

devoted principally to theories on the formation of petroleum, and to the composition of natural crude oils. In the second lecture methods of combustion for steam raising, and, briefly, its use in internal combustion engines, were considered. Particular interest attaches to the possible high efficiency attainable when utilised for steam raising by Prof. Bone's surface combustion system. It is, however, in the third lecture that we find the all-important questions of supply discussed. Euthusiastic advocates of the advantages of oil fuel—advantages which are admitted—often forget that, with small exception, liquid fuel must always be an imported fuel in this country, and that the questions of supply and price must depend on a variety of factors, not the least important being that of transport. Prof. Lewes rightly emphasises the fact that trusts and rings are by no means wholly responsible for the recent high price of petrol; there is the big question of enormous increase in consumption with nothing like a corresponding increase in production. Referring to this high price, Prof. Lewes says:—

The way to keep the price of petrol within reasonable bounds is not by letting the imagination run riot on the subject of trusts and rings, but to develop steadily all processes that will increase the supply, not only of petrol, but petrol substitutes, always bearing in mind that with the present consumption ever increasing, petrol itself cannot supply the market for even another ten years, and will probably be a rarity as a motor fuel before the end of the century.

This naturally leads to a reference to processes for "cracking" heavier oils to produce lighter fractions by the breaking down of the heavier hydrocarbons, and a description is given of one of these processes in which oil mixed with water is sprayed through heated iron retorts filled with iron turnings.

Referring to sources of supply other than petroleum oils, it is shown that shale distillation in this country can yield only an infinitesimal fraction of the petrol consumed. Benzene (benzol), obtained from coal-gas and coke-oven tars, being a native product of proved value as a motor fuel, is discussed. Prof. Lewes says that if the whole of the benzol from the 32 million tons of coal annually coked in coal-gas and coke-oven practice were recovered, a very considerable supply would be assured, but under existing conditions less than half the coke is obtained in recovery plant (it may be noted that the use of recovery ovens is extending rapidly), and most of the benzol goes abroad. Prof. Lewes appears to advocate removing the tax on petrol and the imposition of a tax on export benzol as a means of obtaining an important addition to our supplies of motor fuel.

Heavy fuel oils, suitable for steam raising and for internal combustion engines, constitute 50 per cent., or even more, of the crude oil. Prof. Lewes anticipates no such shortage in supplies of these oils in the future as has existed for some time past, for "the distillation of every available supply to yield petrol must result in enormous volumes being thrown on the market." The

present shortage is ascribed to the better price of petrol giving it preference for shipment during a period when there is great lack of transport facilities. With the increase in the number of tank steamers (many yards are busy with such vessels) he anticipates that the enormous stocks held in many fields will become available.

IS CANCER INFECTIVE?

NOTWITHSTANDING that no analogy has been shown to exist between cancer and any known form of infective disease, the contrary is often asserted without proof, as a kind of creed, by well-meaning and enthusiastic students of the disease. A recent lecture illustrates the importance of the influence the latter view may come to have upon the public in general. Whether it is wise to put forward such views before a non-critical lay audience is open to doubt, even if they are told "there is no risk of direct infection, although it is better to avoid direct contact by kissing, by using in common table porcelain, clothing, or beds."

In a popular lecture¹ delivered at the Urania, in Berlin, Dr. V. Czerny, the famous surgeon, gives a clear account of the reasons why, after forty years' experience in surgical practice, he still holds that cancer is an infective disease. According to him it is communicable, not directly, but through an intermediate host. Once the infection is conveyed, the normal cells become changed, they destroy the organism not only by disturbing functions vital to life, but also because, like real parasites, the cancer-cells withdraw necessary foodstuffs, as well as secrete abnormal products of metabolism, viz. toxins which poison the organism. Czerny supports his view by arguments as to the varying frequency of the disease in different countries and in different districts of the same country, the alleged occurrence of epidemics of cancer, of the eyelid in cattle, of the thyroid in trout, and of cage epidemics in mice; but he neither points out the statistical and pathological fallacies that underlie the assertions of the authors whom he quotes, nor takes cognisance of the explanations more cautious authors have given of the apparent differences and "epidemics" upon which he depends. Every precaution necessary for the statistical study of cancer in man applies with even greater necessity to animals, since the data obtainable from an animal population can be controlled at will by the investigator. Unless these precautions are taken, weight may not be attached to reasoning from such imperfect data without important reservations.

Bugs, mucors, mites, worms, cockroaches, bilharzia, filaria, acid-fast bacilli, &c., are alleged as possible intermediate hosts of "the ubiquitous cancer parasite," which may be a protist, but more likely is an ultramicroscopic organism "which constantly secretes a chemical irritant. If one

¹ "Ueber die neuen Bestrebungen, das Los der Krebskranken zu verbessern." By Dr. Czerny. *Himmel und Erde*, Heft 7, April, 1913. Also published separately by B. G. Teubner, Leipzig and Berlin.

conceives of these micro-organisms being adapted to the diseased cells and disseminated along with them by the lymph and blood-streams, a satisfactory explanation of the features of cancer in man is obtained. It is conceivable that there are a number of different micro-organisms which produce these irritating substances, and that there is not a single cause of cancer." The "ubiquitous parasite" finds entrance into the body by the openings made in the case of X-ray ulceration, chronic inflammation of all kinds, *e.g.* of the breast, the ulceration of the tongue following on the irritation of a jagged tooth, catarrh of the stomach due to alcohol or tobacco, ulcer of the stomach, ulcer or catarrh of the large intestine due to constipation; entrance for the parasite may even be made possible by congenital anomalies, &c., &c.

Although no evidence is adduced in support of these conceptions, any alternative to such an infective causation, involving as it does the further hypothesis of symbiosis of the parasite and the cancer-cell, is ruled out of court by Czerny. He says: "On account of the numerous errors made in the past, many pathologists have given up the search for a cancer parasite, and content themselves with some ingenious cellular theory, which suffices for instruction, but does not yield actual practical applications." Surely no practical application can yet be made of the infective hypothesis of the cause of cancer, although the taking of quite fallacious cancer censuses has been based upon it. The importance actual observation has given to chronic irritation has long since justified legislative measures for the protection of workers engaged in various occupations from enhanced liability to the disease.

Czerny reviews optimistically recent attempts to influence the growth of tumours by radium, X-rays, fulguration and chemical means, sera, &c., but his forty years' personal experience as a distinguished surgeon of international fame adds greater weight to his important announcement: "Unfortunately, the first beginnings of cancer are often so insidious that they do not attract the attention even of the patient himself, who first seeks medical advice when ulceration, a palpable tumour, pain—that faithful guardian of health—long-lasting digestive troubles, wasting, and bad looks warn him. Nevertheless, early diagnosis and removal of a condition *long remaining localised*, is the best means of restoring to complete health and avoiding the sad chain of consequences of the advancing disease. Therefore, with the assistance of anæsthesia and asepsis the surgeon has gradually sought out tumours in all organs of the body, even in the brain and spinal cord, and removed them. Naturally cancer comes under operation later, and therefore in less favourable circumstances the more inaccessible its situation. If success for tumours of the brain and spinal cord is rarer, still in the case of the skin 80–90 per cent. of cures can be depended upon. Complete cure in the case of the breast is obtained in 40 per cent., *i.e.* living and controlled five years

after operation. For the stomach and intestine, 20–30 per cent. of success can be calculated on."

Since the first vague statements of the cure of transplanted cancer in mice by chemical means were made there has been a rising flood of similar announcements in scientific journals. According to the experience of the writer the greater number of these communications had better never have been published. The results claimed as cures have been for the most part nothing of the kind, but due to errors, sometimes arising in the properties of the tumour unknown to the "curer," at other times due to the observer being unaware of the behaviour of transplanted tumours in general and of the behaviour of a particular tumour obtained from some other laboratory, the observer being inexperienced both of how to obtain uniform growth and of the numerous fallacies he has failed to avoid. Shots in the dark, by those inexperienced in the growth both of experimental and natural tumours in animals, are, however, to be expected until more is known of the nature, chemistry, and metabolism of cancer, and certainty is attained as to whether or not it is an infective disease. But it would be a grave misfortune if the increasing flood of alleged cures of transplanted cancer in animals led to an augmentation of the number of persons who, disdaining or fearing surgical advice and treatment, prefer "treatment" by some other less efficacious or even useless method, or by some of the new chemical preparations already prematurely placed upon the market.

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PLANKTOLOGY ON THE PACIFIC COAST.

THE school of marine planktologists at the University of California and the biological station of La Jolla (San Diego) is doing notable work on the Pacific under the expert guidance of Profs. Ritter and Kofoid. We now welcome a recent contribution on the classification and vertical distribution of the Chætonatha of the San Diego region, by Ellis L. Michael (University of California Publications in Zoology, vol. viii., no. 3). To begin with, the material is evidently very abundant. The locality in question shows seven out of the eighteen valid species of *Sagitta*, two of the three species of *Eukrohnia*, and one of the two species of *Spadella*. The author has done good work in redescribing and elucidating those species, and is to be congratulated on having failed to discover any new ones. The work has been confined to a comparatively small area, but it is evident that no pains have been spared to make it complete.

The author states: "We are convinced that direction and velocity of currents, temperature and salinity of water, wind, clouds, fog, rain, light and darkness all affect the distribution of plankton *even within a very small area*. The influence of all these conditions must be known to solve any problem concerning the quantitative distribution of plankton." All these influences have been very fully investigated.