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.

E. F. BASHFORD.

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 Chætognatha 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.

The systematic part of the work contains a most useful revision of the known species of Chætognatha with a detailed key giving brief diagnoses of the genera and species, as well as a fuller statement of characters, with measurements of many specimens in the case of most species.

In the very full discussion of the problems of distribution, illustrated by many tables, we find that our author considers that his data contain numerous examples illustrating lack of uniformity in distribution. Some of these examples are as follows: In two hauls of the same net in the same region on the same day the number of *Sagitta bipunctata* varied from fifteen at 6.20 a.m. to one at 7.20 a.m. per unit volume of water. On another day, under similar conditions, the number varied from twenty-five to one, and on another day similarly from one to fifty-six, and on still another occasion from 135 to one. "Other instances might be cited, but enough have been given to show that the surface-distribution of *S. bipunctata* is not constant for any length of time, even in very small areas. The objection will be made that hydrographic and meteorological conditions change rapidly near the coast, but remain constant on the high seas. I doubt the validity of such an objection. In the first place, owing to variations in wind, rain, light, barometric pressure, heat, &c., it is very improbable that hydrographic and meteorological conditions even approach constancy on the high seas. In the second place, some of the above examples show that *S. bipunctata* varied in abundance even when these conditions, so far as known, remained constant during the period within which the contrasted hauls were made."

The author finds himself in agreement with similar observations that have been taken in recent years in the Irish Sea, and comes to the conclusion that "we are therefore compelled to acknowlege a very definite causal relation between rate of reproduction and variations in the quantity of plankton." He discusses the influence of other organisms on the abundance of plankton, and illustrates it by the effect of "red-water," due to the presence of enormous numbers of the dinoflagellate Gonyaulax, and recognises, consequently, that to estimate adequately the quantity of plankton in a given area of the sea we must consider far more than the physical and chemical conditions, and must not omit the biological influences involving the effects of growth, reproduction, food-relations, and other activities of the organisms concerned. As Kofoid (1903) has demonstrated, there are variations in the quantity of plankton which are nearly, if not entirely, independent of hydrographic and meteorological conditions.

Mr. Michael shows that *Sagitta bipunctata*, the commonest species that he deals with, is "epiplanktonic," and, moreover, migrates towards the surface at night and into deeper zones in the day. In the surface-nets this species attains its morning maximum within an hour after sunrise, and its evening maximum within an hour after sunset. He considers that it is probable that the species in its diurnal migrations is constantly moving towards that zone of water in which "twilight conditions" are to be found. The effects of salinity and temperature are also investigated in detail, and the conclusion that our author arrives at is that "probably light has more pronounced effect on vertical distribution than temperature or salinity, because its variations are more regular and periodic."

It is interesting to find that in a later paper in the same series from the University of California, viz., C. O. Esterly on the distribution of the Copepoda of the San Diego region, precisely the same general conclusions as to irregularity of distribution of the plankton are arrived at. In speaking of the absence of any uniformity, the author of this later paper says: "Instances of this could be given almost without number in regard to the distribution of the Copepoda of this region." The marine biologists of the Californian coast are clearly to be congratulated on the thoroughness with which their investigations are being carried out, and on the sound conclusions at which they are arriving. W. A. H.

PROF. FRANCIS GOTCH, F.R.S.

THE phenomena of life and their cessation at death present varied interests attracting to their investigation minds of very diverse type. Thus when the foremost ranks of physiology show a new-made gap, and a distinguished service of some one particular kind is at an end for ever, the loss to the science is not readily repaired. It is then too clear that the gifts which have vanished have differed from those that are left more than in degrees of excellence. Thus deeply at the present time physiology suffers by the death of the late Prof. Francis Gotch. His name is significant of a world-wide reputation. His personality was obviously individual, and in its peculiarities excellent.

Nothing that can be said in the near future can add to or detract from his established reputation. A master of the technique in one particular line, his measurements stand until that technique undergoes unforeseen developments and improvements. In that branch of the subject which he had made his own he had contributed to knowledge a long series of very precise data, placed with great skill at points of salient interest. Feeling no need for the incentives provided by explanatory hypotheses, testing no particular form of speculation, he has patiently and with great ingenuity assisted in a fundamentally essential survey of the physical evidences of life as studied in nerve, muscle, the retina, the special organs of electrical fishes, and in the central nervous system. Further than this, he was a distinguished authority upon the literature of this subject, and a writer of valued summaries and lucid historical articles.

Judged from his writings, he was what I have thus too briefly stated, namely, a dispassionate contributor, and a cold analyst, of evidence. Strange as may seem the contrast, to his students he was a magician, a marvellous weaver of deft