to two periods of six weeks each as a maximum. The officers of the medical department of the army are separated into two distinct categories, combatants and non-combatants, the former being drafted from the general list, while the latter comprise medical men, apothecaries, and veterinary surgeons. Relative rank is strictly defined in accordance with a hierarchical scheme known as the "Tchin." The chief medical officer of the army ranks as a lieutenant-general and also as a privy councillor, but his professional title is "inspector-general." Occupants of the next grade below rank as major-generals and also as councillors of state, their technical description being "inspectors of districts." In all official documents a medical officer's civil designation is invariably cited—as, for example, "District Inspector, Councillor of State, Dr. X. Y. Z. is appointed, &c." The grade of inspector entitles the holder to rank as a noble as well as to be addressed as "Excellency." On appointment a young medical officer enters the ninth class of the Tchin with the relative rank of captain, his corresponding civil nomenclature being "titular councillor." Four-fifths of the medical recruits come from the Academy of Military Medicine at St. Petersburg, the balance being obtained from the other state faculties. A youth enters the academy at the age of 17 and after two years devoted to the general sciences spends three more in medical study. Then, provided he can pass for his medical degree, he becomes eligible for the army, but although given the position of a captain his pay and allowances are those of a subaltern until he has served for four years. The seven most meritorious army candidates passing out of the academy are allowed to prolong their studies for three years, when those who have made good use of their opportunities are granted the means of completing their education in foreign schools during a further triennial period. On their return these industrious young men are rewarded with the best posts in the department. The pay of a Russian medical officer on appointment is £85 per annum. After four years he receives £120, and when promoted major £280. As colonel the emoluments come to about £450 yearly, and in the inspectorial rank to between £680 and £800. Only about half of the academy students enter the army, the number varying annually from 60 to 80. Evidently this contingent is totally inadequate for the medical requirements of such a gigantic army as the Russian, nor does it appear that in war time the number of medical officers could be effectually supplemented from among the civil practitioners of the vast empire whose strength is said to be inferior to 15,000. It was with a view to meet the difficulty that the Russian army authorities decided to organise schools where *feldschers* or medical subordinates could be trained to act as assistant surgeons. There are at present five of these establishments where boys aged from 13 to 17 years receive medical instruction during four years. For the most part they are the sons of soldiers, and on all sides the testimony as to their intelligence and efficiency is highly satisfactory. In time of war it is calculated that no fewer than 10,000 of these *feldschers* would be required. We are indebted for the foregoing interesting notes to an article in the *Archives de Médecine et de Pharmacie Militaires* by Professor Frédéric Antony, who concludes his exhaustive paper in the following suggestive terms: "The medical inquiry which followed the war in the Balkans seems to have proved clearly that the systematic exclusion of medical officers from administrative matters created numerous misunderstandings; that their advice was not always listened to, especially at the base and in zones remote from the directing authority; and that many times the vexatious results of an incompetent hospital administration were attributed by their authors to the medical men whose recommendations had been neglected."

BAD TEETH AMONG ARMY RECRUITS.

In the House of Commons on March 18th Mr. Weir asked the Secretary of State for War, in view of a statement contained in the recently issued report of the inspector-general of recruiting to the effect that in the reports from manufacturing districts, stress was laid upon the number of men rejected for bad teeth, whether he would state the percentage of men who were rejected for this cause during the year under review. Mr. Brodrick replied that the number of men rejected for bad teeth in 1902 was 4558 and the ratio per 1000 inspected was 52.03. This number is nearly double the figures for 1901.

Correspondence.

"Audi alteram partem."

A THEORETICAL VIEW OF THE CAUSATION OF CANCER.

To the Editors of THE LANCET.

SIRS,—The object of the present letter is to point out what seems to me the logical and scientific conclusion to be drawn from recent research as to the direction in which the solution of the grave problem of the etiology of cancer is to be found and to do this as briefly and as simply as possible. A careful consideration of all the known causes of disease has hitherto failed to establish any one of them as the specific and undoubted cause of cancer, and as the result of the great mass of detail embodied in the researches of those who have been working at the problem only two views can be said to have at the present moment much claim upon scientific attention. Perhaps it would be more correct to say that only one view is attracting much notice—namely, the existence of a parasite or micro-organism which is the specific cause of the malignant epithelial growths known as cancerous. The other recent theory—that of Dr. John Beard of Edinburgh University, which he communicated to the pages of THE LANCET a few months ago¹—has met with a singularly cold reception and has provoked practically no criticism. Nevertheless, there can be no doubt that Dr. Beard's theory is one that will have to be faced and inquired into further, though there can be few persons indeed who have the necessary abilities and embryological knowledge to undertake such a formidable task.

Briefly, then, the present position is this. The whole list of the known factors in the production of morbid conditions has been scrutinised in vain to find any particular agency which can be said to be the specific cause of cancers or other tumours. From the mass of facts known to clinicians and pathologists some few factors there are which evidently have some bearing upon the problem. Amongst these are the following: (a) the occurrence of cancer at certain special periods of life; (b) the influence of sex in determining the parts of the body affected; (c) the occurrence of cancer in glands fully developed physiologically; (d) the frequent occurrence of cancer in some families; (e) the influence of long-standing local irritation; (f) the effect of previous disease or local injury; (g) the effect of particular diets; and (h) the possibly infective nature of the disease.

The importance of each of these has been urged at different times by various observers, and the mere mention of such widely varying factors in itself seems to point to the conclusion that in none of them is to be found the sole specific cause of the disease. All of them—except the last—have therefore been put aside as not furnishing full explanation and investigators have turned their attention to other more promising fields. In these circumstances it is most natural, considering the enormous results that have been obtained in other diseases, that many are looking for the solution in the discovery of a specific parasite or micro-organism. It is no part of my present purpose to discuss the researches which have been already published in this direction. Whether the growths obtained by Plimmer and others are to be regarded in any sense as integral parts of the cancer from which they were obtained, or whether the appearances in cancer cells are due to degenerations or true parasites, does not affect the present point. The fact remains that the line upon which most research is now being done is the bacteriological line, presumably upon the supposition that a specific vital cause may be found for cancer, as has been demonstrated for so many other conditions.

The only other view now being urged is what we may term the "germ-cell theory." In this country this view was, as I have said, set forth in THE LANCET last year by Dr. Beard. It is by no means an easy theory to understand thoroughly, for the simple reason that it depends upon the author's views of embryology, which, to say the least, are not familiar to everyone. But as I understand it Dr. Beard holds that cancers—and I think he now extends the view to

¹ THE LANCET, June 21st, 1902, p. 1758.

other tumours—are due to certain products of the segmentation of the fertilised ovum. Certain cells, as the result of segmentation, are set aside to form the sexual cells of the next generation—that is, of the developing embryo. Some of these cells in early development wander into abnormal situations—become, in fact, aberrant germ cells. This part of his view is not a theory, it is a fact which has been observed in embryos of lower vertebrates, these particular cells being easily recognised by their special characters and by special staining methods. The theoretical part of the view is that these cells occur in mammals and lie dormant in those situations into which they have wandered, retain their capacity for developing into certain tissues, and at some later period of life, which in the case of cancer is, as a rule, between 40 and 60 years of age, take on growth and form cancers. I am not aware that these cells have been observed in mammals; there are special difficulties in the way which need not be stated here, but it is argued from analogy that the same process most likely takes place in mammals as in some other vertebrates.

Here, then, are the two views which at present may be said to hold the field, the one theory assuming that cancer may be due to a parasite and the other that it is due to aberrant germ cells in the embryo. The fact that the latter view has received but little attention is no argument against its validity. Nothing could very well be more divergent from each other than these two explanations of the cause of cancer and the most striking point to the mind of the present writer is that the advocates of neither view seem to have given a thought to the theory of their opponents. As far as I am aware the bacteriologists have not given any indication that in their opinion Dr. Beard's germ-cell theory can have any relation to a parasitic cause of cancer, nor did Dr. Beard in his latest paper on the subject (read before the Royal Society of Edinburgh on Feb. 16th, 1903) refer in any way to the possible action of a parasite upon his pre-existent germ cells. It is this striking omission on both sides which is my apology for the present letter.

We are accustomed to divide the causes of disease into two great groups, the predisposing and the exciting causes. We recognise that some morbid conditions are more liable to affect some individuals than others, because we say they have a predisposition or a predisposing cause acting on them, rendering them more susceptible. In other diseases we recognise that an exciting cause alone is sufficient to produce disease provided that the species of animal in question is not immune to that particular condition. But susceptibility in itself must be regarded as a predisposing cause, though the term is generally used with regard to more restricted factors, such as age, sex, family, &c. Is it not possible, then, that the secret of the cause of cancer is wrapped up in the discovering of an *exciting cause* which is able to act upon a *predisposing one*? In other words, is it not possible that both the embryologist and the bacteriologist are right, although they themselves do not see the necessity for each other's view? How can a parasite conceivably give rise to growths of such special types as we find in cancers unless there be a pre-existing cell or tissue upon which its peculiar influence may be exerted? But if Dr. Beard is correct in supposing that in mammals there are dormant germ cells which retain the capacity of development in special circumstances it is equally possible that the bacteriologists may discover the special irritant necessary to start the growth. Or, as seems quite as likely, there may be many exciting causes, of which a parasite may be one, which have the power to initiate growth in a pre-existent germ cell.

It therefore seems to be possible that the cause of cancer will be found to depend upon two sets of factors—one a predisposing cause and the other an irritant acting upon the former. Whether these two factors are to be identified with the germ cells and a specific parasite remains to be proved. More probably there will be found to be a *germ cell which can be impelled to growth by more than one exciting cause*. In any case, to the mind of the writer a conception of the etiology of cancer which does not recognise the necessity of both a pre-existing cell of a definite type and an exciting cause which makes that cell take on deferred growth is an inadequate view. In the interdependence of these two aspects of morbid etiology the true cause of cancer will in all probability be found.

I am, Sirs, yours faithfully,

GERALD R. LEIGHTON, M.D. Edin.,

Professor of Pathology in the Royal (Dick) Veterinary College.
Feb. 17th, 1903.

THE EFFECTS OF BORIC ACID AS AN INTERNAL MEDICINE.

To the Editors of THE LANCET.

SIRS,—Mr. Reginald Harrison's letter in THE LANCET of March 21st, p. 836, will be welcomed by all who, like myself, advocate the use of moderate quantities of boron preservatives in articles of food, such as butter and potted shrimps, which are liable to decompose rapidly. While deprecating the use of boric acid he advocates the use of boracite, which, he tells us, is a borate of magnesium containing 62.5 per cent. of boric acid (anhydride), both as a medicine and also as an article of commerce for preserving such foods as he has mentioned. Mr. Harrison is perhaps not aware that in making an analysis of a food containing boric acid it is not possible to tell whether the acid was added free or in combination, or, if the latter, with what bases it was combined, and that whether boric acid or boracite was added the analyst would only be able to recognise the presence of so much boric acid. It is exceedingly difficult to understand how the effect of a few grains of boric acid on digestion can be so different from that of a few grains of boracite as Mr. Harrison believes it to be, because the hydrochloric acid in the gastric juice must quickly liberate boric acid from the borate of magnesium. I should like also to point out that the preservative generally used for potted shrimps is a mixture of boric acid and borax known in the trade as glacialine, and that it is probable that the alkalies present in most organic substances preserved by it are sufficient to neutralise the free acid, which is at most exceedingly feeble. That Mr. Harrison has suffered from indigestion after partaking of potted shrimps and other articles containing boric acid is no proof that the preservative was the cause of his trouble. Has Mr. Harrison found that it caused indigestion when mixed with his ordinary food? If he has we may have to admit that it does not suit his digestion, but we shall have also to admit that his digestion is unlike the digestion of the vast majority of persons, in whom there is overwhelming evidence to show that no appreciable harm results from the ingestion of considerable amounts of boric acid, even when continued daily for several months at a time.

I may sum up these remarks by saying that Mr. Harrison, by advocating the use of boracite, admits the principle of the use of a boron preservative, that analysts do not distinguish between boric acid and borates in a food, that it is doubtful whether boric acid in the free state is ever met with in the majority of the foods he has mentioned, and finally that to the best of my knowledge Mr. Harrison is the first who would forbid the use of boric acid as a preservative while allowing the use of a borate.

I am, Sirs, yours faithfully,

THOMAS R. BRADSHAW, M.D. Dub., &c.,

Physician to the Liverpool Royal Infirmary.

Liverpool, March 21st, 1903.

THE RISE OF BLOOD PRESSURE IN LATER LIFE.

To the Editors of THE LANCET.

SIRS,—In THE LANCET of Feb. 14th, p. 472, there appeared together letters from Dr. Harry Campbell and myself, in one of which, my own, the mean pressure in the capillaries was spoken of as a considerable amount—say, 50 mm. Hg; in the other, Dr. Campbell's, as virtually *nil*. I did not trouble you with any explanation of this apparent paradox, as I thought the reconciliation of the two points of view would be perceived by physical readers. But as in his very interesting letter in THE LANCET of March 21st, p. 835, this accomplished physician returns to the subject may I point out, after the fashion of the landlord of the Rainbow, that we are both right and both wrong? Dr. Campbell was, and is, considering the pressure in a (any one) capillary, I was considering—as I think I said?—pressure on the capillaries—i.e., in the capillary system. The capillary system, and it is with the arborescence as a whole, not with individual twigs, that the heart is concerned,—the capillary system may be imagined in sum as a vascular area of a certain collective diameter and capacity, and a rough calculation of this area, diameter, and capacity can be made and the probable mean pressure in it