authors
and their colleagues at Porton have in fact played a large
part in this work, and whilst the research at this estab-
lishment was started primarily for defence purposes, this
book illustrates how wide its applications have been.

Part II, which takes up approximately one-third of
the text, illustrates the practical implications of Part I,
and will be of more immediate interest to industrial
workers. In Chapter 9 the principles of deposition and
filtration dealt with earlier are applied to collecting plant
such as cyclones, scrubbers, electrostatic precipitators,
and ultrasonic agglomerators. The treatment is rather
brief, but as in other chapters, many references are given.
There is a useful table listing the filtering efficiencies
of various types of dry fibrous filters. The chapter on
health hazards occupies some 40 pages and deals chiefly
with industrial dusts. The information on inhalation and
particle size is critically examined, and the need to con-
sider the shape of particles as well as their size is men-
tioned. The individual protection of workers is con-
sidered in some detail, and the data given here on the
performance of respirators is not easy to find elsewhere.
Several pages are also devoted to the study of airborne
infection. Chapter 11 summarizes observations which
have been made on atmospheric pollution in Great
Britain up to recent years and refers also to environ-
mental studies carried out in America. The authors
suggest that sulphuric acid mist should be considered
as a potential toxic agent in smog. Chapter 12 deals
with condensation nuclei and the drop size distribution
in clouds and fog. The authors discuss experiments
which have been carried out on the artificial nucleation
of clouds, and consider methods of fog dissipation. They
emphasize that although from a theoretical viewpoint
fog dissipation by means of surface active agents may be