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C A N C E R*

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This article has two parts distinct from each other,—

- I. The frequency and distribution of Cancer, and conclusions concerning the etiology.
- II. The radiotherapy—by X-rays and by Radium—of malignant tumours.

PART. I. *Frequency & Distribution of Cancer*: When in this lecture the word Cancer is used, generally all malignant tumours are meant. It is well-known that by far the most frequent malignant tumour is the carcinoma. As the statistical quotations are taken from various countries, it is practically unavoidable to use the word Cancer for Malignant Tumours in general although the increase in frequency is related mostly to carcinoma in its strict meaning. As you know, Cancer has existed from the oldest time of which we have knowledge, and its distribution is universal. Not only every Country, every People, every Race has its part of this scourge, but even most animals, at least the vertebrates, down to the fish, suffer from it. But if there is practically no people entirely free from Cancer, and if Cancer has been well-known from the time of Hippocrates and Galenus, the frequency and proportion is extremely variable among the various peoples, and even in the same country, or in the same town, this frequency shows variations. It is not long since some investigators of Cancer, among them myself, have begun to be occupied, by this most important question.

When my first Article about Cancer appeared in 1906, there existed only very small references in the literature about the

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Death-rate in 100,000 of population in the
year 1910 in different countries.

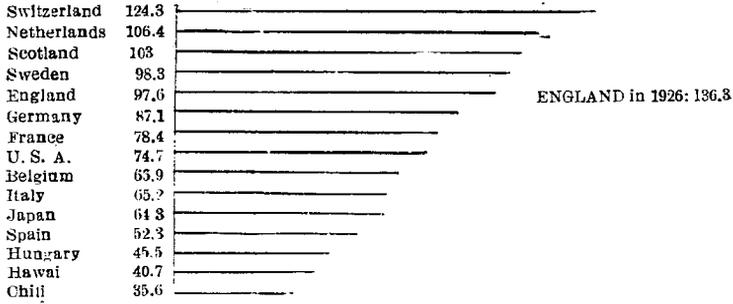


Diagram No. 1.

Death-rate in 100,000 of population in 1910
in different towns.

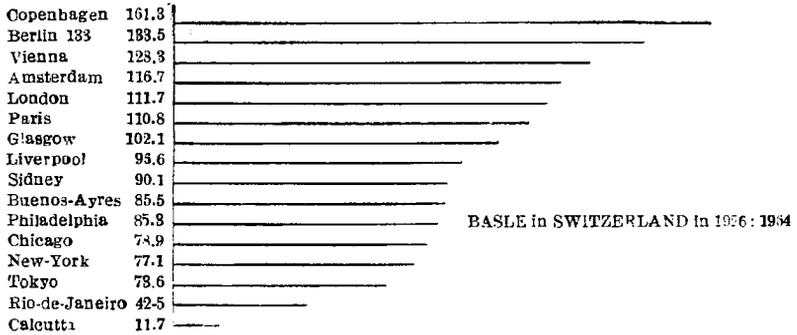


Diagram No. 2.

Frequency and Distribution of Cancer, and it is only during the last 20 years that some authors have begun to push the investigations about it thoroughly. Three names must be mentioned before all,—the first of them is Dr. Frederick L. Hoffman, of Massachusetts, U. S. A.—in my opinion, the greatest living authority on the frequency of Cancer. In England, J. Ellis Barker has immortal merits on this question. In France, Professor Gustave Roussy has contributed much. The greatest part of my statistical data are taken from these authors.

You know that today all civilised countries have well furnished statistical offices, the leaders of which are mostly scientists of international fame.

Diagram No. 1 shows the frequency of Cancer in different countries in the year 1910. This diagram, like the others following, shows the number of yearly Cancer deaths compared with every 100,000 living inhabitants.

Diagram No. 2 shows the frequency in different towns. As you see, these differences are very important. Even in civilised countries and towns the frequency varies in proportions of 1 to 3 to 4 to 5, and more.

These Diagrams are compiled by Hoffman, and I found them in a work of Roussy. For the years 1926 and 1927 I have only a very limited number of letters, mostly from Hoffman. I must express my gratitude here to the Health Department of Shanghai who have been so kind as to send me some of the latest publications about the frequency of Cancer. This frequency is always, as I said above, reckoned per 100,000 living inhabitants per year. In 1926 the frequency in England was 136.3. In the city of Hambourg 130.9. In the whole of Germany 102. In Stockholm 142. In Danish cities and towns 145. In Denmark as a whole 135. In Vienna 142.4. In Paris 133.9. The highest frequency known is at Basle in Switzerland: 196.4.

In most striking contrast with these, terrible numbers is the rarity of Cancer among so-called “uncivilised” peoples, but the methods of investigation in these primitive countries are naturally quite different from European or American proceedings. Primitive peoples, primitive countries, have no statistics, and naturally we cannot have any numbers, but Hoffman and

Barker have introduced a method of questioning the doctors practising long years among such primitive peoples. It is true that even these doctors cannot have any exact numbers, but from their reports the contrast with our countries, is enormous. Doctors in civilised countries have, nearly all, to spend a great part of their time on Cancer cases. They see hundreds and thousands of Cancers. Doctors among Central African Negroes, Indians of Canada, Papuas, and so on, have seen, in their practice of many years among thousands of patients, no Cancer at all, or only one or two cases.

Most of these reports are collected by Mr. Barker, many of them by Hoffman, and some by myself. Hoffman himself writes:—in the “Boston Medical and Surgical Journal” of 1923:

“Among our native Indians Cancer is very seldom met with in those who are of pure blood; while during my recent investigations in South America I failed to find a single case of Cancer among thousands of native women, from whom enquiry was made for the purpose.”

The same authority informs us in his pamphlet, “New Aspects of the Problem of Cancer Control”:—

“Among the full-blood Indians cancer practically never occurs. I have made special enquiries among the Navajos and Zunis, but failed to find a single recorded case. But even more impressive is the result of a recent enquiry by means of a questionnaire sent out to 127 agency physicians, including practically the entire country with a total Indian population of about 115,000. Sixteen out of 71 reported no cases of cancer of the skin, twenty out of 71 reported no cases of cancer of the mouth, twenty-one out of 71 reported no cases of cancer of the breast, and thirteen out of 68 reported no other form of malignant disease. In the remainder of the reports cancer was referred to, in the large majority of cases, as of rare occurrence, and only in very few cases as of average occurrence, probably chiefly among tribes largely intermixed or intermarried with the white population.”

Dr. Isaac Levin, of the Department of Pathology of Columbia University has made extensive investigations at the expense of the George Crocker Special Research Fund. He learns from Dr. Chas. M. Buchanan, who practised for 15 years among 2,000 Indians, that he noticed in all this time only one cancer case. Dr. Henry E. Goodrich, practising for 13 years

among 3,500 Indians, saw not a single cancer case. Dr. L. M. Hardin, Dr. Mary H. McKee, Dr. A. P. Meriwether, Dr. L. R. Parkinson, Dr. E. O. Sears, Dr. F. Shoemaker, and Dr. J. F. Turner all report the same. (All quoted from Barker—Hoffman).

All these Doctors have practised long years in Indian communities ranging from 1,000 to 3,000, and have known personally everyone in their community, and naturally have well observed every fatal case. Sometimes the objection is made against these observations, that the rarity of cancer is due to the low average duration of life among these people.

Mr. Barker quotes as an answer to this objection;—Dr. Ales Hrdlicka's "Physiological and Medical Observations among the Indians."

"The proportion of very old people, among the Indians, is far in excess of that among native white Americans. Thus the difference in age cannot account for the rare occurrence of cancer among Indians. Cancer is prevalent among the whites of the same localities."

Dr. Hrdlicka is known as one of the leading Anthropologists of the world.

The British Medical Journal of the 7th July, 1923, publishes a letter from Dr. Bernard Hollander:—

"The interior of Africa is practically free from Cancer. Only in coast towns, where natives mingle with Europeans, does cancer occur, and then also with extreme rarity."

The British Medical Journal of the 3rd June, 1923, quotes a letter of Dr. P. P. Fouche:—

"For 6½ years I was District Surgeon in the Orange Free State. The district in which I practised had a native population of 14,000. I never saw cancer in any form in a native."

The British Medical Journal of 1906 contains an article of Dr. L. Hearsey, Principal Medical Officer, British Central Africa:—

"There can be little doubt but that cancer, as a disease affecting natives of British Central Africa, is of the utmost rarity. Enquiries from medical men of lengthened residence in the country, and who have been in constant touch with natives, confirm this statement:"

Dr. Renner, Medical Officer, Freetown, Sierra Leone, writes in an article in the *British Medical Journal* of the 31st September, 1910, entitled "Cancer Among the Descendants of the Liberated Africans in Sierra Leone."

"I have been rather struck by the increased number of cases of cancer among the descendants of the liberated Africans. But this disease is of extreme rarity among the hundreds of Aborigines who come yearly for my treatment. This great difference in the frequency of cancer among these two classes of population is due, in my opinion, to the fact that the descendants of the liberated negroes have adopted the mode of living, the food, and the dress of the Europeans. The Aborigines are continuing the simple and primitive living of their forefathers."

The *British Medical Journal* of the 21st July, 1923, prints a letter of Dr. Cameron Blair, which runs as follows:—

"One of the most lively impressions of every medical worker in Nigeria is the rarity of carcinoma. Personally, I have been looking out for it on the spot for some 22 years, and my experience resembles that of my colleague, Dr. Dyer Sharp. I have never seen a case of carcinoma or sarcoma. Some of the medical men in the coastal regions of Nigeria encounter carcinoma occasionally among natives who have copied the dietetic and other domestic practices of the Europeans."

The *British Medical Journal* of the 29th September, 1923, contains a letter of Dr. J. R. Love:—

"I practised in Cape Province, South Africa, for 14 years (1901-15), and during that time I do not remember having seen a case of cancer among the natives."

The third report of the British Imperial Cancer Research Fund gives, on pages 30/40, the following:—

"Sir William Macgregor, who was for nearly 10 years Governor of British New Guinea, in an address delivered at the London School of Tropical Medicine, said:

"For 9½ years I never saw a case of cancer in British New Guinea, but at the end of that time there occurred an example of cancer in the person of a Papuan that had for 7 or 8 years lived practically a European life."

In the *Lancet* of the 4th February, 1922, Colonel Dr. Robert McCarrison made the following statement:—

“For some 9 years my duties lay in a remote part of the Himalayas, amongst isolated races far removed from the refinements of civilisation. They are of magnificent physique, preserving until late in life the characters of youth, unusually fertile and long-lived. Although my operating list averaged over 400 operations a year, I never saw a case of cancer.

A highly qualified Parsee Doctor, F. D. Bana, M. B., M.R.C.S., D.P.H., etc., etc., writes in a letter: from Etawat, Northern India, 30th November, 1923:—

“Cancer is practically not occurring here.”

During 1927 there were a number of Indian Army Medical Men in Shanghai. I had occasions, several times, to have lengthy conversations with them about the frequency of cancer in India. All confirmed that in the interior of India cancer is absent or of the utmost rarity.

A Medical Officer of the Danish Government for the Eskimo population of Greenland, during fully 20 years, confirms also the utmost rarity of cancer there. This is a particularly important observation, as these Eskimos are practically only meat—eaters, having no other food.

Mr. Bandara, a Singalese Medical man, Health Supervisor of Christmas Island, confirmed to me that he had never seen cancer among the native population of the island.

Lieut. Colonel Dr. Texeira, Chief Medical Officer of the Island of Timor, in a personal conversation, confirmed, that cancer is practically non-existent among the natives of this island.

I could continue these quotations indefinitely. Most primitive races of the earth, Lapons of Scandinavia, Yakuts of Siberia, Kanaks of Polynesia, etc. etc. etc. are practically free from Cancer, but *only as long, as they conserve their ancestral mode of living.*

What is the only possible conclusion from all these observations? I have shown that among the peoples who represent the highest civilisations on this earth, in England, Holland, Switzerland France, Scandinavia, etc., etc., the frequency of

cancer is about 100 to 150 per year of 100,000 inhabitants, but these numbers, although strictly true, still do not convey an accurate impression for out of these 100,000 there is a very high proportion of people who die young of other diseases. The true proportion of cancer can be found when we take the cancer death rate in people in the second half of their life. For a person of 45 years of more, the probability of death by cancer is one to five, or perhaps one to four. Today, in some countries, the cancer mortality is higher than the Tuberculosis mortality. The Scottish statistics are reputed for their precision. The annual report of the Registrar-General for Scotland, 1923, shows that in Scotland in 1922, 5,818 persons have died from all forms of Tuberculosis. In the same year 6,133 persons died from cancer.

Today in the United Kingdom the cancer-mortality is about 10% of the whole mortality. This shows that about 5,000,000 of the whole population of England and Wales are condemned to die from cancer. Supposing that the frequency of cancer remains stationary, but that is very far from the case, as will be seen in the following chapter.

So far we have seen that cancer in civilised states is enormously frequent. Many, many millions of Europeans and North Americans are doomed to die from Cancer. In opposition to this enormous frequency among highly civilised peoples, cancer is non-existent or extremely rare among primitive peoples. We have seen, by the Diagrams *I* and *II* that the frequency of cancer is proportionate to the degree of civilisation of the people. It can be said with as much certainty as can be made in any generalisation that,—

Cancer, in general, is a disease of civilisation. We are assuming as granted the following hypothesis:—

Cancer occurs among every people, but is enormously more frequent among highly civilised nations. Against this hypothesis two objections are proffered:—

- I. Among primitive people there are few who attain old age, the age of Cancer. But I have already shown that among many primitive tribes of North America of the Himalayas, etc., etc., the proportion of old people is remarkably high. Nevertheless, cancer is very rare there.*

II. Primitive peoples are reluctant to consult a doctor and thousands or millions of primitive people never see a modern doctor, so that cancer among them is not apparent. But there are a great number of primitive tribes which have had doctors living among them for many years. These doctors know their people far more thoroughly than a European or American doctor may know his ever changing patients. I have quoted quite a number of doctors who have known practically every person of their districts who could say that during 5 or 10 or 15 years there has not occurred one case of death of which they had no knowledge, and these doctors have seen no cancer during long years.

INCREASE OF CANCER IN THE LAST DECADES:

Surely the very high difference in the distribution of cancer among different peoples is very important and surprising to the uninitiated, and even more important and surprising is the increase of the frequency of cancer in civilised countries in the last decades. Diagram No. 3 shows the increase of cancer in England (and Wales) from 1840 to 1926. Mr. G. Ellis Barker quotes on pages 84 to 96, of his work: "Cancer," London, John Murray, Albemarle Street, W., July 1924.

"In the report on the State of the Public Health, published by the British Ministry of Health, (here abbreviated) *Deaths per 100,000 of Cancer in England & Wales*: (See Diagram III).

About 1840.....	17.3
„ 1860.....	36.7
„ 1880.....	50.0
„ 1900.....	82.9
„ 1922.....	122.9

(I can add from other official source: In 1926: 136.3)

In a recent work of Dr. Hoffman:—

"Cancer in Russia, Scandinavia and other states," "We find that the yearly death-rate of Cancer in England in 1926 has not been less than *136.3 to every 100,000*.

"From these figures it will be seen that the death rate of cancer in England is to-day about eight times what it was about one century ago."

Increase of yearly death-rate per 100,000 of population in England and Wales, from 1840 to 1926.
From 17 to 136.3

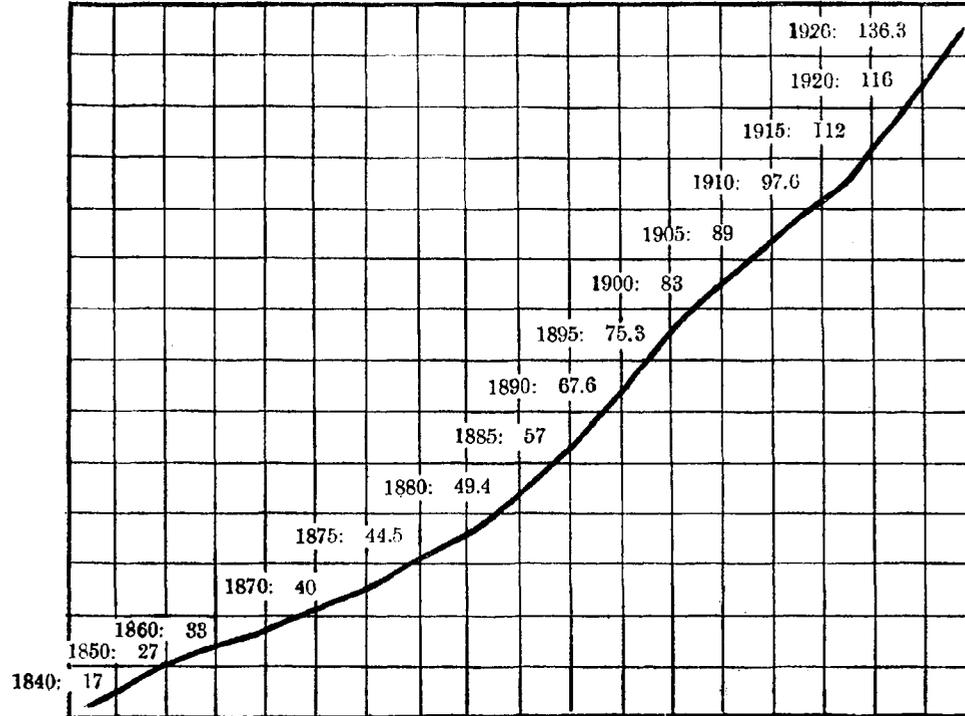


Diagram No. 3.

The report of the Registrar General for Scotland, published in 1923 shows that, in Scotland, there have died from cancer,—

In 1901.....	3,662
„ 1905.....	4,132
„ 1910.....	4,863
„ 1915.....	5,291
„ 1920.....	5,765
„ 1922.....	6,133

In the short space from 1901 to 1922, the number of deaths in Scotland increased by 80%. Previous to 1878 the cancer death rate was constantly less than 50 per 100,000, today it is between 130 and 140.

Dr. Hoffman's magnificent work, "The Mortality from Cancer Throughout the World," gives the following data of cancer mortality in the United States of America, counted by the yearly death-rate on 100,000,—

In 1900.....	62.9
„ 1905.....	71.4
„ 1910.....	76.2
„ 1915.....	81.4
„ 1920.....	83.4
„ 1922.....	86.8

In the state of Massachusetts where Dr. Hoffman himself is the Chief Health Officer, the cancer death-rate has advanced as follows:

In 1856.....	18.8	per 100,000
„ 1860.....	27.2	„ „
„ 1870.....	35.4	„ „
„ 1880.....	52	„ „
„ 1890.....	61.9	„ „
„ 1900.....	71.2	„ „
„ 1910.....	89.5	„ „
„ 1920.....	115.3	„ „
„ 1922.....	116.6	„ „

In Japan I know only the cancer-death rate from 1911 to 1921. In these 10 years the cancer death rate per 100,000 in Japan has advanced from 66 to 76.

In his booklet: "Cancer in Russia, etc.," Hoffman relates some new data:

Cancer deaths in Leningrad from 1885 to 1926

In 1885	per 100,000	76.5
„ 1895	„ „	94
„ 1921	„ „	102
„ 1926	„ „	118

Very interesting are the statistics from the town of Stockholm where the cancer death rate has been noted with the utmost care from the year 1861. During the period 1861 to 1926 the absolute number of cancer deaths has increased from 83 to 629, and the death rate per 100,000 from 76 to 142.

In Norway, as reported by Dr. F. G. Gade, Cancer has also increased in the same proportions as in other countries. In 1924 the cancer death rate of Norway was 111.4 per 100,000, but in some towns of Norway, it has been from 140 to 158. In Denmark, which has perhaps the highest mortality of cancer in the whole earth, the cancer death rate in the whole country is about 140, but in the city of Copenhagen it has advanced to 161. In Holland the cancer death rate per 100,000 was 83.2 in 1890, while in 1920 it was 127, and in 1926 close to 140.

In Switzerland we have the cancer death rates from 1915 to 1926. During these 11 years the population has increased from 3,882,000 to 3,960,000. The number of cancer deaths in the same 11 years had increased from 4,614 to 5,356, and the rate per 100,000 from 109 to 135.3.

Particularly sinister are these numbers from the Swiss city of Basle, which has, as it seems, the highest cancer mortality in the world. From 135.4 in 1901, it has increased to 196.4 in 1926.

The increase in Paris is shown by Professor Roussy in his work "L'Etat Actuel du Problem du Cancer, Paris, Gauthier Villars et Cie, Editeurs." The population of the town of Paris has rested practically stationary from 1900 until today, but the absolute cancer mortality is as follows:—

Annual deaths from Cancer in Paris:

In 1900	.....	2,740
„ 1905	.....	3,093
„ 1910	.....	3,073
„ 1915	.....	3,327
„ 1922	.....	3,593

In Germany in 5 years, 1920 to 1925, the increase was from 87 to 102.

It would be easy to continue these terrible figures. On the average in civilised Europe, in the last decade the annual increase of cancer has been not less than $2\frac{1}{2}\%$ per year, counted always on the average of the previous year. As I have said already, about one out of every 4 or 5 persons in the second half of life, must die from cancer. These appalling numbers speak a terrible language, but if we penetrate more deeply into the question, the facts are even darker.

As will be shown in my article about the Radio-Therapy of Cancer, the proportion of cured cancers is today higher than 20 or 30 years ago, and the above-quoted statistics are not of the cancer morbidity, but of the cancer mortality.

There are usually two objections against the thesis that the number of cancers in civilised countries is rapidly increasing:—

- (I) The general mortality has become much lower, and the proportion of aged people in civilised countries is much higher than half a century ago. This is a very serious objection, and it is quite indubitable that a very small part of the increase is due to the growing number of old people, but there are also countries in whose statistical year books the proportion of aged people is given exactly, as in Denmark, Finland, Sweden, Scotland, Holland, etc. Taking into account all these statistics, which are too complicated to be quoted here, we find that only 5 to 10% of the increase can be due to the diminished general mortality. But there is even another more striking argument. In the last 5 or 6 years the decrease of the general mortality has become insignificant. It is quite natural that in countries where the general annual mortality is about 12 or 14 to one thousand there is not much more decrease to expect. And yet in recent years, when the general mortality has lowered insignificantly, the increase of the cancer mortality has been higher than before, so that in a country where for the last 50 years cancer has increased from 70 to 140, out of this 140, only at most, 10 or 12 are due to the increased proportion of old people.

- (II) A second objection is that the number of cancer deaths is not really increasing, it is only our diagnostic-methods which have been perfected. In other words, there are in reality no more cancers than before, only we *diagnose* an increased number. This objection is believed also by a great number of doctors, and even by some very noted ones.

The above quoted report of the British Government provides a striking answer to this objection. Notice the comparison between the increase of cancer in general and the increase of external cancers, for instance of the Breast and of the Skin.

(See Diagram 4).

The general cancer death rate increased in England from 1912 to 1926, from 102 to 136.3. During the same period the proportion of skin cancer has augmented from 2.5 to 4.5, and the cancer of the breast from 10.3 to 16.2. I suppose, that no doctor will believe, that 15 or 20 years ago there has been any error possible in an advanced fatal case of skin cancer or breast cancer. I have been occupied myself with cancer practically and theoretically all the last 25 years. I cannot well imagine myself any illness, with which an *advanced* case of cancer of the breast, could be confounded, and if in some quite exceptional cases such a mistake is possible, this is such an exceptional fact that it cannot possibly influence the statistics. In the last 15 years, from 1912 to 1916, the increase of cancer in England has been:

Cancer in general	34%
Cancer of the skin	28%
Cancer of the breast	35%

A very heavy argument for the reality of this increase is furnished by the fact that in the last 5 and 10 years, when our diagnostical methods have not made any noteworthy progress, the increase of cancer has been even more marked than ever before. There is also another argument for the reality in the increase of cancer. I myself, as well as other radiologists, believe that the advanced diagnostical methods, not only do not increase the apparent frequency of cancer, but tend rather to diminish it. Effectively, I remember quite a great number

Increase of the yearly death-rate per 100,000 of population in England and Wales, from 1912 to 1926.

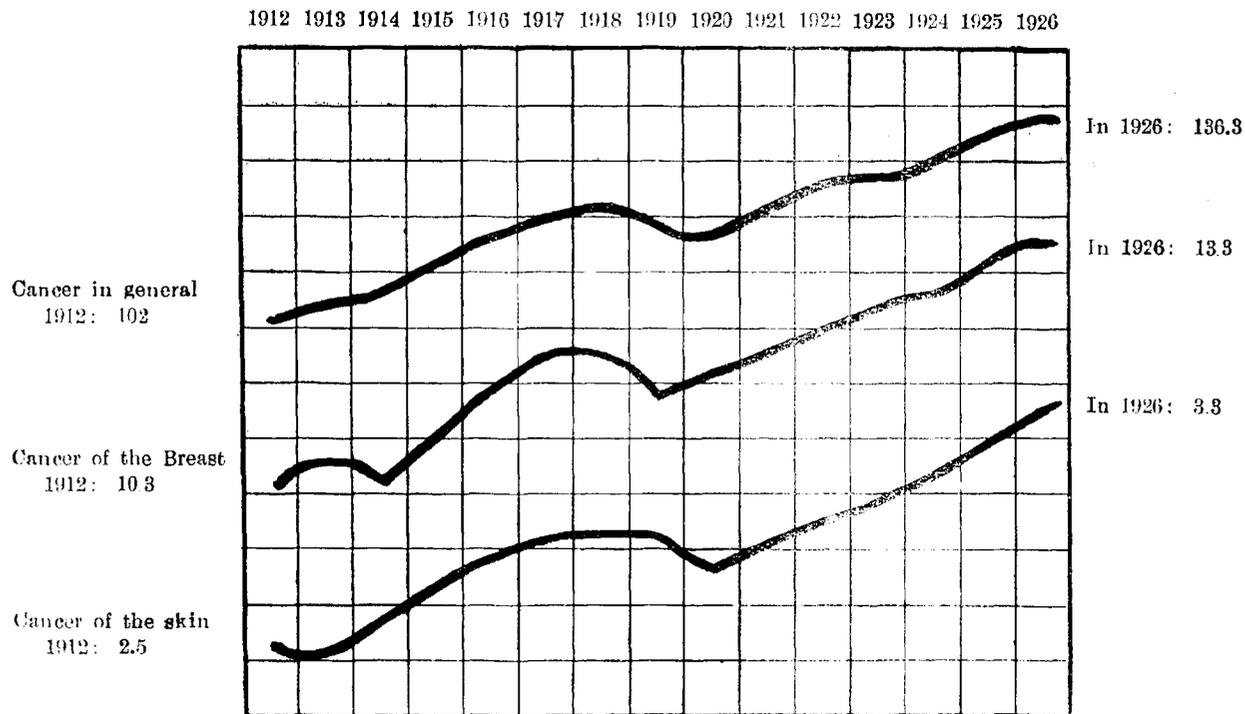


Diagram No. 4.

Cancer

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of cases which have been forwarded to me as suspicious of cancer of the stomach or of the colon. A close examination has shown a non-malignant stricture of the pylorus or of the colon. In such cases the defective nutrition, the stagnation of putrid bowel contents, the resorption of ptomaines, create a very cancer-like cachexia.

The conclusion of all these above-quoted observations is, that Cancer is not only much more frequent in countries with high civilization, but that this frequency is rapidly increasing.

CONCLUSIONS ON THE ETIOLOGY OF CANCER

It is well known, that enormous amounts of money, and many years of work have been and are still spent on laboratory-investigations about Cancer. Miss Slye in Chicago has pursued researches about the Cancer of mice for fully 20 years, and has sacrificed about 40,000 mice. You know the investigations of Dr. Bashford in England. All these researches have furnished very interesting results of pure scientific value, but for the etiology of *human* cancer, for its prevention and cure, the results of all this labour are very poor. Cancer in mice, in rats, tumors in hens, etc., are so far removed from human cancer that conclusions concerning these tumours are not applicable to cancer in Man.

But before entering the questions of etiology of cancer, I would like to express my opinion on two questions, *the Contagiosity and Heredity of Cancer*:—

(I) *Contagiosity*:

The only argument for the contagiosity of cancer is its frequency, but if this frequency had the slightest relation to contagiosity, there should be a marked difference in the frequency among people who come into contact with cancer, and those who have no contact. You know that, for instance, Chief-Surgeons of great surgical clinics have enormous numbers of cancer operations. We have never heard that cancer is more frequent among surgeons. But again, a great many surgeons have received small wounds on their hands in the course of cancer-operations. I believe that no authentic case is known where a surgeon has infected himself in this way. In tragic contrast to this, is the great number of surgeons with grave infections contracted from operations on septic cases. I know

of more than 700 doctors of medicine who died from Spotted Typhus during the Balcanic and Great Wars while Plague and Yellow Fever have also devoured many highly qualified victims. Cancer is not more frequent among surgeons than among lawyers or businessmen. There are some special cancer-hospitals in Europe. I have visited the Cserny Hospital in Heidelberg, and the Middlesex Hospital in London. Among the servants and nurses, etc., of these hospitals, who are practically passing their lives in continuous contact with cancer, this dread disease is not at all more frequent than among the surrounding civil population, so that it can be said:—"Life-long continuous occupation with cancer does not increase at all the probability of contracting it."

(II) *Heredity of Cancer:*

To the superficial observer there seem to exist cases of cancer heredity. Recently, we have heard of the death from cancer of a well-known person of high rank, whose father and mother, before the war, both died from cancer. I have known a family where the mother, and 20 years later, both her daughters, had cancer of the breast.

One of the great feudal families of pre-war Austria-Hungary had quite a series of cases of cancer of the internal surface of the cheek. All these seem to furnish arguments for heredity, but there are very heavy arguments against this conception. About 25 years ago Denmark carried out a very thorough investigation of cancer in its whole population. It was found that the cancer mortality was, at this period, 6% of the total mortality. The descendants of persons who died from cancer had a frequency of 6%, and persons who had no cancer in their ancestry, had equally, this percentage. In other words, children of cancerous parents have generally no greater chances of contracting cancer than children of other people. I remark here, incidentally, that the same proportion of cancer mortality in Denmark has since increased from 6 to 12%.

Recently Dr. Hoffman found in San Francisco that in the ancestry of cancerous people cancer occurs in 9%, but it seems to me, that in our times, with a cancer death rate of 130 and 140, the same 9% of cancer is found in every ancestry. But if cancer is not hereditary how can we explain the above related cases of cancer families?

Certainly, a part of them, as also some apparent cases of contagiousity, are explained simply by the great frequency of cancer. If today about 1/5th of the grown-up people must develop cancer, then it is quite natural that in any group of, say 20 grown up persons, there will be about 4 cases of cancer.

But there is another consideration of far greater importance. Some years ago, in 1913, I wrote an article in the "Gazette Médical d'Orient" about "Apparent Heredity." I showed in this article, by numerous examples, that very frequently, when the same disease appears in subsequent generations, this is attributable, not to true heredity, but to the transmission of the same faults in the fashion of living. Every man has a certain tendency to continue the same habits or customs of living, in the practice of which he has received his education. I will try to prove later, that, at least a great part of the etiology of cancer, is due to the unnatural life of the present civilised man, and it is very possible, even probable, that it is not the cancer which forms the sinister heritage, but the faults, and habits which provoke this cancer.

Anyhow, although I dare to say categorically that cancer is not contagious, with heredity, I must be a little less positive and be content to say that if heredity plays a role at all in the etiology of cancer, this role is very small, so that, practically, in the overwhelming majority of cases, it can be said that cancer is not hereditary. So the following four statements can be considered as proved:—

- (I) Cancer is far more frequent in highly civilised countries,
- (II) The frequency of cancer is rapidly increasing,
- (III) Cancer is not contagious at all,
- (IV) Cancer is practically not hereditary.

But, if cancer is not contagious, why then its rapid increase in the last decades? The human race has not changed in the last 50 or 80 years. There is only one possible deduction from all this:—

**THERE IS SOMETHING WRONG IN OUR FASHION AND
MANNER OF LIVING!**

I will try and analyse those conditions of our life, which have changed in the last 50/60 years. But before entering into this question, I find it necessary to examine some elements of the etiology of cancer which to-day are already known.

I can mention very briefly the well-known fact that long irritations of various natures create a predisposition for cancer. A stormy sexual past in women predisposes for cancer of the cervix. The Kangri-cancer of Kashmir, as a result of repeated superficial burnings, is well known. You all know the examples of this. But there are also other conditions which predispose to cancer, the role of which has been learned only in late years. Perhaps the most palpable result of the researches on experimental cancer on small animals has been the discovery of the role of Tar. Repeated tar-brushing is the only way to provoke cancer in mice, but professional occupation of Men with tar or with tar derivatives, also predisposes to cancer, and not only on the directly irritated places. There are also many other substances, used in occupations which, predispose to cancer. I mention Paraffin, Petrol, Aniline, Arsenic, X-rays, Soot, certain stones and ores, etc. We know today of a long series of so-called occupational cancers. There is a very important common trait of all these cancers. They appear only after very prolonged occupation with these cancerogenous substances. 15, or 20 years of occupation are necessary. The limited space of this article does not allow me to enlarge upon this subject. Anyhow, it seems that quite a great series of minute intoxications,—the impregnation of the body with such small quantities of poisonous substances, that a true chronic poisoning cannot develop,—creates the predisposition for cancer.

There are many examples known where persons have in their occupations to do with Tar, with Anilines, with Paraffin, with X-rays, with Soot, etc., and perhaps after 10 or 15 years of occupation they have ceased all contact with these substances. Yet several years later the typical bladder cancer of the Aniline worker, the scrotum-cancer of the chimney sweepers, the hand-cancer of the radiologist has developed.

It is very probable, that there are many different substances, which, although their action on the human body is very small, yet when repeated many years, create, or increase the predisposition for Cancer. Perhaps this predisposition is formed by a special diminution of the resistance. We may assume as granted that various minute alterations of the constitution, having lasted many years, are predisposing elements to Cancer. If we accept these two theories, three very important questions arise before us;

1. What are the differences in the lives of civilised and primitive peoples?
2. Which elements of our life have changed in the last half century?
3. Which of these differences of changes may have an influence on the predisposition to Cancer?

The subject is immense. It is beyond the capacities of a single man, and at the end of this lecture I will make a proposition which, in my opinion, would help to bring these questions, if not to a complete solution, at least, nearer to it.

Anyhow, I try to give here a sketch of this great matter:—

(I) Life of primitive man, and life in civilisation.

1. *Fresh food and conserved food.* Primitive man's food consists of the vegetables, the fruits and the animals which surround his hut. These are mostly substances for which our digestion and our organs were adapted countless generations ago. Civilised man, above all in the last decades, has always been consuming increased quantities of frozen flesh, tinned fruits and vegetables, jams prepared in big factories, and so on. All these conserved foodstuffs are unnatural by several reasons: (a) They mostly contain preserving chemicals. (b) The nature of the nutritious substance itself is altered by every sort of conservation. (c) The vitamins disappear or diminish, or change.

2. *Bowel functions.* Civilised people are mostly constipated. This subject is extremely difficult to treat. In modern medicine it is not fashionable to talk about constipation. A patient, to whom the doctor, treating him, will say, as a diagnosis, that he is constipated, will have no consideration for him as a doctor. But there are very deep-thinking doctors, in many countries, who are considering chronic constipation as the most important sickness of all. Chronic constipation diminishes the resistance, so that every other sickness finds constipated individuals an easy prey.

Dr. Hoffman has published a report on the "San Francisco Cancer Survey," in the Fourth Preliminary Report:—He examines the preceding sicknesses in cancerous patients in a series of American towns:—New Orleans, San-Francisco, Buffalo, Chicago, Montreal, etc. Diseases like Appendicitis, Gall stones, Gastric Ulcer, Rheumatism, Diabetes occur with

no particular frequency in the antecedents of cancerous people, but chronic constipation and the use of Purgatives occur in an overwhelming majority. By far the greatest part of cancerous people have been constipated during long years of their life. It is well known that chronic constipation creates a slow and chronic ptomaine intoxication of the body.

In contrast to this, primitive people are practically never constipated.

3. *Tar.* We have seen that tar and its derivatives are some of the most evident cancerogenous substances which are known. Primitive man has very few, if any, contacts with tar. The civilised man of to-day lives in a veritable atmosphere of tar. The air of our great towns is vitiated with the smoke of coal, and this smoke contains much tar. Our streets are paved with tar-like substances. The floors of our rooms are impregnated with tar. Our furniture, our dresses, etc., etc., etc., are all painted with tar or Aniline derivatives.

In a great part of our tinned foodstuffs there are small quantities of aniline dyes.

4. *Insufficiency of sleep.* Modern man, even of the most easy classes, never sleeps enough. Primitive man sleeps mostly 8 and 9 hours in the night and has a siesta of one or two hours.

(II) Differences in the life, one or two generations ago, and now.

1. *Conserved food.* All that I have said about conserved food as differing from the life of primitive tribes, is valid in the same manner in the difference in the lives of our grandfathers and fathers. Even 30, 40 years ago, at least in Continental Europe, the quantity of conserved food was very small. Today, the representative of a great French Newspaper, Jules Huret, relates how he had participated in a great dinner in a large American town, after which the Chairman told him proudly, that every dish of this sumptuous dinner had been made from substances at least a year old.

2. *White Bread.* Even, in my own youth, White Bread was nearly unknown. The small water-and wind-mills of our fathers produced wholemeal flour. Our generation has invented the white bread, the substance of which is artificially deprived of the cortical substance of the grains. In my opinion the

absence of bran in our food is the principal reason for chronic constipation. Man is not a herbivorous and not a carnivorous creature. He is by nature fructi-and granivorous, but his organism is suited for grains in their natural state. You know now, that the principal cause of beri-beri is the too thorough peeling of the rice. Peeling of wheat and rye is the principal cause of constipation with all its consequences.

3. Tar, Aniline and its derivatives. All that I have said about these substances, in considering primitive peoples, is the same when we consider the changes in European life in the last half century. By far the greatest number of these substances have come into use during the present generation. It is important to remember that, in our lifetime, coal has nearly everywhere, replaced wood as heating material, and Coal-smoke contains much more tar than wood-smoke.

4. On this occasion I must mention two substances of very high toxicity which have come into use within the last few years. These are:—

The Arseniate of Lead as an artificial fertiliser.

The Methylate of Lead as an addition to Motor-spirits.

The promoters of these poisons assure us of their practical innocuity, which may be true at the present moment. But what will occur, when our agricultural grounds become impregnated with the Arseniate of Lead, and our roads and streets with Methylate of Lead?

5. Cigarette smoking is becoming more and more generally used and the use of long pipes is quite abandoned today. The bottom of these long pipes had a collection of a tar-like substance of extreme toxicity. With cigarette smoking this same substance enters the mouth of the smoker.

6. Sugar. The consumption of sugar has enormously increased in the last generation. We consume five to six times as much sugar as our grandfathers did. Our system is not suited to crystallised sugar. It is well known in dermatology that many dermatoses cannot be cured without the prohibition of sugar. It is also well known that the abuse of sugar is the worst enemy of our teeth. It is possible that the abuse of sugar irritates the whole epithelial system. It gives much cause for thought that Switzerland and Denmark, with the highest cancer mortality, have also the highest sugar consumption.

7. Syphilis. The question of the influence of syphilis is a complicated one. It seems indubitable, that an individual, who has had syphilis, is, *caeteris paribus*, more exposed to a later cancer. It is generally admitted, that one of the most malignant cancers, that of the tongue, happens nearly always in men, with a history of syphilis. But we have no trustworthy data about the spreading of syphilis in the last half-century. We don't know, if it has really become more frequent, or not. It seems, that in the last 8 or 10 years, syphilis is becoming markedly less frequent in Europe. I read in very trustworthy publications, that the new infections of syphilis have diminished by not less, than 50% or more in the great European cities. Cancer is, as has been shown above, very far from diminishing. But it is noteworthy, in this connexion, that every alteration, which we know, as increasing the predisposition to cancer, acts only after 15 or 20 or more years of duration. So we have to wait still many years, until we can form an opinion on the influence of the frequency of syphilis on the frequency of cancer.

I have to record also some observations, which I have made personally. In some regions of North-Africa and Asia Minor where I have travelled, syphilis is extremely common. The greatest part of the population is suffering from it. But cancer in these regions, although not absent, is decidedly of much rarer occurrence, than in Europe. It is noteworthy, that in the same countries also the metasymphilitical diseases, like Tabes and Paralysis, are extremely rare.

In conclusion, although syphilis increases the probability of subsequent cancer, I do not believe that it is one the principal reasons of the increase of the frequency of Cancer. Anyhow, further thorough investigation are urgently necessary in these connexions.

III. Which of the differences shown in I. and II. or which other peculiarities in the life of Civilised Men have an influence on cancer?

I consider three abuses of human life, all of them enormously widespread.

1. A too carnivorous diet. I am of the opinion that civilised man eats far too much meat, and this has a deterring influence on his health. But I do not believe that the abuse of meat may be one of the important predisposing factors of cancer. One or two generations ago the abuse of meat was even higher.

than today, but cancer was relatively rare. There are some primitive peoples, Eskimos, Indians of Northern Canada, Australian Aborigines etc. who eat, nearly exclusively, meat, as they have practically no other food. These peoples have no cancer, or very little. Perhaps, quite indirectly, by lowering the general state of health the abuse of meat may have some weakening influence, but I am not of the opinion, that it should be one of the great predisposing elements. Quite different is the consideration of frozen meat, of canned beef or other conserved meat. With these foodstuffs it is the conservation, which is important, as I have related above.

2. Abuse of tobacco. The relation of this abuse to Cancer is very complex. It is well known that Cancers of the tongue, of the lips, of the mouth, are the special Cancers of the heavy smokers. But I am of the opinion, that non-abusive smoking is not one of the important predisposing elements of Cancer. Our fathers and grandfathers smoked more, than the present generation. Some primitive people in the Philippine Islands, in Sumatra etc. smoke generally more than we do, and are relatively immune to Cancer. In my opinion, the smoking habit is damaging. Heavy smokers seldom live long, and I consider it best not to smoke at all. But, I repeat, I don't believe, that tobacco has a noted influence on Cancer.

3. It is the same with Alcohol. Surely, alcohol is one of the greatest enemies of Mankind, and I consider total Prohibition as one of the best laws of Humanity. You know, that the Life Insurance Companies have an especially low rate for total-abstainers. I myself, I eat little meat, don't smoke and am a total-abstainer. But our grandfathers were heavy drinkers and had few cases of Cancer. Russian peasants of remote districts, in the Imperial times, were terrible drunkards, but had very few cases of Cancer among them.

Altogether, of the 3 preceding faults of Mankind, abuse of meat, of tobacco and of alcohol, I believe, that none have any decisive influence on the recent increase of Cancer in civilized countries.

Electricity. One of the most distinguished Members of the present Conference is of the opinion, that the widespread and ever-increasing use of Electricity, surrounding us with a more and more tight-meshed net of electric current, may have an influence on the predisposition to Cancer. It is impossible,

to have to-day any definitive opinion on this question. The dispensable data is too insufficient. I myself, being a specialist of Radiology and Electrotherapy of 25 years of practice, do not believe that the electrification of our surroundings should have any influence on Cancer.

I am of the opinion, that from the above-related conditions of our life, the following may have a part in the increasing predisposition to Cancer:

- I. Chronic constipation.
- II. Conserved Foodstuffs.
- III. Insufficiency of Vitamines.
- IV. Tar-and Aniline-saturated surroundings.
- V. Abuse of sugar.

Surely, by a methodical examination and observation, many other conditions may be found out, but all these are not more than suppositions. The question arises, in what way can we know with a certain degree of certainty which of these, or other conditions, have a really important influence on the spreading of cancer.

In the way of laboratory-researches there is very little hope of any solution. As I have already said, the nature of cancer of laboratory animals is so different from human cancer that any conclusions on etiology are void. Experimental observation, is so difficult, that it is practically impossible. As it has been said above, the actions of substances which we recognise as having a role in the provocation of cancer, must act for about 20 years. The experiments are only of value if made on a sufficiently great number of individuals. All this is practically unrealisable. But I think that there is a way by which some positive knowledge about this condition may be gathered. Surely there must be human agglomerations in the world, where most of the conditions of high civilisation are acting, but for instance coal is not burned in appreciable quantities. There must be other sections of population where tar is more or less absent, or where crystalised sugar is not abused, or where conserved foodstuffs are not in use, or where the quality of food is such that chronic constipation is rare. Exact observations are necessary about the frequency of cancer in such groups of people where one or other of the elements of modern civilisation is absent. The much quoted Dr. Hoffman has already made valuable examinations along these lines, but

this examination must be continued on a much larger scale, and by several expert doctors. As a practical result of all that I have said in this lecture, I suggest a way by which we could approach the question of the etiology of cancer. This way is the following:—

Some very experienced medical men, who are experts on this matter, and who have been occupied thoroughly with the question of the distribution and frequency of cancer, should form a Commission, headed, if possible, by Dr. Frederick Hoffman of Massachusetts. This Commission should submit to a thorough examination the living habits and customs of a great number of peoples and agglomerations, and compare this with the frequency of cancer. It should be found out in this way what are the conditions of life, which increase the frequency of cancer.

As I have said, great sums of money and very much scientific work have been applied to laboratory researches about cancer. The results have been very interesting scientifically, but rather poor for the preventing and healing of cancer. I believe that there could be found individuals or corporations or governments which would sacrifice what is necessary for such an enterprise, and also that doctors could be found, who would sacrifice some years of their existence for these researches. There exists today an International authority to which such a proposition could be submitted. This is the "League of Nations" in Geneva, Switzerland. The League has a Hygienic Commission, and actually even a Cancer-Commission. In my opinion, if the League of Nations, or its Hygienic Commission, would publish, that it finds desirable and reasonable the formation of such a commission, the Rockefeller Fund or the Crocker Fund, or other funds would perhaps provide the necessary sums.

I propose therefore the following resolution:—

That, this Conference of the China Medical Association advocates the formation of a Commission to enquire into the relation of the manner of living to the difference of Cancer frequency in different countries, and that the resolution to this effect be sent to the Health Committee of the League of Nations, eventually also to the Rockefeller Fund, or other funds with a request that steps may be taken for the formation of such a Commission.

Dr. A. L. ENGLAENDER.

PART. II. *Radio-therapy of Malignant Tumours.*

I have no ambition to make a complete survey of the Radiology of Cancer. There are today several radio-therapeutical institutions in the world, notably, those in Paris under the leadership Prof. Reguad, and Madame Curie, and in Stockholm under Prof. Gösta Forsell, also in other countries, whose reports give complete review of these matters.

I will give here a short summary of this branch of science, just sufficient for doctors not specially expert in Radiology, to know what can be expected today from the treatment of malignant tumours by X-Rays and radiant substances. You know that these methods are of relatively recent date. The *modus operandi* is still in process of formation. The radio-therapy of cancers is principally based on the destructive qualities of X and Radium rays. These rays, when applied with sufficient intensity, attack and destroy every living cell, but the quantity of rays necessary for the destruction of the various kinds of cells varies in very wide limits. So, for instance, when we take the doses, necessary to provoke a marked erythema of the skin of an adult person, as 100%, then I can give, for comparison, for the different tissues the following numbers:—

Equivalent to 100% on the adult skin on normal tissues:

Muscle	about	200%
Bowels	„	130 „
Liver, kidney ..	„	100 „
Skin of face ..	„	60 „
Skin of children	„	60 „
Castration, women	„	50 „
Castration, men	„	30 „

Equivalent doses in pathological tissues:

Carcinoma	about	100-120%
Sarcoma	„	70 „
Tissues of Leukemia	„	30 „

These relative numbers mean the doses really arrived on the place of action. The proportion of acting and of applied rays differs proportionally to the thickness of tissues to be traversed by the rays before arriving at the place of the illness. Thus, for example, in the case of cancer of the uterus in a woman of medium corpulency, very penetrating X-rays of a modern special deep-therapy apparatus can send about 25%

of the superficial dose on the uterus. But these are rays originating at about 10 inches from the cutaneous surface.

Radium is applied in a different manner. The best method is, in my opinion, to place the radium in a small tube of platinum or gold, the walls of the tube of about 1 millimeter, and to introduce these tubes as near to the tumor as possible. The minimum necessary quantity of Radium is 60 milligramm of the element.

As you have seen above, the radiosensibility of Cancer is not very great. How can we act upon the tumour in sufficient quantity without destroying the skin above? This is the method of the "cross-fire." The rays are applied in different places in such a manner, that their direction should be always on the tumour.

By the application of very penetrating rays for deep cancers, of rays of middle—penetration for superficial tumors, by the judicious application of filters (aluminium, zinc, copper etc.) an experienced specialist, in possession of a special instrumentarium and of sufficient quantity of radium can attain some very satisfactory results. But I feel obliged to warn against the use of small and simple machines for the radiotherapy of Cancer. Many hospitals or doctors are to-day in possession of simple X-ray machines, which give very satisfactory pictures can be obtained, also some therapy of skin-diseases. But for the therapy of Cancer these machines are absolutely insufficient, and I have seen some very sad cases, where an early cancer has been treated in this manner, and not only the favorable time has been lost, but the cancer, irritated by the weak and superficial doses, has increased and multiplied in particularly rapid manner.

Naturally, as with surgical methods, the prognosis of radiotherapy is infinitely better as long, as the cancer is not advanced. The still very dubious prognosis of deep cancers, of the stomach or of the cervix is not due to their deep locality, but to the fact, that these cancers are only exceptionally seen early.

About the methods which I follow I can only say, that they are the cautious methods of Prof. Holzkecht of Vienna.

The methods of measure in my laboratory are three fold. Every tube is measured and controlled by the ionometric method. My ionometer is that of Prof. Martius. Then a

pastille of Sabouraud-Holzkecht is always used. The third control is that given by the Milliamperemeter, the radiometer of Bauer and the calculating of distance and time of exposure.

The radium is, if possible, introduced in the tumour itself. Where this is impossible, I apply it as near to the tumour as possible. My Radium-tubes are of platinum, and for use they are put in small tubes of rubber.

I have to say some words about, what I call the adjuvatory methods of radiotherapy. You will kindly excuse me, if, to this assembly, I dare to say a common place. Whatever may be the illness, what method of treatment may be applied, the resistance, the natural healing-capacity of the patient is of quite first importance. This resistance must be relieved by any way at our disposition. I am of the opinion, that the patients system must be disintoxicated. His digestion must be arranged, his food controlled, his oxidation augmented. I receive some immunising preparations from France and Germany. They are mostly extracts of tumour substance, sometimes extracts of embryonal tissues.

All these adjuvatory methods are insufficient, when they are alone to heal a cancer. But although our mightest arms against cancer are surgical excision and radio-therapy, the patient receives a very considerable help by these adjuvatory methods. I presented two cases of healed cancer at a meeting of the Shanghai Medical Society. You may have read of them in the Medical periodicals, I have also some cases, where the healing of despaired, inoperable cases have be obtained.

About the technique in the different localization I should say some words.

The superficial cancers of the skin have an excellent prognosis with X-rays. The healing is rapid, simple, without any suffering, and not at all mutilating. The cicatrization is particularly favorable.

When the localisation is on the eyelid, I apply a lead-spatula between globe and eyelid, to protect the globe.

Cancer of the lips is very successfully treated by X-rays, as long as they are not in an advanced state. In every case, even if the submaxillary glands are not palpable, they must be treated as energetically, as the tumour itself.

Cancer of the tongue is well known as one of the most malignant cancers. The treatment preferred to-day is by

Radium. Always an efficient antisyphilitic cure should be applied and smoking absolutely prohibited.

Cancer of the breast. Here, X-rays are superior to radium. In my opinion, the best results can be obtained by combination of operation and consecutive radiotherapy. In this combination, sometimes a simple enucleation of the tumour is sufficient, as the spreading cancer-cells are easily destroyed by the Rays. Cases, considered as inoperable by surgery alone, may be operated upon and given subsequent radiotherapy. It happens sometimes, that an inoperable case may be rendered operable by a previous radiotherapy. Anyhow, the subsequent radiotherapy must be continued some months.

Cancer of the oesophagus is treated by Radium. The small tubes are fixed on a silk-string of exactly measured length and the patient swallows them. Always deep radiotherapy is used. I must admit, that the results are seldom really favorable. But temporary relief is generally attained. **Cancer of the stomach.** In Europe and America, this is by far the most frequent localisation of Cancer 30 to 40 or more % of the total number of Cancer is found in the stomach. It seems to me, that in China, although cancer in general is very frequent, stomach-cancer is less frequent, than in Europe. This cancer is in itself not the most malignant. Its practical great malignancy comes generally from too late diagnosis. It cannot be emphasised enough, that in every case of stomach-complaint in a patient over 45 years of age even of apparently simple nature, a radiological examination, conducted by competent hands, must be suggested to the patient. If I insist on competency, it is, because the diagnosis of an early stomach-cancer is one of the most difficult tasks even for a fully experienced radiologist. Serial radiographs, are indispensable. Nearly always, the examination should be repeated after some days of energetic treatment by diet and atropin.

It is noteworthy, that although cancer of the stomach is, as I have just said, the most frequent localisation of all the cancers, primary cancer of the duodenum is of the extremest rarity. This is a very heavy argument again the ulcerous origin of the stomach cancer. Indeed, the last years are showing more and more, that ulcer of the duodenum, and especially of the bulb, is far more frequent, than cancer of the stomach itself. If the ulcer of the stomach would really be among the

causes of the cancer, the localisation of both diseases should be identical. This is not at all the case. Cancer of the stomach is very often found in regions, where ulcers hardly ever occur. So on the great curvature, and as I have said, by far the most frequent place of the peptic ulcer, the duodenal bulb, is practically free from cancer.

Anyhow, the only hope of bettering the prognosis of stomach cancer is in the early diagnosis of it.

Intestinal cancers occur mostly in the distal parts of the colon. Generally also these cancers come too late for treatment. The X-rays are here preferable to radium.

Cancer of the anus have a relatively better prognosis by radiotherapy. But I have two cases of it in my memory, which show well, how capricious and incalculable is this scourge of mankind. About 1912 I received nearly simultaneously two cases of cancer of the anus. I applied the same treatment to both. The one has rapidly healed and I observed the good result for 3 years, when I lost the patient from my control. The other case, apparently similar, was not at all influenced by the same treatment.

Cancer of the uterus. As you know, that locality is also most frequent. In the above mentioned number of roughly 400.000 cancer-deaths in England, about 40.000 have been in the uterus. Here radiotherapy has had real triumphs. Mostly a mixed treatment is applied, radium in the cervical tube, X-rays round the abdomen. I had some cases, considered absolutely inoperable, with excellent results, some of them maintained from 6 and 8 years. But quite naturally, also here the prognosis is incomparably better if treated early in the sickness.

I must make brief mention of cancer of the penis. In Europe it is a very rare localisation. Its rarity forms even a very powerful argument against the contagiousity of cancer. Effectively, if cancer were contagious, the tens of thousands of cases of uterine cancer should produce a greater frequency of cancer of the penis. I remember many cases where sexual intercourse was continued weeks and months, after the uterine cancer already existed. I know not a single case, where one of these men had a cancer of the penis.

It is very interesting, that here in the far east cancer of the penis is far more frequent than in Europe and America.

The radiotherapy of this cancer is rather easy and has a relatively favorable prognosis. The inguinal glands must be treated, even if they show no infiltration. I have mentioned, that cancer is very frequent in China. No statistics exist about its frequency. I have the impression, that on the average, the Cancer of the Chinese is even more malignant, than in Europe.

In conclusion, I insist once more on the importance of the early diagnosis of Cancer. As long, as no method of immunisation against the cancerous cell is invented—and I fear, that we are still very far from it—the greatest hope for the patient is early diagnosis. When this is established he may be treated by operation, by X-Rays or by Radium, or by a combination of them.

THE INCIDENCE OF MALIGNANT DISEASE IN CHINA

JAMES L. MAXWELL, M.D.

I have been asked to deal with the question of malignant disease in China as my contribution to the symposium on this extremely important subject. I fear that there is little at the present time that can be done to elucidate this problem, but in the belief that every little helps I am glad to do anything I can to increase our knowledge of this disease.

In view of this discussion I was asked by the Secretary of the Surgical Section to issue a questionnaire to as many as possible of our hospitals. That questionnaire it must be confessed was not altogether a happy one for it has merely emphasized the fact that on many points there is no evidence of any value available as yet. It has, however, brought out one or two very interesting facts with an amount of evidence that is quite overwhelming and it has pointed the way to certain problems of whose existence we hardly knew. I should like here to express my very hearty thanks to all who have taken the trouble to answer these questions and especially to some who have replied with carefully prepared statistics from their own records.

Altogether I have had 72 replies not including eleven from doctors who had not had enough experience, or were too recently on the field, to answer the questions,

Sixty-seven replies came from China, 3 from Formosa from hospitals working among the Chinese, and 2 from Korea. These last two will only be very briefly referred to as I had the good fortune to receive a paper on Carcinoma among the Koreans from our very valuable contributor Dr. Ludlow just as I was beginning to write this paper. Dr. Ludlow's article is so important and interesting that I shall try and cut down my own paper that we may get in his as well. It will be found that his conclusions are startlingly different from those at which I have arrived.

The replies from the 70 hospitals dealing with the Chinese show an extraordinarily striking unanimity along certain lines. So unanimous is this opinion that it is hard to believe that there can be any mistake in certain of the conclusions both with regard to Carcinoma and Sarcoma.

No fewer than 65 of the 70 returns agree that the most frequent sites for carcinomata are Breast, Cervix and Penis.

Breast is put first by 49 hospitals; second by 8; third by 3.

Cervix is put first by 10 hospitals; second by 19; third by 3.

Penis is put first by 6 hospitals; second by 10; third by 4.

With such a wide agreement there seems little doubt that these sites may be regarded as the commonest for cancer in this country. Further they agree pretty closely with the statistics that I gathered a year ago on the subject of the anatomical incidence in 1133 cases of malignant disease, (*C. M. J.* February 1928). In my cases however, the order of frequency in recorded cases was Breast, Penis, Uterus. Personally I doubt whether either of these orders is the right one and I would actually place cancer of the cervix as the most frequent of all forms seen in China. It is doubtful whether as large a proportion of cases of this disease come to the surgeon as that of other new growths and, the great majority of cases of cancer of the cervix being inoperable, few actually find their way into the wards of our hospitals.

Through the kindness of some of my correspondents a further series is now available, comprising 558 cases of which Breast cases number 137; Penis 88; Uterus 78. When it is remembered that these figures are for carcinoma only and my earlier ones were for malignant growths generally, the approximation of percentages to those shown in my earlier 1133 cases is very close indeed.

With regard to cancers other than those mentioned above, carcinomata of stomach were practically the only ones which call for serious remark.

2 hospitals place these first; 9 place them second, and 3 place them third; while in the 558 cases mentioned above 59 are given as cancer of the stomach, making a very decidedly higher proportion than that in my earlier figures but still extraordinarily low as compared with the incidence in Western lands.

When we turn to Sarcomata there is the same general unanimity as regards the sites most commonly affected but here we have to note one rather extraordinary difference of opinion in regard to the relative frequency of Sarcomata and Carcinomata. Several of my correspondents are emphatic that sarcomata are relatively more common in China than in Western lands and this of course agrees with the experience of physicians in India. On the other hand a few are decidedly of the opposite opinion. Three hospitals report that cases of sarcoma are rare and one reports having never seen a case. Until there is a more general possibility of microscopic examination of growths in all hospitals it is impossible to come to any final conclusion but what evidence there is favours, I believe, the first opinion that sarcomata are relatively common.

When, however, we come to the sites most commonly affected there is a very general unanimity in the experience of the physicians reporting.

16 hospitals report sarcomata as most common in the long bones; 7 more specify bones only; and 10 refer to special frequency in the jaw. It would seem likely that the cases in the second group might for the most part be divided between the two other groups and it would thus appear that sarcomatous growths of the long bones and the jaw very easily hold the first place in tumours of this nature. Seven hospitals report sarcomata of the neck as being especially common and my own experience coincides with this. Five are impressed with its frequency in the eye and two each make special reference to growths affecting the head and the lymph nodes.

Speaking generally, however, our knowledge of sarcomata is even more scanty than that of carcinomata and in both cases the study of malignant growths out here is only in its infancy.

Much remains to be done and much could be done if we could agree on a united effort beginning with the providing of a clear picture of the anatomical sites most commonly affected. I cannot help feeling that such a study would be very well worth while. For the differences that would be thus brought out between the incidence of cancer not merely between China and Western lands but between this and neighbouring countries might help to solve some of the most important of the problems of cancer investigation.

The difference referred to is indeed a very striking one. Cancer of the breast is a disease of evidently high incidence in China and, if the statistics are correct, and there is no reason to doubt them, one of very low incidence in Japan. Cancer of the stomach on the other hand appears to have a relatively low incidence in China but a strikingly high incidence, as Dr. Ludlow shows in his paper, in Korea and this is borne out by reports I have from two other hospitals in that country. Such differences must be dependent on causes which should not be impossible to determine and which if determined would throw a strong light on the causation of cancer in general.

CARCINOMA IN THE KOREAN*

(Preliminary Report)

A. I. LUDLOW, M.D., F.A.S.C., Seoul, Chosen (*Korea*).

The fight against cancer is one form of warfare in which all nations should be engaged. Whether or not cancer is on the increase, the loss of life, through this disease, is sufficient to enlist the efforts of physicians in every land to stop its ravages.

So far as the writer is aware, no reports have been made concerning the subject of cancer in the Korean. In order to make a beginning along this line, a preliminary report is submitted of the occurrence of carcinoma among 10,000 in-patients of Severance Hospital, during the period of April 1922 to April 1927, inclusive. Other forms of malignant tumors are excluded in order to concentrate first upon a single form, carcinoma.

*Article No. 48, Research Dept., Severance Union Medical College and presented at the C. M. A. Biennial Conference, Feb. 1929.

Although Severance Hospital is located in Seoul, a city of 300,000 inhabitants, the patients come from all parts of the country. The hospital of 100 beds, including an isolation ward, is connected with the Severance Union Medical College. The in-patients, numbering on an average 2,000 a year, are drawn from all classes of society. Many of the poorer class are cared for, as shown by the fact that the free patients represent over 45 percent of the in-patient days. All the services—internal medicine, surgery, gynecology, obstetrics, pediatrics, neurology, dermatology, ophthalmology and oto-rhino-laryngology are represented in the hospital.

AGE OF HOSPITAL PATIENTS

A review of literature shows a surprising absence of the age incidence of patients in any given out-patient clinic or hospital. Such information should be at hand before any accurate comparison can be made between the statistics of various hospitals. The following table (No. 1.) compiled from the records of the out-patient clinic of the Severance United Medical College for the period of April 1, 1926, to April 1, 1927, shows the age incidence of the Korean patients.

TABLE No. 1.

Age Incidence of Korean Out-Patients

AGE Years.	MALE	FEMALE	TOTAL	PER CENT
0-10	1,785	1,034	2,819	18.87
11-20	2,199	977	3,176	20.70
21-30	2,877	1,143	4,020	26.20
31-40	1,741	1,023	2,764	18.01
41-50	1,070	432	1,502	9.79
51-60	424	249	673	4.42
61-70	185	166	351	1.90
71-80	50	26	76	0.49
81-90	9	10	19	0.12
TOTAL	10,345	5,000	15,345	100.00

Table No. 2. gives a comparison between the age incidence of inpatients of Lakeside Hospital (Cleveland, Ohio, U.S.A.) and Severance Hospital (Seoul, Korea), for the year 1927.

TABLE No. 2.

Age Incidence of American and Korean In-patients
(Lakeside Hospital and Severance Hospital 1927)

Age Years		Male	Female	Total	Percent
0-10	American	844	692	1536	22.90
	Korean	251	120	371	18.31
11-20	American	384	617	1001	14.92
	Korean	253	137	390	19.25
21-30	American	483	918	1411	20.88
	Korean	325	214	539	26.60
31-40	American	517	673	1190	17.74
	Korean	223	142	365	18.02
41-50	American	404	388	792	11.80
	Korean	138	79	217	10.71
51-60	American	271	202	473	7.05
	Korean	63	35	98	4.84
61-70	American	118	112	230	3.48
	Korean	27	10	37	1.83
71-80	American	55	27	82	1.22
	Korean	4	3	7	0.35
81-90	American	1	2	3	0.05
	Korean	1	1	2	0.09
91-100	American	0	1	1	0.01
	Korean	0	0	0	0.00
TOTAL	American	3077	3632	6709	100.00
	Korean	1285	741	2026	100.00

It will be seen by reference to Tables No. 1. and No. 2. that the age incidence of Korean outpatients and inpatients is approximately the same. A comparison of the age incidence of American and Korean inpatients as shown in Table No. 2. presents also great similarity but there is considerable difference in the sex incidence, there being in the American series 45.87 percent male and 54.13 percent female in patients; while the Korean figures show 63.42 percent male and 36.48 percent female inpatients.

At first glance, the statistics (Tables No. 1 and No. 2.) of the age of Korean patients, seem to confirm the general impression that old people do not frequent the hospitals in the Orient nearly as often as those in the Occident. For only 17.82 percent of the patients in Severance Hospital are over the fortieth year. A comparison, however, with the statistics

(Table No. 2.) of an American general hospital (Lakeside Hospital, Cleveland, Ohio) fails to confirm this impression as only 23.56 percent of the American inpatients are over the fortieth year of age. As far as these two hospitals are concerned there is not a great difference in the age incidence of the patients.

In any study of the cancer problem it is also important to know the age of the population under consideration. Fortunately the Government Census of 1925 furnishes very accurate information as to the age of people living in Korea. This is given in Table No. 3 which shows 21.32 per cent of the people of Korea to be over 40 years of age. According to Rogers, the census return for Bengal revealed 17.86 per cent of the people to be over 40 years of age, as against 27.53 per cent in England.

TABLE No. 3.

Age Incidence of the Population of Korea. Census 1925

Age Years	Male	Female	Total	Percent
0-10	3,042,279	2,879,094	5,939,373	30.42
11-20	2,075,310	1,946,266	4,021,576	20.60
21-30	1,551,513	1,448,986	3,000,499	15.37
31-40	1,257,660	1,141,895	2,399,555	12.29
41-50	936,145	843,139	1,779,284	9.11
51-60	637,231	623,096	1,260,327	6.46
61-70	391,369	436,617	827,986	4.24
71-80	117,961	146,748	264,709	1.36
81-90	10,945	17,112	28,057	0.14
90-115	530	1,049	1,579	0.01
Total	10,020,943	9,502,002	19,522,945	100.00

A comparison of the age incidence of the patients in Severance Hospital and the out-patient clinic, with the age incidence of the population of Korea, reveals a striking similarity in each decade. As far as age is concerned, therefore, the Korean patients represent a fair cross-section of the population of the country.

OCCURRENCE OF CARCINOMA

Before reference to the occurrence of carcinoma in the Korean (Table No. 4.) a few statements should be made.—

1. As this is a preliminary study the conclusions drawn are tentative.
2. In a country such as Korea, where Western Medicine is still little beyond its initial stage (there being only 1,509 licensed practitioners, or 7.8 per 10,000 persons), medical statistics are somewhat fragmentary which makes it all the more important that great care be exercised as to statements concerning disease.
3. Many persons with carcinoma who present themselves at the out-patient clinic are not admitted to the hospital, sometimes because the growth is in-operable and often for lack of available beds in the hospital. It is hoped that later a study may be made of these out-patients but as many of the former diagnoses have been based on clinical observation only, this group is excluded from the present paper. There is no doubt that there would be several changes necessary in Table No. 4. if it included all the carcinoma of the out-patients.
4. Gideon Wells states "that diagnosis of cancer may be correct, or there may be omissions or there may be commissions." There have no doubt been both omissions and commissions among the 10,000 patients but as yet the number of autopsies is insufficient to give much evidence along this line. The small number of carcinoma patients who die in the hospital is explainable in part by the fact that few Koreans will permit a member of the family to die away from home.
5. Pathological sections have been made of most of the tumors or their metastases.

The statement is frequently made that carcinoma occurs at an earlier age in the Oriental than in the Occidental. This is not confirmed by the present statistics for the ages of patients in Table No 4 range from 26 years to 70 years, with an average of 47.7 years for males and 47. years for females; nor is it confirmed by the number of patients below and above the fortieth year as given in Table No. 5.

TABLE No. 4.
 OCCURRENCE OF CARCINOMA
Severance Hospital, 10,000 Inpatients (6300 male—3700 female)
 April 1922 to April 1927.

Anatomical Distribution	Sex		Total	Age in Years					Cond. on Disch.		
	M	F		25-30	31-40	41-50	51-60	61-70	Imp	Un-imp.	Died
1. Stomach	58			2	14	19	21	2	15	37	6
		17	75	2	2	7	3	3	8	8	1
				4	16	26	24	5	23	45	7
2. Uterus		15	15	1	5	6	2	1	9	2	4
3. Penis	13		13	0	4	5	3	1	13	0	0
4. Mammary Gland	1			0	0	0	0	1	1	0	0
		5	6	0	0	1	3	1	5	0	0
				0	0	1	3	2	6	0	0
5. Skin	4			0	1	2	0	1	4	0	0
		2	6	0	0	2	0	0	2	0	0
				0	1	4	0	1	6	0	0
6. Intestines	4			1	1	1	1	0	0	3	1
		1	5	0	1	0	0	0	1	0	0
				1	2	1	1	0	1	3	1
7. Liver	4		4	0	1	2	0	1	0	3	1
8. Rectum	1			0	1	0	0	0	0	0	1
		2	3	0	0	1	0	1	0	2	0
				0	1	1	0	1	0	2	1
9. Ovary		3	3	1	0	1	1	0	3	0	0
10. Thyroid Gland	1			0	0	0	1	0	0	1	0
		2	3	0	0	0	2	0	1	1	0
				0	0	0	3	0	1	2	0
11. Antrum Highmore	2			0	0	1	1	0	1	1	0
		1	3	0	0	1	0	0	1	0	0
				0	0	2	1	0	2	1	0
12. Vagina		2	2	1	1	0	0	0	1	1	0
13. Oesophagus	2		2	0	0	0	0	0	2	0	0
14. Lower Jaw	2		2	0	0	0	2	0	2	0	0
15. Urinary Bladder	1			0	0	0	0	1	0	1	0
		1	2	0	0	1	0	0	0	1	0
				0	0	1	0	1	0	2	0
16. Kidney	1		1	0	0	0	1	0	0	1	0
17. Orbit	1		1	0	0	1	0	0	0	1	0
18. Mesentery		1	1	0	0	1	0	0	1	0	0
19. Retro-Peritoneal		1	1	0	1	0	0	0	0	1	0
20. Nasal cave	1		1	0	1	0	0	0	0	1	0
21. Multiple	1		1	0	1	0	0	0	0	1	0
Grand Total	97			3	24	33	30	7	37	51	9
		53	150	5	10	21	11	6	32	16	5
				8	34	54	41	13	69	67	14

TABLE No. 5.

Age and Sex Below and Above Fortieth Year
In 150 Patients with Carcinoma—

Age Years	Males		Females		Total	
	No. Cases	Percent	No. Cases	Percent	No. Cases	Percent
25-40	26	17.33	15	10.00	41	27.33
41-70	71	47.33	38	25.33	109	72.67
Total	97	64.66	53	35.33	150	100.00

A review of Table No. 4. shows an extensive anatomical distribution of carcinoma involving the usual sites.

Carcinoma of the stomach, which is regarded by many as rare in the Asiatic, is equal in number to all the other regions. This is even a greater proportion than that found in western countries, but probably higher than the actual occurrence in the Korean, for as stated above, many patients, particularly with inoperable external forms of carcinoma, are not admitted to the hospital.

Considering the predominance of male patients and the comparatively small number of gynecological cases, carcinoma of the uterus is not far from the usual frequency in other lands.

The proportion of carcinoma of the penis is unusually large. No reason can be assigned for this unless it be the large number of cases of phimosis and less care in cleanliness of the prepuce.

The percentage of mammary carcinoma is very low, only about a quarter of that in western lands, but this is easily accounted for by the many patients found to be inoperable and not admitted to the hospital.

When there is more education along these lines the number of operable mammary carcinomas will doubtless increase.

The carcinoma of the male breast is the first one to be recorded among Koreans. A detailed report of this case may be found in the China Medical Journal, December 1925.

No comment will be made in this article on the remaining cases of carcinoma, which are few in number and scattered over many regions.

Quatrefages (*The Human Species*, 1897) submits the following: "Unity of species and multiplicity of races involves the liability of all men to common diseases, which will at the most vary as to accessory phenomena but allow the existence of diseases more or less peculiar to certain human groups."

During the past 17 years the writer has investigated many of the diseases in the Korean and each study tends to confirm the statement of Quatrefages and as far as this study has proceeded, carcinoma seems to be no exception.

With the progress of medicine in Korea it may be predicted that not only carcinoma but all forms of cancer will be found nearly as frequently among the Koreans as among the people of Europe and America.

SUMMARY

1. The age incidence of Korean patients in Severance Hospital and out-patient clinic is approximately the same.
2. The age incidence of Korean and American in-patients in two general hospitals, Severance Hospital (Seoul, Korea) and Lakeside Hospital (Cleveland, Ohio), is approximately the same.
3. The age incidence of Korean patients in Severance Hospital is approximately the same as that of the population of Korea.
4. The anatomical distribution of carcinoma in the Korean is extensive and involves the usual regions.
5. The ages of carcinoma patients range from 26 years to 70 years with an average of 47.7 years for males and 47 years for females.
6. The percentage of carcinoma patients below the fortieth year is 27.33 percent and above the fortieth year 72.67 percent.
7. Carcinoma of the stomach which is regarded by many as rare in the Asiatic is equal in number to all the other regions.
8. Carcinoma of the uterus is frequent, considering the preponderance of male patients and the comparatively small number of gynecological cases.
9. Carcinoma of the penis is unusually frequent.
10. The comparatively low percentage of mammary carcinoma is accounted for by the large number of inoperable cases not admitted to the hospital.
11. With the progress of medicine in Korea it may be predicted that not only carcinoma but all other forms of cancer will be found nearly as frequently among the Koreans as among the people of Europe and America.

**THE VITAL DYEING OF CANCER WITH SOUR DYES
AND ITS THERAPEUTICAL USE***

D. ENGEL. M.D.

Shanghai.

The treatment of inoperable cancer with Isamin-blue has been lately so widely discussed in the literature, that I think, it may be of a certain interest to recapitulate shortly an experimental study of mine, which deals with this matter and formed the basis of some therapeutical work. My studies, started in the spring of 1923 lead to the result, that certain inoculated tumors attract electively, in comparison with the normal tissue, some dyes from the group of the triphenylmethansulfon acid (Fuchsin S., Lichtgruen, Rotviolet 5 R S, Isamin-blue) in vital dyeing. This means, that the tissue of some tumors accumulate these dyes more than the normal tissue.

The idea of these experiments was given by the experience, that the kidney and the reticuloendothelial system becomes electively dyed with lipoidundilutable acid dyes. Hoeber concluded from this fact, that the vital dyeing with lipoid undilutable sour dyes is not a passive proceeding, but depends on a vital process. The cancer-cells being different in their biology and metabolism (Warburg) from that of the normal tissue, it was interesting to see, if the tumor behaves differently, in a qualitative or quantitative sense, in the vital dyeing from the normal one.

As I said, my supposition was justified. Almost at the same time that I made my experiments, the same results were published by Karczag and his collaborators. They found also, that the mentioned sour dyes are tumoraffin, with the difference, that Karczag states, the necrotic parts of the tumor are those, which get coloured, and I state, that the exquisite colouring of the tumor is due to the hyperactive living tumorecells analogous to the hyperactive cells of the kidney and reticuloendothelial system.

With regard to the protocols, I would refer you to the original publication and repeat only so much, as it seems necessary to make myself understood.

*Presented at the XIXth Biennial Conference of the China Medical Association, Feb. 1929.

Technic:

I inoculated full grown white mice of 12-16 gram subcutaneously with mouse-cancer (tribe Ehrlich), with mouse-sarcoma (tribe Berlin, Prof. Blumenthal) and with a cancer produced by tarirritation and transplanted many times till it reached a big virulency; besides this rats were inoculated with rat-cancer (tribe Berlin, Prof. Blumenthal) in the same way.

I waited till the tumor was about the size of a hazel-nut. I then injected in the animals subcutaneously, far from the tumor, 3 times 1 c.c. of a 1% solution of different dyes 15,5 and one hour before killing the animal. The tumor was extirpated on the living animal, which was afterwards killed and all its organs compared microscopically with each other and with the tumor. With regard to the histological examination, I examined mostly frozen sections of unfixed tissue in Ringer solution. In order to see the normal histology of the tumor, it was divided into two parts: one half was examined simply by frozen section and a drawing was made of it, than the second half was washed entirely from the vital dye (important) then fixed in formol and embedded in paraffin.

The first section of the paraffin block was dyed with Haematoxylin-Eosin and compared with the corresponding drawing of the other untreated half. I used the following dyes for injection: Neutral-red, Cyanol, Trypan-blue, Indigsulfonacid potassium, Patentblue A. (Hoechst), Rosindulin 2B, Saeureviolett, Eriocyamin, Rotviolett 5 R S, Isaminblau, Palatinrot-A, Palatin-Scharlach A, Wasserblau, Saeurefuchsin, Lichtgruen F. S. (Gruebler), and Wollviolett S (Bad-Anil.).

From the many experiments I reproduce here only two.

Experiment I:

With Fuchsin-S-Cancer of mouse.

Mouse No. 46 inoculated on the 4th Feb. 1924 subcutaneously with cancer of mouse (tribe Frankfurt) in the coccygeal region. The 14th of Feb. the tumor is the size of a hazel-nut, elastic, of a hard consistency. At 7 p.m., the next day at 1 p.m. and 3 p.m., injection of 1 c.c. of a 1% solution of Fuchsin S in the subcutis of the neck. Killed the animal at 4.30 p.m. examination of the organs as described above. The mouse has a normal skin colour, the urine is dark red, the tumor and the

organs are all uncoloured, with the exception of the kidney, the latter is dark red. The tumor is only a little necrotic in the centre. After the addition of 1% acid acetic to extirpated organs they become all more or less red. The most coloured is the tumor, certainly at the border, decreasing towards the necrotic centre. Also the kidney, which was already red before, being put in acid is lighter (+ + +) than the tumor (+ + + +). Amongst the parenchymatous organs the pancreas, sublingualis and the liver are only reddish (+). The heart, spleen and the lungs are uncoloured (—) the peritoneum and conjunctive tissue are red (+ + +).

Histological examination:

(a) Simple preparation: diffuse colouration of bigger cell-groups. The single cells are of homogeneous colouring, reddish (after addition of acid acetic to the Ringer solution). No granules in the cells.

(b) Embedded cut: typical structure of mouse cancer. In all the preparation there are only a few small necrotic centres. The comparison with the simple preparation shows, that the few necrotic centres are not situated in the parts coloured red by the vital dyeing. This results also from the fact, that there are fewer necrotic parts in all the preparation (Haematoxylin-Eosin), than red coloured ones in the vital examined cut, after addition of acid.

This experiment has been repeated many times with identical results.

The mouse sarcoma behaves likewise to the cancer. The mouse tar-cancer does not show any elective colouration in comparison with the other organs, likewise the rat-cancer, in spite of a more advanced necrosis of this tissue than in the mouse-cancer.

Experiment 8.

Mouse-sarcoma—with Rotviolett 5 RS.

The mouse No. 18 was inoculated on the 30th June 1923 with mouse-sarcoma subcutaneously. On the 11th July the tumor is the size of a hazel nut, it is hard. Injection of 1 c.c. of a 2% solution of Rotviolett 5 RS, 16, 7 and 1 hour before killing the animal. The autopsy performed immediately after killing, shows, that—without addition of acetic acid—except the kidney,

some parts of the small intestines and the bladder,—which are red,—all organs and the tumor are colourless. After addition of acid the tumor becomes purple-red (+ + + +), more intensive in colouring than all other organs, including the kidney (+ + +). It is a little spotted by darker and lighter coloured parts. Also the lighter parts are darker red than the other organs. We can see through a magnifying glass, that the darker parts correspond to the proliferating marginal zones of the small tumors composing the conglomerate-tumor. The submaxillaris, pancreas (+ +) are reddish, the liver and the spleen are colourless (—). By microscope we see in the simple preparation a diffuse colouration of the cellplasma without any granules.

We take the cuts of the tumor from Ringer—in formol solution and dye after with Haematoxylin—Eosin. We see, that the former dark-red parts of the native preparation are lighter coloured with Haematoxylin, but the nucleus is nevertheless well visible. There is no sign of necrosis. I suppose therefore, that the accumulated red dye prevents the cells from taking the Haematoxylin. For this reason I washed the other parts of the tumor, dyed formerly with Rotviolett for 24 hours in water fixed it in formol and dyed it in Haematoxylin-Eosin. The tumor shows now a homogeneous dyeing in its whole expansion. There is no sign of a necrosis at all, also the former differences in the intensity of Haematoxylin disappeared. The supposition, that the vital dye hindered the dyeing with Haematoxylin, seems therefore justified.

To be brief, I will confine myself to the results of my experiments: From the many sour dyes used, there was only a small group, which was characterised by having an elective affinity to certain tumors; they were some from the triphenylmethan group: Fuchsin S., Rot-violet 5 RS, Lichtgruen FS, and Isamin blue. They dyed the tumor more intensely than all the organs. They all are capable of an intramolecular transformation and change after the addition of alkali to a colourless form. For this reason the organs and the tumor are colourless at the autopsy, except the sour kidney, the head of the epididymis and the cardiac part of the stomach-mucosa, which are coloured. For making the dye visible in the organs, we must put them in sour solution. It is strange, that the elective coloration with the mentioned triphenylmethan dyes was observed constantly only on two kinds of tumor: in the

cancer of the mouse and the sarcoma of mouse. The tar-cancer and the rat-cancer did not accumulate the same dyes at all, or at least less than the other organs. The kidney was always nearly as much coloured as the tumor. The pancreas, liver, submaxillaris were always much lighter. The lungs and the spleen were colourless.

At the same time when my experiments were performed analogue experiments were made by Karczag and collaborators, starting from a quite different point of view. The authors arrived at the same results, but drew different conclusions. They used only one kind of tumor, the mouse-cancer, instead of four as I did. They used for injection Fuchsin, Lichtgruen, Wasserblau. They say, that the tissue of cancer has no vital "carbinolophoby" (affinity to the dye), it is the necrotic part of the tumor, which adsorbs the dye electively. The difference in our opinion is fundamental: I state that the capacity of accumulating the dye is a quality of the living cancer-cells. Karczag attributes this quality to the dead necrotic tumor-substance.

What is the reason of the discrepancy in our opinion in this important matter? I see the reason in small, but for the results important differences in the technics: Karczag fixed the vital dyed tumors in formol-acetic-acid, embedded them in paraffin and dyed them with carmin. He found also, as I did, that those parts of the tumor, which adsorb the vital dye, show later a bad colouration of nuclei with carmin. My proceeding was different: I examined first a simple, vital coloured cut, made a sketch of the distribution of its colours, took the next corresponding and therefore, histologically similar cut, washed it carefully in water, to eliminate the vital dye and dyed it only then with Haematoxylin-Eosin. I found by this proceeding a very good colouration of nuclei, also in such parts of the tumor, which were of the vital coloured section very red or very green. I found for instance in experiment No. 8, that the tumor coloured intensively red by Rosindulin, more than all other organs. shown after a carefull washing in water and treatment, as stated above, in the whole cut not one necrotic spot, in contrast to an excellent colouring of the nuclei. A corresponding section dyed with Haematoxylin-Eosin without being washed before with water, showed a very slight colouring of the cell-conglomerates dyed formerly with Rosindulin.

It seems therefore that the cells dyed with sour vital dyes behave differently in taking the Haematoxylin, from the cells not being dyed before.

I don't want to repeat all my arguments brought up against Karczag. I want to mention here only this; that the two kinds of tumor, the rat-cancer and the tar-cancer were the more necrotic ones, and if Karczag were right, these tumors should have been dyed more with the triphenylmethan dyes, than the others. We saw the contrary was true,—they have not been taking the dyes.

Dr. Strauss (Berlin) sees in the results of my experiments a fundamental innovation and hopes it will be possible to find out a dye, which behaves on the human cancer similar to the experimental ones. It would be easily possible to distinguish during the operation on a vital dyed man between the tissue of cancer and the normal one, to find out the limits of the tumor, and the affected glands, so important in the radical removal of tumors.

My experiments are not yet far advanced, but I think, it is important to have shown theoretically, the possibility of finding some substances, which have a stronger affinity for the cancer than for normal tissues. I mentioned in the beginning of my lecture, that my experiments were the basis for the treatment of cancer with Isaminblue. I want to mention here only two authors, who report about a large number of treated cases. Bernhardt saw forty cases in the Medical Clinic in Berlin treated with Isaminblue. A part of them were observed for over 1½ yrs. They were mostly inoperable, advanced cases. He advises for intravenous injection a 1½% solution, starting with 5 c.c., increasing to 20 c.c. He gives 2 or 3 courses one course consisting of 24 injections. Between the single courses, he inserted an interval of 2 weeks. He finds the Isaminblue not toxic. Different tumours react to it differently. He had the best of results with ovarian cancers. More than half of the sufficiently treated patients got considerably better.

Bernhardt thinks, that lead increases the effect of Isaminblue. He says, the results of the therapy were sometimes surprising, consisting in the sudden revival of the general condition, the return of appetite, gaining of weight and partly in disappearance of the tumor, ascites and even the glands.

It is interesting, that also B. (Dustrin) describes the Isaminblue as a "caryoclastic poison," having an affinity for the Chromatin of mitotic cells. It is an observation, which corresponds with my opinion expressed against Karczag.

Karrenberg tried out the treatment with Isaminblue in the Dermatological clinic in Hamburg. He studied it on a few quite unfavourable cases; nevertheless he was surprised to see the craters of the ulcers clearing up, the borders getting flatter, the pains disappearing for longer time. The tumor never disappeared entirely. Karrenberg finds his results very encouraging and advises to follow the method (Klin. Woch. 928 No. 27).

Roosen advises not to treat the tumor to be treated with Isaminblue, with X-rays.

We see from these few mentioned extracts of literature, that the therapeutical experiments with Isaminblue are still in the early stages. I do not want to state, that the cure of the cancer lies on the line of the chemotherapy. But the possibility of it is given and in such a case my experiments will be a hint, in which direction the experiments should be carried on. The first steps made are quite encouraging and it is worth while to make some further trials. On the other hand my experiments should be a contribution to the biology of cancer.

LEPROSY

F. REISS. M.D.*

I feel greatly honoured to speak before this Mission on Leprosy. Although my experience in Leprosy is not great, it has been my wish, since the first day of my arrival in China, to study this question.

I must admit to my regret that I have not found in Shanghai sufficient interest in the matter, and consequently also no adequate Research Institute. I had hoped to find in China, which furnished the great contingent of Lepers in the world—you know that we have about one million of them—more spirit of

*Lecture give at the Chinese Mission for Lepers on the 1st March 1929.

investigation than anywhere else. Unfortunately, as we all know apart from the efforts of a few Missions these pitiable creatures are, so to speak, deserted by mankind and left to their sad fate.

I do not intend to say much about the importance of this scourge, I believe that outside the Bible, the Chinese have the oldest historical notes on the subject. We find this disease mentioned in the oldest records, even one of Confucius' pupils, Yen Pe Nien, a native of Shantung, is said to have suffered from Leprosy. In the annals of the Sung Dynasty we find the title of a Work on Leprosy which deals with the treatment of this disease. Moreover, a very detailed description of Leprosy treatment may be found in the "Golden Book of Medicine." Consequently, as you see, and probably know much better than I, Chinese scholars have dealt with Leprosy more than fifteen hundred years ago, and yet, I must observe to my regret that in modern China less is done for Leprosy than in any other country. I do not wish to speak about research work, but even the care of Lepers has so far been greatly neglected. When, in 1923, I read the reports on the third Leprosy Conference, I was greatly astonished to find that all the Countries of the World were represented at this Conference with the sole exception of China, a Country which is largely responsible for the propagating of this disease.

There is hardly a Province in China where cases of Leprosy do not exist, most of them are in Kwantung and Shantung, but, as investigations of the last few weeks have proved, we have quite a considerable number of them even in Shanghai.

I do not deem it necessary to speak about the various symptoms and manifestations of Leprosy. I wish to deal with a matter, the discussion of which appears to me to be much more serious, it is the question. How can China cope with the eminently important problem of the treatment of Leprosy? It is beyond any doubt that help must come from this Country itself, and that it is useless to apply to the League of Nations. Nor is it of use to alarm the whole world about the deplorable state in which Lepers in China are living until an organisation, to abolish this state of affairs has been formed. I believe that instead of the League of Nation we have a nearer and just as competent forum, one, that ought to show more interest in this question and this is the Nationalist Government in Nanking.

It is certainly laudable that the Government indulges in grand plans of reconstruction but the way to this reconstruction leads over the bridge of a sound and healthy population. I, therefore, believe that within the bounds of their reconstruction two problems should not be forgotten by the Government, that is the care for Lepers and Regulations on the prevention of venereal diseases. You all know very well that Leprosy can no longer be considered as an incurable disease. What applies to T. B. and Syphilis likewise holds good of Leprosy as well: it is the treatment of the early stages the importance of which cannot be too strongly emphasized. The earlier the correct recognition of the symptoms the better the prospect for definite cure. Prof. Benchetrit the head of the Leprosories in Venezuela put certain questionnaires to all Leprologists of the world, of which the following two will interest you:

(1) Do you believe in the curability of Leprosy?

(2) In the case of a patient who has been afflicted with symptoms of Leprosy, whose symptoms have been made to disappear by therapeutical measures, and in whom the Lepergerms can no longer be found—when may such a patient be considered as cured? Of the many answers I am repeating one, that of Unna, the head of the Leprósy institute of Hamburg:

(ad 1) We firmly believe in the curability of Leprosy, that is to say in the possibility of eliminating all symptoms. Our belief is founded on professional experience as we have been successful in accomplishing complete cure.

(ad 2) We also answer the second question in the affirmative. For us the presence or absence of the bacilli is the only certain criterion. If, after repeated examinations, no bacilli are found we consider the patient as cured. In our opinion it is just as useless to claim complete disappearance of secondary conditions (as skin and muscular atrophy, scars etc:—) before we consider a Leprosy case as cured, as in obsolete Lupus to postulate complete disappearance of the scars before considering the treatment as accomplished.

I quote this instance to demonstrate that Leprosy is not considered now as an incurable disease. We now put the question: How should we treat Leprosy? My reply is: individually. I consider individual treatment much more important than isolation, which, in its application, as you

probably know, is not very efficient. One bad effect of compulsory isolation in China, in my view, would be to produce a tendency to hushup manifest cases. Compulsory isolation has had no good effect in the Philippine Islands, where it is becoming increasingly common to isolate patients in their own houses. Chosky of Bombay, who was decidedly in favour of isolation, reports from Matunga that, from 1911 to 1926, 1693 Lepers have been admitted to the Leper Colony, 633 of whom, that is nearly 40% escaped in spite of an iron wall 8 meters in height. Similar reports come from the Belgian-Congo. You see that by compulsory isolation not much can be accomplished. I think that this measure should apply, if at all, to vagabonds and beggars, in the first place, and to Lepers with open wounds in the second place.

Furthermore it is my belief that Leprosy is not more contagious than T.B. Besides the clearly recognisable Leper cases are less dangerous because easily recognised, and it is a known fact that persons engaged in nursing amongst Lepers contract less Leprosy than those who teach amongst Lepers or live in Leper districts. I could give many arguments against compulsory isolation which, after all is a survival of mediævalism. However strict the Law, there are many practical difficulties: in China these difficulties would probably be very great. It is of interest to note that in Canada where isolation is not compulsory the Leper cases decreased from 31 in 1875 to 12 in 1920. I would like to mention whilst dealing with this subject that the Japanese Government ordered the enlargement of their Leper Homes to accommodate 4500 persons, thereby making it possible for all patients seeking treatment, to be assisted. The Government pays annually from 300-600 yen per patient. As we in China are still far from any such institutions, which, in any case, are hardly suitable for this Country, I believe that it is of great importance to establish modern Hospitals for the treatment of Leprosy. Consequently let us abolish the mediæval Leper-Homes and replace them by treatment. Isolation, as I have indicated, is not of great value. Indeed, Leprosy is the least contagious of all infectious diseases. Some scientists deliberately infected 140 convicts, as an experiment, and in 140 cases they failed to produce the disease. Besides this important fact, it is quite well known that one Leper in a family, living together for years does not infect the other members.

As regards inheriting the disease, I may state that serious Leper cases are not reproductive. Here Nature itself helps to check this disease. Light and less serious cases can reproduce, but in most cases the progeny is healthy, especially when separated in time from the infected parent. Children who inherit the disease are usually short-lived and it seems that the disease has a tendency to die out in the family.

As regards the question of the transmission of the disease, I am sorry to state that we have no definite knowledge of the way of infection. It seems that there is some agency other than personal contact: whether contagion is carried by mosquitoes or bed-bugs is not established, but it is a fact the Leprosy is prevalent in marshy regions, where mosquitoes are found.

Before I close my short discussion, I should like to add a few words on diagnosis, which should be emphasized: you need a well-trained specialist to diagnose this disease. It is not sufficient to see a few Leper cases and imagine you are a specialist in Leprosy, but we need well trained physicians in dermatology to rule out diseases similar in appearance and not to make mistakes such as Unna describes of a colleague, who diagnosed a very pronounced nodular Leprosy as Warts. Furthermore, another colleague treated his wife for several years for eczema, whereas she was suffering from Leprosy!! It is without doubt evident that in mediaeval times they treated Syphilitics as Lepers: this can be traced in the evidence of bones found in the cemeteries of Leper-Homes.

We have passed from mediaeval times, and possess exact microscopic and serological methods of diagnosis and can treat the disease accordingly. This task cannot be solved by the Leper Mission, but only by well-trained specialists in well-equipped Institutes.

Certainly we have the best remedies available to us. The last decade has witnessed a wonderful advance in the treatment of Leprosy.

Chaulmoogra oil is still the sovereign remedy but Antileprol seems to gain a good many followers for its painless application. About the treatment with heavy metals, carbondioxide-snow and vaccine are favourable reported upon. All these are questions which need a strict individual attention and not a routine.

This great task can only be perfected in well-equipped Leper-Hospitals where the solution of many important questions will ultimately be found. Such as:—

- (1) Why the majority of Lepers are males?
- (2) Why does not a leper infect his children.
- (3) Why do the poorer classes suffer the most?

(4) Why in one case does the disease appear in the form of a macular anaesthetic and in another in a nodular form. All these are scientific problems which can best be studied in China where the disease is rife and where in fact a Chinese would prefer to sleep in the same bed as a Leper than to allow a case of scabies to enter the door.

The function of your Mission, from the doctor's point of view, should be to promote a campaign to enlighten the Chinese Public as to the nature and dangers and treatment of Leprosy which should give you a fine field for activity and I feel confident that this is a matter which could not be left in more competent hands, and that, with your help, in conjunction with a few well-trained specialists the end of the Leper problem is in sight.

COMPLIMENT FIXATION AND PRECIPITATION TEST FOR SYPHILIS IN LEPERS

R. M. WILSON M.D. and W. P. GILMER M.D.

With the purpose of determining the value of the compliment fixation and precipitation tests in diagnosing syphilis in lepers tests were made on 637 inmates of the Kwangju Colony. The results are compared with similar tests using the same reagents, on the clinic patients in the Graham Hospital.

In the compliment fixation test the Noguchi technique was employed, using in some cases an acetone insoluble antigen prepared according to the method given by Dr. Stitt (*Practive bacteriology slett 7th edition page 267), and in others the alcoholic heart extract with cholesterol. The precipitation method used was the Kahn rapid precipitation test (*rapid precipitation phase of the Kahn test for syphilis from J.A.M.A. July 14, 1923).

All the compliment fixation tests and the first 200 Kahns were made in the laboratory of the Graham Hospital. The last 343 Kahns were made by *Technicians* trained from among inmates of the colony. The final reading were made by U.S.

TABLE No. 1

Listing plus minus, and 1 plus, as doubtful, 2 plus as weakly positive, 3 and 4 plus as strongly positive we arrive at the following:—

Negative	77.4%
Doubtful	3%
Weakly positive	3%
Strongly positive	17%

Since all Noguchi tests using acetone insoluble antigen were strongly positive we assume that the compliment fixation was due to leprosy.

Discarding these the results are as follows:—

Negative	.. .. .	80%
Doubtful	.. .. .	3%
Weakly positive	.. .. .	3%
Strongly positive	.. .. .	14%

The results in the Graham Hospital during the same period gave the following:—

Negative	.. .. .	79%
Doubtful	.. .. .	3%
Weakly positive	.. .. .	4%
Strongly Positive	.. .. .	19%

The Noguchi was used in about one half of these and the Kahn in the remainder. There was no appreciable difference between the results with the acetone insoluble antigen and the cholesterinized alcoholic extract among these non-leprous patients. The compliment fixation tests gave a slightly higher per cent of positives than the precipitation tests but not enough higher to be of significance in this number of cases.

Our final comparative results indicate that there is little difference between leprous and nonleprous patients where using the Hoguchi with cholesterinized heart extracts as an antigen or the Kahn precipitation test. Since there is apparently

complete compliment fixation in non syphilitic lepers when the acetone insoluble antigen is used, a differential is established between syphilis and leprosy and a diagnosis of syphilis among lepers by using a test employing both antigens.

All of the lepers in the colony are under treatment with C. M. oil (intramuscular injections) as reported in a recent article (*Leprosy in Korea*, Wilson J.A.M.A. Oct. 9, 1926). For the last two months those showing laboratory evidence of syphilis are receiving the C. M. oil with salicylate of mercury added. We expect to make a report on the results of this combined treatment later.

TABLED RESULTS

	No Cases	Negative	Plus-minus	2 plus	3 plus	4 plus
Acetone, Insoluble Antigen	24	0	0	0	1	23
Alcohol extract beef cholesterin	70	49	2	7	2	10
KAHN	1043	808	31	92	76	36
Percentages		77%	3%	3%	8%	10%

Kahn in lepers:

Negative	.. .. .	77%
Doubtful	.. .. .	3%
Weakly Pos.	.. .. .	8%
Strong Pos.	.. .. .	10%

LEGISLATION AND LEPROSY

LEE S. HUIZENGA, M.D., C.P.H.-YALE

Legislation against leprosy seems as old as leprosy itself. At present, however, there is somewhat of a reaction against legislating for the forced segregation of communicable diseases. "Education and not legislation," is the slogan of the day. Whatever may be our attitude towards legislation as an effective means for the eradication of leprosy, it must be admitted that it has worked in the past and even in the present it is the only

universal means resorted to, yet this does not mean that segregation compelled by law is the best method. A more excellent way will be possible after education has also entered this field of public health.

From the earliest times lepers were sent in to forced segregation either by common consent of the people or by statutory law. In speaking of legislation in respect to leprosy, we may consider the casting of a leper out of a community by common consent as practised by primitive peoples, as the simplest form from which later legislation developed. By society's consent the leper had his place pointed out to him varying in different countries. In Africa it amounted to but very little, in Asia it meant that the patient was virtually reduced to a beggar's life apart from society.

In civilized lands statutory law controls the leper and makes him subject to the same penalties as a criminal until he surrenders to segregation. Statutory laws date back to Moses time.

From a study recently made we learn that where rigid segregation has been applied, the disease has been partially controlled, where it has not been applied and for want of better means, leprosy makes definite headway. China has no national legislation at all, neither has central Africa. India has only partial legislation in a few states and in each of these countries leprosy spreads unhindered. America, Europe, and Australia are largely controlling the problem by legislation. Legislation however, alone cannot control it. Legislation needs enforcement. In Japan this is left to the police, in the United States to public health officials. The question keeping sanitarians thinking today is just what part legislation should play in the eradication of the disease, whether the police force should be used at all, or whether education should be pushed to the point, where the awakened public health consciousness in the public and in the patient would make voluntary segregation possible under sympathetic supervision of public health agencies.

A study of public health legislation today shows that in but a few countries the enactment of the law is left to the ministry of health for enforcement. Special division of the ministry of health in such countries are at times designated for the sole purpose of leprosy control. In the United States

both federal and state control come into play. The federal control has jurisdiction over the federal leprosarium, quarantine service, the army and navy service, the District of Columbia, and the interstate traffic. As the states fail to provide their own leprosarium, the federal government steps in upon their request and cares for the lepers at federal expense. The United States maintains one federal leprosarium in the states at Carville, La.

The legal demands upon lepers varies in different countries. Some countries demand isolation of lepers in leprosaria, as in the United States; others leave the choice to the patient of being isolated in the home, in a hospital ward, or in a leprosarium, as in Canada. In some countries only pauper cases are cared for in leprosaria, as in Spain. In Assam it is understood that the leper must live outside of the villages—an ostracism like that of the ancient Hebrews. This prevails also in Persia, Iraq, and Arabia.

As to the rigidity of the law, Canada is probably as strict as the United States, yet the condition of the leper is made far more tolerable by a choice of isolation.

The majority of countries have no *special* statutory law controlling leprosy other than those controlling infectious diseases in general. Few countries have special acts for the control of leprosy. Canada has "An Act Respecting Leprosy" and the U.S. has "Regulations for the Apprehension, Detention, Treatment and Release of Lepers." The South American countries were first in direct legislation against lepers on the American continent and they are at present putting forth new regulations controlling the recent spread of leprosy. Some European countries have similar special acts.

In discussing the statutes controlling any disease, certain fundamental principles are to be recognized. The right to personal liberty protects any one from being apprehended by the state, except one become dangerous to the public in some way. A criminal can be imprisoned if his crime is proven, a mentally deranged can be sent to an asylum if he becomes dangerous to the public welfare, any person suffering from a disease endangering the public can be forced to isolation. The

criminal of age is incarcerated in prisons, and is considered personally responsible for the acts. The sick, however, entirely innocent, become the object of the governments special humanitarian care even though segregated by law, and the institutions where such unfortunates are cared for are called hospitals, asylums, sanatoria, or the like. Yet whether a criminal, an insane person, or a communicable disease sufferer—all are subject to the same *compulsory* segregation.

As soon as a government compels any one to segregation he becomes a public charge of the government. Legally, however, a government has no right, because of the principle of personal liberty, to force any sick into segregation until it can be proven that such a patient is a danger to public health. Public health regulations assigning certain diseases to isolation, therefore, require proof be furnished by the expert advice of sanitarians, physicians or health officers, before a person can be isolated. With the progress of medical science and the enlightenment of the public by public health education, forced isolation of communicable diseases has been greatly modified in past years. Only a few years past so called "pest-houses" were common and patients with small pox, diphtheria, and other communicable diseases were forced into these places. Such a treatment is now relegated to the past.

For leprosy forced segregation is still in vogue. Leprosaria frequently are veritable prison houses, surrounded off by the deep sea, or by barbed wire fences. Patients escaping from them are hunted as escaped convicts and forced to return. Lepers are still forced to segregation upon the old theory of the highly communicability of the disease. It is well recognized today that the disease is not nearly as communicable as tuberculosis and venereal disease, which diseases at present are not subject to segregation by law, although tuberculosis is far more fatal and syphilis is also mutilating. Whether leprosy should be segregated by force because it is a public health danger, should at least be reconsidered. More modern and more humanitarian methods of treatment of the present time, and a better understanding of some of the causes of the spread of the disease seem to indicate that the principle of personal liberty of the leper weighs heavier than does the danger he is supposed to be to the public, if certain restrictions are met with as are also met with in other communicable diseases.

It has been said that a leper becomes a public health nuisance for aesthetic reasons, if not for actual public health reasons. Society abhors one who is mutilated as is a leper. Legally there is probably no way in civilized lands by which a leper can be forceably confined to a leprosarium for aesthetic reasons. As we provide homes at public expense for the aged, and the cripple, without any legal compulsion over the inmates, in like manner we should provide for the care of those non-infective old cases of leprosy who voluntarily enter such institutions.

Here again, the way to change legislation is by education. To demonstrate that leprosy can be controlled and is no real reason for fear, will calm society and society at rest on the issue, other legislation will become possible.

THE PRACTICE OF MIDWIFERY IN MANY LANDS

VI Uganda

VII Denmark and the United States

This article concludes a series of papers on midwifery and the training of midwives in different countries.

In the first part of it we deal with the problem as it affects one of the more primitive races, while the second half deals with the state of things in two countries one in which the training of midwives is particularly advanced and thorough and one in which it has been almost completely neglected.

Our very hearty thanks are due to Dr. A. R. Cook of Uganda for very full information that he has let us have in regard to the methods employed in that country.

VI UGANDA

Uganda being a British Protectorate, the rules in force for the control of midwives are those promulgated by the Government. This was done mainly, we believe, as the result of representations by the medical missionaries.

One point of special importance to us here will be brought out, viz. how the problem of the areas where qualified doctors or midwives cannot be secured for difficult cases is dealt with.

Unfortunately we have not at our command the particulars of the courses of training required but the following quotation from a personal letter from Dr. A. R. Cook gives a general idea of how the system works. He writes:—

“We take native girls able to read and write fairly fluently. They have to have a minimum training of 18 months (most have two years) of which three months are spent in a general hospital of 50 beds. They must have attended 50 lectures on midwifery and have personally conducted 20 labours. Their conduct must have been satisfactory.

To get the Central Midwives Board certificate they must get at least 50 percent on two written papers in the vernacular and on oral examination on bones, instruments, models, testing of urine and on the diagnosis of a case of pregnancy.

They do remarkably well in isolated districts. At one centre, in two years, they conducted over 600 labours with only one maternal death.”

After receiving her certificate the midwife has to register with the Central Midwives Board, which issues to her a license to practice. Only such licensed midwives are allowed to attend women in labour for gain, but the section of the Ordinance dealing with this subject concludes as follows:—

“Providing that nothing in this subsection shall apply to any woman rendering assistance in a case where the services of a duly qualified medical practitioner or a registered midwife are not readily available.”

VII DENMARK AND THE UNITED STATES OF AMERICA

We have deliberately associated these two countries together because we have here two highly civilized states which treat this midwifery problem in diametrically different ways and we consider that the lessons to be learnt from the consequent results as regards maternal mortality are very striking.

Denmark can boast almost the lowest maternal mortality of any country in the world. The midwifery is conducted entirely by non-nurse licensed midwives.

Professor Dr. med. E. Hauch of Copenhagen, the head of the midwifery training department has kindly written us the following particulars.

"In the midwifery school here the education has till now taken one year, but just now we have changed to two years. The pupils are coming from all social levels, a lot of them have been housemaids, others are widows, their husbands having been workers, farmers or small business men, but we have some from the higher circles, daughters or widows of medical men, officers, etc. The pupils have to pass an examination before admission but this is only on the most elementary subjects. Before leaving the school they have naturally to pass another and rather stiff examination.

At the present moment we train 25 to 30 midwives a year, quite sufficient for our country. In Denmark with about three and a half million inhabitants and nearly 78,000 births a year we have about 1200 midwives.

The maternal mortality during or just after delivery is 2.04 per thousand, and the mortality of puerperal fever is 0.9 per thousand for the whole country."

The United States on the other hand has one of the highest maternal mortalities in western countries. There is no general system of midwifery training and non-nurse licensed midwives are largely unknown.

Dr. G. W. Kosmak, the Editor of the *American Journal of Obstetrics and Gynecology* writes, in a personal letter, that there is but one school, that of Bellevue in New York where training for non-nurse midwives is given and from which only a small number are graduated each year.

Dr. Kosmak writes:—

"Most of our States have placed all sorts of restrictions on midwife practice but have done little to provide for the education and supervision of these women."

Dr. R. L. Dickinson, than whom there is no higher authority in the States on this subject, has written us a letter in which he strongly deprecates the present condition of affairs and expresses himself in favour of the systematic training of non-nurse midwives.

EPILOGUE

We commenced this series of papers with the hope of proving conclusively that the employment of non-nurse trained midwives was common in most countries in the world and that the use of these women was not attended by the disastrous results which it had been stated would follow their employment in China.

The results of our enquiries have astonished us with the unanimity of the replies which we have received. We would like to state the following conclusions to which we have been personally led.

1. That in almost all countries non-nurse trained midwives are employed.
2. That no disastrous results have followed their employment.
3. That where these women are universally employed the maternal mortality is lowest and conversely that where in western lands doctors and nurses are solely responsible for the delivery and attendance on women in labour the mortality is highest.
4. That a high standard of education is not required for midwives if efficient training is given at the maternity schools.

HYSTERO-SALPINGOGRAPHY

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Carrey first in 1914 used collargol injection and the X-ray shadow for the determination of the patency of the Fallopian tubes. His work was followed by that of Rubin in 1915, and Dartigues and Dimier in 1916. Since then much work on hystero-salpingography has been done. Various drugs have been used, such as sodium bromide by Kennedy, a suspension

of bismuth by Williams and Reynolds, and sulphate of sodium and barium. Due to the irritation caused by these drugs, together with the lack of opacity obtained, the practice was given up.

In 1922 Sicard and Forestier observed that iodized oil when injected subcutaneously or intramuscularly gave an opaque spot on the roentgenograms, and that this opaque spot persisted for a long time. They later used the oil before exploring cavities in the spinal canal and the bronchial tubes. Portret (1923) first used iodized oil for injection into the uterine cavity and Heuser in 1925 used lipiodol for the diagnosis of pregnancy. Since then it has been used in different countries with uniformly good results.

Lipiodol; an iodized poppy seed oil, and iodopin, an iodized sesame oil, contain 40 per cent of iodine in organic combination giving no reaction to starch. When freshly prepared they have a light yellowish colour and are quite transparent. A change of colour to brown indicates the liberation of free iodine, and therefore an unfitness for use in uterine injection.

According to many authors lipiodol is well tolerated by the human tissue, being no more irritable or toxic than any other vegetable oil. Iodopin has not been as frequently used.

Hystero-salpingography is one of the most valuable methods in the field of gynecology for demonstrating the condition of the genital tract. Tubal occlusion demonstrated by Rubin's test is not sufficient evidence to justify operation. As stated by Victor Bonney, in nine out of ten cases the obstruction occurs at the uterine end, and plastic surgery in such cases invariably fails. On the other hand it is common for good results to be obtained if only the fimbriated ends are involved. Hystero-salpingography alone can locate the occlusion.

In cases where conservative surgery has been previously performed upon the pelvic organs and where no information as to the nature of the operation is available, hystero-salpingography may furnish valuable information. In one case coming to us with a history of two ectopic pregnancies, one on either side, and the supposed removal of both tubes by the attending surgeon, a closed tube was demonstrated on one side. By this method the success of a salpingostomy or a multiple



Before operation



After operation

L.F.L. 21738 age 30, married 12 years, had two spontaneous deliveries at home ten and eight years ago, but each of the children died. During the first delivery the patient sustained a third degree perineal laceration. By salpingogram both tubes were found obstructed at the fimbriated ends, and the findings were confirmed by operation. Peritonorrhaphy, appendectomy, salpingostomy and suspension of uterus were done by Professor Maxwell and one of the writers. Subsequent hysterosalpingo-graphic examination showed free oil in the peritoneal cavity indicating the patency of both tubes.



Showing a uterus deviated to the left side with the right Fallopian tube sealed at the fimbriated end



*Specimen removed
The right tube contains
iodized oil moved
with the Ovary*

H.T.M. 22050, age 34, married, had had 9 pregnancies of which 5 were full term. In 1925 she was operated upon for an ectopic pregnancy of the left tube and again for the same trouble in the right tube in April 1928. To the patient's knowledge both tubes had been removed. Uterosalpingogram showed the presence of the right tube with one end sealed and this was confirmed at operation.



E.O. 21794, age 30, was married for nine years with no pregnancy. She had a history of gonorrhoeal infection and salpingitis. Rubin's test showed the right tube patent at 140 mm. pressure, with no auscultatory signs on the left. Uterosalpingogram confirmed this test.



C.J.T. 19241, age 28, married, had vaginitis with extensive stricture, formation six months before admission. Iodipin injection showed the extensiveness of the lesion above the stricture and the condition of the vaginal vault.



Anterior view



Lateral view

L.H.C. 21404, age 19, married in Nov. 1927, was in labor and was attended by a railway surgeon at Nankow. The rectum as well as the lower part of the vagina were badly torn and a stricture formed as a result of scarring. Uterosalpingogram in this case furnished information concerning the condition of the vagina. A plastic operation was performed by Professor Maxwell with an admirable result.

myomectomy, the outline of uterine tumours, and the extensiveness of cicatricial formation in strictures of the vagina can be determined. While an early diagnosis of pregnancy may be made by this method, conservatism is necessary, since abortion occurred in 20% of the cases examined by Miller.

With a patient having a chronic pelvic inflammatory disease where a diagnosis of chronic cholecystitis, appendicitis, duodenal ulcer and chronic salpingitis had been made by various members of the staff, a hysterosalpingogram showing obstruction at either end of both Fallopian tubes was the deciding factor in confirmation of the diagnosis of chronic salpingitis. That this was the main seat of trouble was confirmed by operation, although a chronic appendicitis was also present.

For obvious reasons, in cases of acute or subacute pelvic inflammation, uterine hemorrhage, cervical and uterine infection and pregnancy, hystero-salpingography is contraindicated.

The application of the test is very simple. Strict aseptic precautions should be observed. The patient needs no preparation beyond a vaginal instillation of 30 cc. of 1% mercurochrome the night before, and a saline enema an hour before the injection. The patient lies on the fluoroscopic table and is properly draped. The cervix is exposed with a bivalve speculum and the field is painted with 20% mercurochrome. The cervical lip is seized with a tenaculum forceps, and gently drawn down towards the outlet. As a rule, it is more effective to seize the anterior lip if the uterus is anteflexed, and the posterior one when it is retroflexed. An uterine sound is then passed to rule out any obstruction and to estimate the length and the direction of the uterine cavity. A Keyes-Utzman urethral canula with a rubber tip is firmly pressed against the external cervical os, a short rubber tube is attached to the other end for connection with a syringe of lipiodol or iodipin, and 20 cc. of warmed lipiodol or iodipin is slowly injected under fluoroscopic observation with the speculum partially withdrawn. The injection should be stopped and the film taken as soon as the oil fills both the uterine cavity and the Fallopian tubes. Excessive pressure is unnecessary and the amount of fluid needed for injection can be regulated by careful observation. No more oil should be allowed to pass into the peritoneal cavity than enough to demonstrate the patency of the tubes. The patient often experiences a slight degree of pressure and pain.

The after effect in our experience so far has been very satisfactory. We have repeatedly allowed outpatients to walk home immediately after the injection, and several inpatients have been observed, with no untoward results. There were no changes in hourly temperature and pulse when taken carefully for 12—24 hours.

The fate of the iodized oil varies greatly in different individuals according to the location and the contractibility of both the tubes and the uterus. We have observed the uterus empty itself immediately upon the withdrawal of the cannula. We have frequently failed to demonstrate the oil after ten days. Other authors on the other hand have reported that the oil has been found in the peritoneal cavity as long as eight months after injection.

The value of hystero-salpingography as an adjunct to the various types of pelvic surgery is shown by the following case reports:—

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C.L. 138274, Chinese housewife, age 30, was married for 11 years, but had never been pregnant. Uterosalpingogram confirmed the clinical findings of an antiflexed uterus and patent Fallopian tubes.



T.K.J. 22029, age 29, was married for 13 years with no pregnancy. Menstrual, family and past histories were essentially negative...Abdomen was soft, no mass nor tenderness was found. Pelvic examination showed the cervix to be conical with a small nulliparous os. The uterus was retroflexed and adherent. Rubin's test showed both tubes non-patent at 120 mm. of pressure...Uterosalpingogram indicates obstruction of both tubes at the middle portions. At operation the entire left tube and the distal two thirds of the right tube was removed. The operation confirmed the uterosalpingographic findings and the sections showed tuberculous changes. Subsequent examination failed to demonstrate the presence of free oil outside the uterine cavity.



Y.P.C., No. 138311, age 20, came for sterility, irregular menstruation (3 years) and leucorrheal discharge. The uterus was felt to be infantile and the examination was otherwise normal. Rubin's test showed both tubes patent and hysterosalpingography, besides confirming the test showed the uterus a bicornuate one.



Showing left uterine cavity



Showing right uterine cavity

S.W.W. 21712, Chinese housewife, age 25, complained of severe dymenorrhea since the onset of her menstrual periods. Pelvic examination showed a double vagina with a perfect septum between the two. The left side was of normal size, but the right one was small. There were two small cervixes. The uterus was felt to be separated above and fused below. The uterine sound could be passed for a distance of a little more than an inch on both sides.

Hysterosalpingographic examination showed that the uterine cavity on the right was larger than that on the left and this has led us to advise a division of the septum.

THE IMPORTANCE OF CYCLOPLEGIA IN REFRACTION

Dr. T. M. LI and Dr. H. T. PR.

Refraction is one of the most important duties of an ophthalmologist. To be able to refract intelligently, that is, to estimate accurately the errors of refraction in a given eye and to prescribe with intelligence, requires not only a practical knowledge of physiologic optics but also a thorough understanding of the various causes which impair vision. These causes may be classified into, (a) diseases of the refracting media which interfere with the proper transmission of the rays of light to the fovea centralis or the macula, viz., diseases of the cornea, lens, and the vitreous body, (b) diseases which affect directly the function of the retina, or indirectly, through diseases of the choroid, the retinal vessels, optic nerve, the optic tracts, and the visual centers of the brain. For this reason refraction should not be looked upon so light-mindedly by individuals who may require a test of their eyes for the proper correction of the causes of impairment of their vision and symptoms of headache or dizziness due to eyestrain.

It is not the purpose of this paper to deal either with the various diseases interfering with the proper transmission of light to the fovea or the diseases affecting the function of the retina. For knowledge regarding these phases of the subject the reader is referred to standard text-books on ophthalmology. However, it is the desire of the writers to deal exclusively with refraction and to emphasize the most important points in the methods which have been found most helpful to them in their work.

In refraction two tests are generally employed, namely, the subjective and the objective tests. Either one or the combination of both may be employed.

Subjective Test: In the subjective test we have to depend entirely upon the patient's own statements and discrimination. For this reason it is obviously not a satisfactory test for young children and illiterates. The test is briefly as follows: The patient is asked to read the line containing the smallest letters on the test chart which he can see distinctly, and the result is recorded. Both spherical and cylindrical lenses are then placed before the subject's eyes, one after another, until the maximum

visual acuity is obtained; glasses are then prescribed accordingly. In order to facilitate the test, the vision is often fogged by placing before the eye a high plus lens which is gradually reduced as long as it improves his vision; in other words, until the patient refuses to accept any more reduction. With this sphere in place different cylindrical lenses are placed in front of it in the various meridians until the proper cylinder and its axis are determined. The correction thus found is prescribed accordingly. If the patient is not astigmatic he will not accept any cylinder. Fogging an eye relaxes its accommodation somewhat, but at best, the results obtained are not wholly satisfactory, especially in young people. However, with individuals past middle life in whom the power of accommodation is normally greatly reduced, the fogging method of refraction may be employed. The result obtained, in most instances, is quite accurate.

Objective Test: In the objective test we measure the refractive errors of an eye with the help of certain apparatus, such as the ophthalmoscope, the ophthalmometer or the skiascope.

The Ophthalmoscope: Before the invention of the skiascope and the ophthalmometer, the ophthalmoscope was used for the estimation of refractive errors. It was always followed by a confirmatory subjective test. In the hands of an experienced presbyopic examiner with a relaxed accommodation this method may be quite satisfactorily employed, but for one whose accommodation cannot be properly relaxed, it is useless to attempt to measure the refractive errors of an eye with the ophthalmoscope. As a matter of fact, this method is now almost universally discarded.

The Ophthalmometer: The ophthalmometer is merely an auxiliary apparatus in refraction. It measures approximately the curvature of the cornea only and does not measure the curvature of the lens; in other words, with the ophthalmometer one cannot measure the total or absolute refractive errors of an eye. This apparatus is resorted to by those who are not familiar with other approved methods of determining objectively the axis of an astigmatism. As a matter of fact this apparatus is now but rarely used in the clinics of Europe and America.

The Skiascope or the Retinoscope: A skiascope consists of a round mirror with a central aperture fitted on a black disk

and mounted on a handle. The mirror is either plane or concave. The plane mirror skiascope is the one generally used, therefore, all references in this paper concerning the use of this apparatus will be to the plane mirror skiascope. Under cycloplegia one is able to determine quite accurately with a skiascope, not only the kinds, but also the total amount of refractive errors of an eye and the axis of its astigmatism. During the test the patient should fix his gaze on the aperture of the skiascope or at a point a little above it, so that the rays of light coming from the fovea centralis of the retina may be refracted. Furthermore, the patient's pupil should be at its maximum dilatation and the accommodation as thoroughly relaxed as possible, otherwise the test will not be satisfactory. With a dilated pupil a maximum amount of light will be reflected from the retina, consequently, the retinal reflex of the eye appears brighter and its movement easier to observe. Since the ciliary muscle of the eye, acting upon the crystalline lens, has the power of almost instantaneously focussing rays of light on the retina it should be thoroughly relaxed for when a trial lens is placed before an eye its focal point is altered, in consequence of which, the ciliary muscle will accommodate in an effort to bring the focal point to the fovea. For this reason, any trial lens used to neutralize the retinal reflex or shadow of an eye with an active ciliary muscle, will be partially, if not wholly, overcome by the action of this muscle and therefore the lens cannot represent the total refractive errors of the eye. With an active ciliary muscle then, it is almost impossible to measure the refractive errors of any eye. In view of what has been said, a maximum dilatation of the pupil with a complete relaxation of the ciliary muscle of an eye is absolutely necessary for the accurate estimation of the refractive errors of an eye in a subject below the age of forty. These can only be obtained by the use of a cycloplegic like atropine or homatropine. Skiascopy under a cycloplegic is, therefore, the most reliable and accurate method we have for determining the refractive errors of an eye. Its fields of special usefulness may briefly be summarized as follows:

(a) In illiterates or young children whose intelligence is not sufficiently developed to cooperate with the examiner, this is the **only** reliable means by which we can determine their refractive errors. In children, the accurate testing of high hyperopia with a latent or manifest internal squint is essential in order to

preserve their binocular single vision and to spare them a squint operation in later life.

(b) Its findings will serve as a basis for any subsequent subjective test. As a matter of routine practice we invariably supplement our skiascopy with a subjective test.

(c) When there is any doubt regarding the accuracy of a subjective test, skiascopy may be employed to check up the trial case findings.

(d) In certain presbyopic eyes we utilize skiascopy not only to dispense with the tedious and uncertain process of fogging the patient, but also to determine, in a way, the kinds and amount of refractive errors and the axis of its astigmatism. Since, in a presbyope we usually do not employ a cycloplegic, we can obtain a maximum dilatation of the patient's pupils and a relaxation of his accommodation by having him look, not at the skiascope but at a distant object over one of the examiner's ears.

Skiascopy with Cylinders: Skiascopy with cylinders, under a cycloplegic, has come into a more general use during recent years. It is considered to be a more accurate method than skiascopy with spheres alone. To a trained skiascopist it does not make a whole lot of difference. By this method one can determine exactly not only the amount of refractive errors of an eye but also the axis of any astigmatism that may exist. This method of refraction is based principally upon the law of crossed cylinders. Briefly, the technic is as follows: We first ascertain the refraction of one of the principal meridians of the eye with a sphere. Over this a cylinder is added and rotated in such a way that its axis falls within the long axis of the astigmatic band. We then proceed to increase or decrease the strength of the cylinder until the astigmatic band is neutralized. When all the meridians have been neutralized there should be no further movement of the retinal reflex in any direction. For a detailed explanation of this method of refraction the reader is referred to an article on the subject written by Pi.

The Use of Cycloplegics: The use of a cycloplegic in refraction has aroused much controversy. Opposed to its use are pre-eminently the optometrists and opticians. Their opposition is based principally upon the following reasons:

1.—The use of drops is unnecessary for with “a special perforated mirror” (skiascope) they claim that they are able to determine accurately the refractive errors of an eye.

2.—The danger of inducing an attack of glaucoma.

3.—It inconveniences the patient.

4.—It necessitates a number of visits to the doctor’s offices.

5.—The patient is satisfied with the results obtained without it.

The writers wish to give a brief reply to these arguments in the order given above:

1. *The use of drops is unnecessary for with “A special perforated mirror” (skiascope) the optometists and opticians claim that they are able to determine accurately the refractive errors of an eye:* With a skiascope one is able to estimate quite accurately a system of lenses confined within a camera on an optical bench. Although the eye is often spoken of as a camera, we must not forget the fact that a real camera is a dead object but an eye is a living organ in which there is an automatic contrivance, namely, the ciliary muscle, by the action of which rays of light coming from any point may be focussed on the retina by the crystalline lens. In order to measure accurately the refractive errors of such an eye it is not difficult to see that unless the ciliary muscle is put at rest our attempt to measure the eye cannot be a satisfactory one. Therefore, it is necessary to employ a cycloplegic in order to paralyze temporarily the ciliary muscle before we can estimate with accuracy its refraction.

2. *The Danger of Inducing an Attack of Glaucoma.* No one doubts that in an eye predisposed to glaucoma, the use of a cycloplegic on such an eye is a dangerous procedure,. In every preliminary examination of an eye for refraction, it is invariably our practice to examine the eye most carefully for signs and predisposing causes of glaucoma. When none is discovered a cycloplegic is almost always prescribed for patients under the age of forty. As a matter of fact even in elderly patients we have occasionally prescribed a cycloplegic like homatropine, when the manifest refraction was unsatisfactory and when there was no contra-indication to the use of the drug.

During the past few years we have given homatropine to patients ranging in age from forty to seventy. The writers firmly believe that a cycloplegic is indispensable for accurate refraction in all patients under forty years of age. It is absolutely safe if one will only take pains to examine his patient thoroughly to rule out any predisposition to an attack of glaucoma.

3. *It inconveniences the patient.* This contention is hardly worth considering. If a patient is troubled with symptoms of asthenopia due to a refractive error, a few days rest for his eyes is always a good and effective treatment. If a cycloplegic is used the eyes not only will have a more complete rest but also will have the benefit of having their refractive errors correctly estimated and the proper glasses prescribed. A few days of inconvenience may save the patient a life-long headache. No refractionist should ever allow himself to be prevailed upon by his patient not to use a cycloplegic on such an excuse. A conscientious refractionist ought to be willing to see his patient go to someone else rather than lower his standard and ideal of service.

4. *It necessitates a number of visits to the doctor's office.* This argument may or may not have been advanced in a spirit of altruism. Let us admit that the patient's economic welfare is honestly considered. What is the answer? For one who is not in a position to consult a specialist in his private office, there are out-patient clinics in the various hospitals where he can have his eyes properly refracted by paying only a nominal fee, irrespective of the number of visits he will have to make for the completion of the test. To one who can afford to consult a specialist privately, an extra one or two visits in return for a satisfactory examination should not stand in the way of his consulting a specialist. The satisfaction which one gets in knowing that his eyes have been properly tested and prescribed for will more than compensate for the extra fee that he has to pay. Furthermore, unless it be a case of progressive myopia, one refraction properly conducted, will be sufficient for at least two or three years. In progressive myopia of high degree the constant wearing of an accurately fitting pair of glasses oftentimes is the only means for retarding the rapid progress of the myopia. It goes without saying that methods of improving the patient's health should at the same time be instituted by the physician besides prescribing for his errors of refraction.

5. *The patient is satisfied with the results obtained without a cycloplegic.* "Ignorance is bliss" to this class of refractionists for not knowing what is the best for the welfare of their patients. Furthermore, they may be a little afraid to use a cycloplegic on account of their lack of a fundamental knowledge of ophthalmology. In China, where so many people have myopia, due undoubtedly to lack of proper care of their eyes when they were young, especially before the period of puberty, we can see how so many of these patients, feeling the need of a pair of glasses for the improvement of their vision, would hasten into an optical shop for relief. Such patients who formerly possessed a 6/30 vision will naturally feel satisfied with a pair of glasses given him by the optometrist which will enable him to see the 6/9 or the 6/7.5 line of letters. Had these patients gone to a specialist the latter might be able to give him a correction which would enable him to see the 6/6 or the 6/5 line with marked clearness and comfort. The great number of hyperopes and low myopes with active accommodation that often visit our clinics for a second refraction after they had previously been to an optician bears testimony to the fact that the corrections prescribed for them by the opticians without drops have not been satisfactory.

There are some doctors who do skiascopy without a cycloplegic. They ask the patient to fixate an object at six meters distance, and by so doing they believe that they are able to produce a full spontaneous relaxation of the accommodation. This belief is quite erroneous, for, as a rule, as soon as the light from the skiascope is directed into the pupil, the patient's attention on the object is diverted to the light, in consequence of which, he accommodates and his pupils contract. It must be borne in mind that in skiascopy we attempt to measure the refraction of the patient's central vision or the point of fixation, and not his peripheral vision, because the peripheral aberration of the refractive media of an eye varies as much as from 0.25 D. to 5.00 D. Skiascopy, therefore, should not be determined from the light emitting from any part of the retina outside of the macular region. Now, in order to refract the central vision or the point of fixation of an eye, rays of light from the skiascope must necessarily be directed through the center of the pupil. By so doing the pupil cannot but contract and the ciliary muscle accommodates. Consequently, the result, if it can be obtained at all, cannot represent the total or absolute refraction of the eye.

In myopic eyes the ciliary muscle is not so well developed as in the hyperopic eyes because they do not accommodate beyond the far point. For this reason accommodation in a myopic eye is not as active as that of an hyperopic eye. Therefore, with clever manipulation by an experienced hand the refractive errors of a myopic eye may sometimes be accurately determined without a cycloplegic. We believe that in myopia of a high degree this method of examination may be conducted with satisfaction, but in low myopia, however, the accommodation is fairly active and as soon as the far point is brought to infinity or to a point approximately at six meters distance by the use of minus lenses, their accommodation at once becomes active. If one were to hold a low minus lens before one's eye, the vision of this eye would at once become blurred, but in a little while, it would become clear again. Why? Because the ciliary muscle of that eye contracts and the effect of the minus lens is overcome. This is exactly what does happen when one refracts a low myopic eye without a cycloplegic. One can keep on adding until the ciliary muscle is no longer able to overcome. In consequence of which, one is apt to overcorrect the myopia or to prescribe minus lenses unnecessarily for a normal eye or a low hyperopic eye. In practice we as a rule, do not attempt to determine the axis of anastigmatism until the far point approaches the six meter distance, namely, at the point of greatest visual acuity. At this point the eye approaches almost the normal and it will accommodate as such. As a result, it is often quite difficult to determine exactly not only the correct axis of the stigmatism but also the amount of refractive errors in the eye. Much time is thus spent without arriving at a satisfactory conclusion, and eventually, the patient will find it compulsory to undergo a cycloplegic refraction.

During the past years we have had ample opportunities of refracting patients that have been wearing glasses prescribed for them after a refraction without a cycloplegic, and wish therefore, to record one striking case as an example:

O. P. D. No. 19-185, Mrs. Y. S. K. aged 30, came to us June 17, 1929 complaining of headaches, tired sensation of eyes and soreness of eyeball for near work. Vision R. E.—6/30, L. E.—6/60. Six months before, she was refracted by a doctor without a cycloplegic. The following corrections were prescribed by him and the patient was told to wear her glasses for near work:

R. E. —0.87 sphere —1.00 cylinder axis 180=6/12

L. E. —0.75 sphere —0.50 cylinder axis 180=6/30

The patient was not able to use these glasses because they made her condition worse.

Under homatropine the following findings were obtained by us:

R. E. +0.25 sphere +1.75 cylinder axis 90=6/10

L. E. +2.50 cylinder axis 90=6/10

The plus 0.25 sphere was taken out from the right and a minus 0.25 sphere was added to the left correction and glasses prescribed accordingly. The patient found relief and wore her glasses constantly. She returned twice subsequently for re-examination. Twice she was examined under the same cycloplegic and the findings were approximately the same as those found in our first cycloplegic refraction.

Because we may "get away" with a fair number of cases of refraction without drops we must not ignore the fact that the great majority of errors of refraction cannot be accurately determined without a full dilatation of the pupils and a relaxation of accommodation, especially in hyperopic and low myopic eyes. It behoves us as specialists in ophthalmology to study our cases most carefully and to give our patients the full benefit of our knowledge so that our work in refraction may not go amiss and our profession accordingly abused. The general consensus of opinion among the leading ophthalmologists of the world today, is that, when a cycloplegic is contra-indicated we should not use it, but if there is no such contra-indication and the patient is under the age of forty, we should make it our rule always to refract with a cycloplegic. In this way much time will be saved; satisfaction will be given to the patient, and accuracy on the part of the doctor will be obtained. Even in a presbyope, when a manifest refraction proves unsatisfactory, and when there is no contra-indication to the use of a cycloplegic, we not infrequently prescribe homatropine and repeat the refraction. In children under fifteen we use a weak solution of atropine ($\frac{1}{4}$ -1%) for a few days in order to obtain a more thorough relaxation of their accommodation. In using homatropine it is our routine to prescribe a 2% solution for the patient to take home with;

two drops of this solution to be instilled into the eyes the previous night before going to bed. On the following morning, one drop is to be dropped into each eye every ten minutes for two hours, until approximately half an hour before the refraction.

In conclusion, we wish to emphasize again that under no circumstance should refraction be undertaken by one who is not trained in the science of ophthalmology. When there is no contra-indication to the use of a cycloplegic it should be invariably prescribed to patients under the age of forty. Thus much time will be saved as well as accuracy and satisfaction obtained.

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Clinical Notes

POLYPOSIS OF CAECUM

JOHN A. SNELL M.D.

Soochow Hospital Case 10190.

Admitted Feb. 24, 1928; discharged April 5th, 1928.

Male age 24; merchant.

Final Diagnosis: Polyposis of Caecum due to Tuberculosis.

Summary of case record: For past ten months patient has been suffering with attacks of abdominal pain which have become more and more severe and frequent recently. The pain come on at the same time as a mass appears in the right iliac region. The abdomen suddenly bulges up and the mass moves to the extreme right; a gurgling sound of gas and fluid is heard and the mass disappears and the pain ceases. In a few minutes this recurs. A great many of these occur during the day and night. About nine months ago he spat blood for several days in small quantities and again a small amount three weeks ago. There is a slight tenderness over the right iliac region and the

moving bulging mass of intestinal peristalsis can easily be seen, felt and heard. X-ray examination shows a stricture of the intestine at the ilio caecal junction. Wassermann four plus.

On February 28 under novocaine anesthesia the abdomen was opened and the lower ilium and ascending colon removed and an end to side anastomosis performed. The caecum showed a very small opening between it and the ilium with much scar formation; the appendix contracted indurated and bound down to the caecum. The mucous membrane surface dotted with small ulcers and the formation of many polypi. Section shows many giant cells.

Convalescence was complicated by an attack of Lobar Pneumonia which was slow to resolve and aggravating to the old tubercular condition.

GANGRENOUS GALLBLADDER COMPLICATED BY PREGNANCY

JOHN A. SNELL M.D.

Soochow Hospital? Case 6454.

Admitted March 12, 1923; discharged April 2, 1923.

Female age 36; wife of a coolie.

Summary of case record: Four days previous to admission was taken with a rather severe pain in the epigastrium, pain on the next day became located on the right side opposite the umbilicus. A tumor like mass appeared at this point. Has been severely nauseated and vomited anything taken by mouth. Had a chill and fever from the beginning. Pain has become more and more intense. Patient is between seven and eight months pregnant with the fundus about midway between the umbilicus and ensiform. Fetal heart heard over the lower central abdomen and fetal movements definite. There is a tumor like mass on the extreme right abdomen on the level of the umbilicus. This is smooth and the abdominal wall moves freely over the mass. It is hard and painful to touch. The intern made a tentative diagnosis of acute appendicitis and the surgeon felt that it was not appendicitis but more like a rupture of the uterus or an acute condition due to a tumor or a gall bladder. An exploratory laparotomy was done and the specimen removed. The mass proved to be the galibladder greatly distended and pointing in this extreme situation. It

was 8" long and 2½" in diameter and filled with a muco-purulent fluid. It was removed without rupture. It contained a stone and a large portion of the wall was gangrenous. Abdomen was drained and recovery was uneventful. Labor came on at full term.

Ether anesthesia was used.

Surgeon, John A. Snell. Assistant, L. C. Chu.

Hospital Technology Section

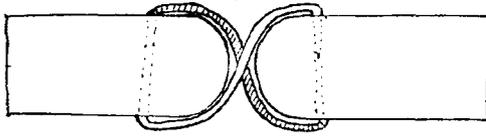
WARD SCREEN HINGES

E. G. B.

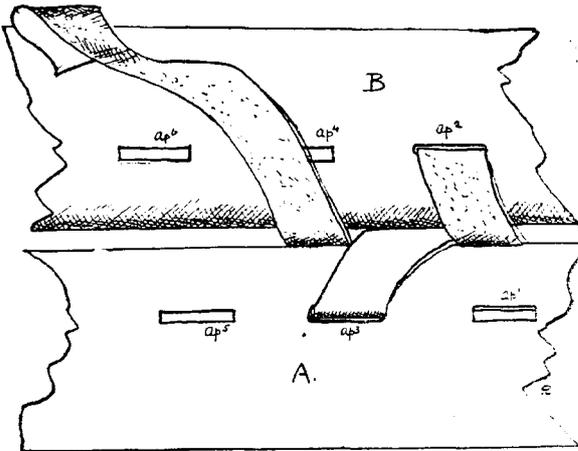
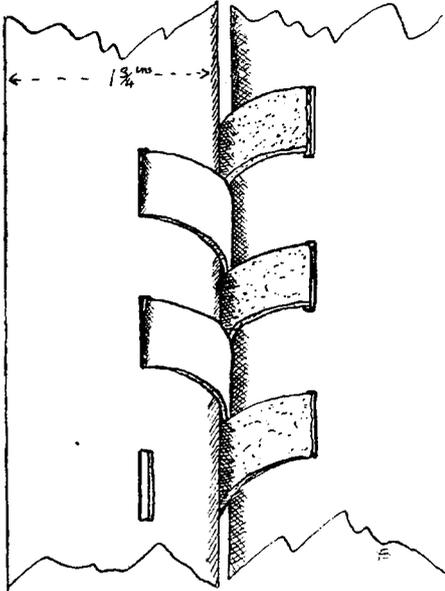
Illustrations by R. BOLTON M.R.C.S., L.R.C.P., W.M.M.S.,
Teian. Hupoh.

These leather hinges for ward screens are not new. I saw, and sketched them more than twenty years ago in China; but lost touch with them, and when the need came, had to devise a new screen from the ground up for lack of them! Now by happy accident what I believe to be the original working model has come into my possession, and I hasten to put it on record as one of the best and most practicable screen-hinges available,—double acting, frictionless, rigid, and unbreakable.

My sample is made of 1¾-in. × ¾-in. wood, laced with a ½-in. strap, through slots ⅛-in. wide, and set back ½-in. from the greatest convexity of the rounded edges of the wooden screen frame. The ½-in. slots are set slightly more (⅓-in.) than their own length apart, each set of three corresponding with the spaces of their opposite numbers. A single strap is laced through all the slots in turn, passing between the frame laths from the "upper" surface of one slot to the "under" surface of the next (or vice versa according to the end from which one starts). The tail of the strap is wedged into the first slot, and the head of it into the last. Glue is not necessary, but will not come amiss.



Plan of Hinge.



To Show Leather strip being inserted.

The hinge action is perfect. Barely $\frac{1}{8}$ -in. separates the frames. There ought to be almost no play, either laterally or longitudinally. Even such little longitudinal play as does exist is in one direction only, and is corrected by reversing the order of the slots in making the second hinge. Two hinges are sufficient; but a third in the middle of the frame will be a sensible recognition of what ward usage means;

To cut the slots, first bore a hole, and complete the slot with a "key-hole" saw,—whose Chinese equivalent, though it may not be in every carpenter's kit bag, will certainly be borrowable on terms somewhere amongst the wood-working fraternity of any town. Failing it, the Chinese fretwork "wire saw" is always obtainable. Our own carpenter made his own key-hole saw with a file out of a 5-in. strip of $\frac{1}{8}$ -in. steel very nearly square in section.

The strap in my sample is obviously a length of suit-case strap, and is quite rough on one side. Each hinge requires about an 8-in. length. Local leather workers can always supply such strips as these.

I. H. T. INQUIRY SERVICE

To the I. H. T.—Our nickel-plated syringes are turning black in the Spirit we use for keeping them in. It is quite a new experience, but all our present Spirit seems to produce the same result. Can you tell us what is wrong? And how to correct it?

M. S.

Answer,—Nickel Sulphide is black. Is it possible that your Alcohol has become contaminated in some way with a Sulphide? Are you burning bad coal near by, or are there sources of H₂S anywhere around?

Of other impurities in Alcohol, Aldehyde is the common one which causes difficulties (unusual headaches etc!). To get rid of it the ordinary way is by distilling the Alcohol once or twice after adding a small proportion of solid Sod. or Pot. Hydroxide. If that fails to remove your impurity, try distilling again after adding a bit of Silver Nitrate crystals, or, in your case perhaps Nickel Nitrate would be cheaper, and would serve.

W. H. T.

I. H. T. REPRINTS

Reprints of the following articles which have appeared in the Section of the "Journal" can be obtained on application to the Secretary, I.H.T., Union Hospital, Hankow. The charge of 10 cts. to cover costs includes postage.

- A System of Records Keeping for Small Hospitals.
- A Wash-hand Fixture for Hot Running Water in Waterless Hospitals.
- The Salving of Surgical Dressings.
- A Vacuum Washer Home-made.
- The Electrolysis of Wild Eyelashes.
- On Economic Drug Buying.
- On the Dangers of Buying Anywhere.
- Some Practical Suggestions in Hospital Pharmacies.
- Some Further Suggestions in Hospital Pharmacies.
- Laboratory Examination for Amoeba Dysenterica.
- Cedar Oil as an aid in the examination of stools for Ova.
- Methods of preparing Intestinal Ova for Study.
- A cheap Hygienic Latrine.
- A Self-closing Pail Latrine.
- Paper Cutting, and the Manufacture of Scratch Pads.
- A Rain Gauge.
- A Sun Dial.

**THE PRESERVATION OF BIOLOGICAL PRODUCTS
IN HOT CLIMATES**

One of the most difficult problems which confronts medical men as the hot weather approaches is the preservation of vaccines and sera for use in their private practice or their hospital work.

It is well known that vaccines rapidly deteriorate when exposed to anything like a tropical temperature, and it is further a fact that variations in temperature cause changes in sera which alter to a considerable extent their potential value. The old method of keeping vaccines and sera in China was to dump them into an ice chest (if ice was obtainable) and hope for the best, but the introduction of electricity into the centres of

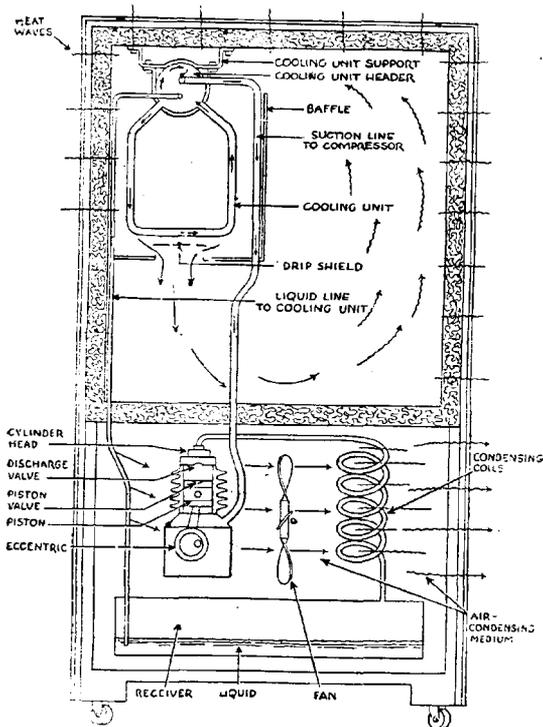
population is proceeding so rapidly that the newer methods of mechanical refrigeration are becoming more and more readily available and can be operated at such a low running expense that the cost is less than that of ice for an ice chest.

Large ice making plants are mostly worked by means of Ammonia or Carbon Dioxide gas, which is condensed by a pressure pump driven by a gas, oil, or steam engine. They manufacture large quantities of ice and can be used for extensive cold storage, whereas the smaller refrigerators which are adapted to household requirements and which in the modern home take the place of the old ice-chest, manufacture but a few pounds of ice and have a cold compartment in which milk and other perishable articles can be kept. Nearly all have sulphur dioxide as their refrigerant and a small electric motor as the source of power. Sulphur dioxide will boil violently at normal room temperatures. Apparently no heat is being supplied but heat is being taken from the surrounding air which thus becomes cooler. This well known principle has been applied by several of the firms manufacturing "Home refrigerators" and we are indebted to the Hambleton China Company, the agents of "Frigidaire" in Shanghai for the following brief description of the cycle of operation in the refrigerators which they supply for home or hospital use.

Briefly the Frigidaire cycle of operation is as follows:—

The air circulating within the cabinet carries any heat which may have leaked through the insulation of the cabinet or which may have entered on opening the door to the cooling unit. As this heat is absorbed it causes some of the sulphur dioxide liquid in the cooling unit to vaporize. The gas, laden with the heat absorbed from the food compartment, is drawn down by the motor-driven compressor through a copper tube and is compressed until its temperature is above that of the cooling medium. The heat is then transferred to the cooling medium and the gas condenses to a liquid (sulphur dioxide) as this heat is absorbed by the cooling medium.

The heat absorbed from the cabinet by the evaporating refrigerant is carried away by the cooling air or water, whichever is used as a cooling medium in the condenser, the compressor serving the purpose of a circulating pump as well as to crowd the gas into a smaller space so as to increase its temperature. (Fig. 1)



Diagrammatic Sketch of Frigidaire (Air-Cooled).

Fig. 1.

The liquid sulphur dioxide flows into the receiver of the compressor from whence it is forced by pressure derived from the compressor, through a copper tube to the cooling unit where it is used again.

The flow of the sulphur dioxide liquid into the cooling unit is regulated by means of a float valve. The valve serves two purposes. First, to maintain pressure on the liquid line in the compressor so as to retain the sulphur dioxide as liquid, and second, to permit some of the liquid to flow into the cooling unit header to replenish the supply which has been vaporizing in the coils.

Vaporization in the coils of the cooling unit takes place continuously but is much more vigorous while the compressor is running. This is due to the suction of the compressor which relieves the pressure in the coils and thus lowers the boiling point or vaporization point of the liquid. The process has been described as a continuous one, since the automatic starting

and stopping of the motor-driven compressor does not enter into the actual principle of refrigeration.

The Frigidaire low pressure control is a method used to regulate the temperature of the cooling unit or coil. This control operates on the principle that whenever there is a certain pressure within the coil, there is always a corresponding coil temperature. Figure 2 illustrates the low pressure control.

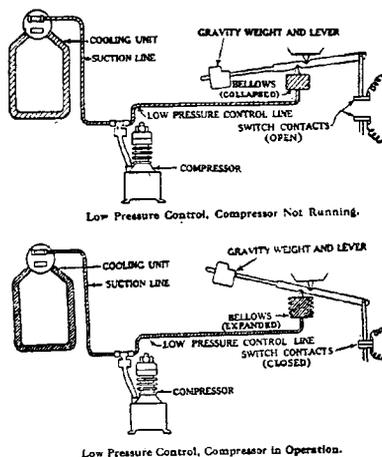


Fig. 2.

It is advisable to define two terms very frequently used in a discussion of refrigerating systems. These terms are high pressure side and low pressure side. The high pressure side of the system is the side consisting of the head of the compressor, discharge valves, the condensing coils, reservoir or receiver, and liquid *up* to the float valve. It is obvious why this is called the high pressure side since higher pressure is necessary at all time to condense the sulphur dioxide to liquid form.

The low pressure side consists of that part of the cooling unit beyond the float valve (that is, as soon as the liquid passes the float valve it enters the low pressure side of the system), the suction line to the compressor, the crankcase and cylinders of the compressor *up* to the discharge valve. Therefore, with the low pressure control, the motor switch is opened and closed by the pressure in the low pressure side of the system.

A careful analysis of the low pressure side of the system will illustrate the well-known physical law that the temperature is directly proportional to the pressure, that is, as the temperature increases in the box the pressure increases. Thus

the pressure or the box temperature is transmitted to the control bellows. The pressure transmitted to the bellows from the low side will be dependent upon the temperature in the cooling compartment and ice trays, which in turn will determine the amount of pressure in the system. Thus, when the cooling unit temperature is about 28 deg. the pressure in the entire low side will be sufficient to expand the bellows far enough to close the motor switch.

When the motor and compressor have run long enough to reduce the temperature in the cooling unit to about 8 Deg. F. then the pressure in the low side will have been reduced to such an extent that the bellows operating the switch will have contracted and caused the switch to open. In other words this system of control is a thermostatic control but it is using a large part of the refrigerating mechanism as the thermostat.

Thus by means of the pressure control which can be adjusted, the refrigerator can be regulated and kept constant to within one or two degrees.

One of the great advantages of the refrigerating cabinet over the ordinary ice chest is that not only can it be certain that the ice is made from and therefore is as pure as your drinking water, but the atmosphere of the cooled chamber is so dry that molds do not grow, while foodstuffs retain their crispness and freshness to a much greater degree than with the ordinary methods.

To the medical man who wishes to keep stocks of vaccines and sera at a low temperature in his own home one of the ice trays may be utilised and the rest of the space used for domestic purposes, while for those requiring more space a special Ice Maker model is made which can be fitted with double depth ice trays, giving a capacity of over 20 lbs. of ice.

Frigidaire has been found ideal in hospitals and laboratories and in the United States over 200 such institutions are so equipped. The Mayo Clinic, the Henry Ford Hospital and the University of Pennsylvania College of Medicine are amongst those which have these installations.

For the storing not only of sera and vaccines but also of enzyme mixtures, biological products, colloid solutions and other mixtures which decompose at ordinary temperatures and where a constant low and dry temperature is required there is no doubt that the Frigidaire is invaluable.

Editorials

CANCER

This number of the Journal is mostly devoted to Cancer and Leprosy.

The problem of Cancer is the most baffling of all those which have presented themselves to medical science, and yet it is one for which we believe there must be a solution.

In days of old it was looked upon as almost sacrilege to attempt to discover a cure for leprosy, for leprosy was looked upon as in the same category as sin—incurable except by a miraculous manifestation of divine grace—and yet it has been definitely proved that a cure for leprosy exists and the two big problems now associated with this disease are how to apply this cure to the poor unfortunate sufferers and how to protect others from the risk of infection.

In the case of cancer a specific cure has yet to be found. Possibly this may be different for different forms of malignant disease, quite possibly it may be by a combination of different methods as has already been adopted in the combined use of a surgical operation followed by X-ray, radium or lead treatment. But in seeking for a cure anything which will throw light upon the distribution and the cause must be of importance.

Here is a field of investigation to which all medical men working among the Chinese can make a contribution, and three questions immediately present themselves:—

FIRSTLY: *Is malignant disease more common in Europe and America than in China?* Dr. Englaender in the most interesting paper which we publish this month seeks to show that the incidence of cancer is less in people leading a more simple life than, as in the highly Westernised countries, among those living largely on preserved foodstuffs and using extensively such things as tar and its products in daily life.

Is this true of the population of the interior of China? Is malignant disease less common in China than in Europe or America and is it becoming more frequent as the products of Western civilisation are coming into more common use?

The variations of the population from which the statistics are drawn, the ignorance of the common people generally and their disregard for any growths of a painless nature are only two examples of the kind of fallacy which must be guarded against in drawing deductions.

SECONDLY: *Is the proportion between sarcomata and carcinomata approximately the same in China as in Europe or America?* A clear distinction must be drawn between sarcomata and carcinomata, which although both "malignant" are indeed separate entities. Here we are up against another big difficulty. In a country where generally speaking operative treatment will not be permitted *unless it appears to the patient and his friends to be desirable*, and where post mortem examinations are almost unknown, how can we be certain whether a growth is one of sarcoma or carcinoma? Quite recently a case was exhibited at the local branch meeting of the C. M. A. in Shanghai which illustrated this difficulty in diagnosis. A patient was admitted to Hospital with a diagnosis of sarcoma of the femur. The leg was amputated and the tumour was microscoped. The report was "carcinoma—probably secondary:" no primary growth was discovered until a few weeks later when the patient was found to be suffering from a carcinoma of the rectum. Had no consent for amputation and consequently no microscopical report been obtained, the patient would have been discharged as "refusing operation," and the hospital records would have shown one more case diagnosed as sarcoma and one less an carcinoma.

THIRDLY: *Is there any definite variation between Chinese and other races in the anatomical sites most commonly affected by the two chief groups of malignant disease?*

Dr. Maxwell and Dr. Ludlow in their investigations, which are both only "preliminary," have come to a similar "tentative" conclusion that there is a variation in the anatomical sites most commonly affected. We shall look forward to a further report from Dr. Ludlow on the incidence of malignant disease in Korea, and meanwhile we would suggest that other medical men following the general lines of Dr. Ludlow's investigation and avoiding the fallacies which he has pointed out, might most helpfully report upon their experience in different parts of China.

H. G. T.

RADIUM

A Reuter's telegram from London under date April 16th gives the following important news with regard to the supply of radium in Great Britain:

"The report of the Sub-committee of the Committee of Civil Research, appointed in July, 1928, to examine national radium requirements, recommends the appointment of a body to be known as the National Radium Trustees to hold the funds provided by Parliament or other sources and to purchase and hold radium for distribution and use by the Radium Commission, whose establishment is also recommended.

The report estimates that at present there are about 25 grammes of radium available in the country. It recommends acquisition before the end of 1930 of an additional 20 grammes.

The report states that the Belgian Congo is at present the only source from which additional supplies of any quantity can be obtained.

It recommends that the Board of the National Radium Trustees should include the Minister of Health and the presidents of the medical societies. This Board should appoint the members of the Radium Commission.

The report also recommends that a public appeal should be made for funds for the purchase of radium, it being estimated that a sum of £200,000 is required. It is understood that the Government will contribute £ for £.

In the House of Commons to-day the Chancellor of the Exchequer announced that the Government accepted, in principle, the recommendation made by the Committee of Civil Research with regard to the establishment of the organization suggested. He also stated that the Government is prepared to contribute £ for £, up to a maximum of £100,000, for the purchase of radium."

THE HOLT SCHEME

We would like to draw attention to the scheme given on another page for providing free passages to England for a limited number of Chinese medical men who may wish to proceed thither for post-graduate medical work.

The Holt scheme owes its origin to the initiative of Dr. George H. Pearson of the Wesleyan Mission Hospital, Paoking (Hunan) and arose out of an attempt which Dr. Pearson was making to get help to enable a Chinese colleague to proceed to England for study. Eventually provision was made through other sources, but as a direct result of his inquiries Mr. R. D.

Holt, Senior partner in Messrs. Alfred Holt & Son of the Blue Funnel Line, made a generous offer to provide free passages to and from England for other men similarly placed.

Mr. Holt, however, made it a condition, that in the first instance, graduates should study in Liverpool, where he himself lives and works and where in addition to the general facilities of the University Medical School, there are the special opportunities of the Liverpool School of Tropical Medicine.

The scheme was then put before Professor P. M. Roxby, Dept. of Geography and Resident Warden of the Students Hostel, a former member of the Chinese Education Commission, who agreed to act as correspondent and representative in Liverpool and to undertake the reception and oversight of graduates.

At a conference between Mr. Holt, Professor Roxby and Dr. Pearson, it was further agreed that the China Medical Association be asked to sponsor the scheme and be responsible for the selection of suitable candidates. On his return to China, Dr. Pearson discussed the matter with Drs. Maxwell and Gordon Thompson with the result that a detailed scheme embodying conditions and regulations was placed before the Executive of the China Medical Association and in substance approved.

In forwarding a copy of the regulations to Professor Roxby, it was decided to ascertain from the University of Liverpool, in some detail, what facilities for post graduate work would be open to Chinese graduates. A reply from the Dean of the Faculty of Medicine has put the whole scheme on a very practical basis and the Executive Committee of the China Medical Association consider that it is now in a position to invite applications in accordance with the above conditions and regulations.

As it is desirable that graduates should arrive in Liverpool at the beginning of the academic year, *i.e.* not later than October 1st, it will be necessary for applications for this year to be received by the secretary of the Executive not later than July 1st.

Those who wish to apply should read the regulations very carefully and make sure that they fulfil the conditions.

Current Medical Literature**RADIUM AND ITS ACTION**

W. E. DIXON, M.A., M.D., F.R.S.

(From the Pharmacological Laboratory, Cambridge.)

M. Becquerel in 1896 noticed that uranium salts affected a photographic plate through an opaque medium, and a few years later similar effects were described for thorium, polonium, and radium. All these metals emit three varieties of rays in different proportions, which are constant for each metal. Radium salts are, however, by far the most radio-active substances known, and have in recent years assumed a great importance in medicine. Indeed, the only practical application of radium at the present time is in medicine, and in this communication radium only will be considered.

SOURCE

In the early days radium was prepared in Austria from local ores and in France from Portuguese ores; later it was extracted in the United States, and now it is obtained practically entirely from the Belgian Congo. The ores from which it is extracted may be classified as follows:

- (1) Pitchblende, an impure uranium oxide found largely in the Belgian Congo. It contains uranium, lead, silica, iron ore, and selenium. The British Radium Corporation deal with pitchblende at Trentwith in Cornwall, but they have extracted probably not more than 10 grams.
- (2) Carnotite is a potassium uranyl vanadate, and is obtained from Colorado and Utah.
- (3) Autunite or uranite is a calcium uranium phosphate containing lead, and is found mainly in Portugal and Australia.
- (4) Betaphite found with mesothorium in Madagascar.

The history of the commercial production of radium is instructive and may be said to have passed through three phases. The first was that of the Austrian monopoly, during which radium was prepared mainly from the pitchblende of Joachimstal in Austria, and to a limited extent from the uranite of Portugal. The price during this phase fluctuated greatly. In 1905 it was marketed at from £5 to £10 per mg.; in 1909-10 at £15 to £27; and in 1912-14 at £36 per mg. The mines in the United States of America were now, however, competing, and as a result of this the price dropped in 1915 to £32 per mg., and in 1916-22 from £24 to £21. At this period the mines in the Belgian Congo were producing and made their presence felt, so that in 1923 the price further dropped to £14, and it now stands at from £10 to £12 per mg. When the mines in the Belgian Congo were in full working the American plant was shut down, perhaps because they could not compete economically with the richer Belgian ores

and cheaper labour, though American authorities have stated that the reason was that as much radium had been produced as was needed. Before the Belgians operated, Europe had produced perhaps 60 grams and the United States 160 grams. If we place the total radium in the world at 320 grams we know that America possesses half or more than half of this amount. In 1923 the hospitals in the United States possessed 120 grams.

At the present time the Belgians hold the economic monopoly of radium production. In 1923 their plant produced 4 grams a month, and to the end of 1924 had produced 110 grams. But their sales did not equal their production, since in 1924 they sold only 22 grams of radium, which suggests that either their works were slowing down or they were accumulating stocks. It is necessary to appreciate these conditions in order to be clear that plenty of radium is available to meet all urgent demands provided that the price is forthcoming; it should also be remembered that the radium once produced lasts practically for all time.

The British Government has a Radium Committee now sitting to search for new radium fields in the British Empire, and within the next few years we may confidently anticipate the working of new mines, which, by competition, must inevitably lead to some reduction in price.

PHYSICAL PROPERTIES

The action of radium depends on its physical properties, and these must be referred to briefly. The modern view of the atom is that it is composed of a nucleus carrying a positive charge around which the outer electrons are distributed; these electrons are in a state of constant motion and each carries a negative charge. In a neutral atom the electrons must carry a total charge equal to the charge of the nucleus. The nuclear charge of hydrogen is 1, of helium 2, up to radium with a charge of 88, and uranium with a charge of 92.

The radium atom is remarkable because it breaks up by expelling a single alpha particle, which represents the nucleus of the helium atom, which has a charge of 2; or by shooting off an electron (beta particle). The expulsion of the alpha particle lowers the nuclear charge of the atom of radium by two units, and a substance referred to as emanation is produced which is composed of a gas, niton, allied to argon; further expulsion of alpha and beta particles produces a series of radio-active elements known as radium A, B, C, D, E, and F, until ultimately lead is formed, which is non-radio-active. No protons (hydrogen nuclei) are emitted, but only helium nuclei and electrons. Radium salts are thus being continually transformed into other metals, and it has been estimated that about half the radium will be transformed in 1,700 years. The activity of radium salts is measured by the discharge of a gold-leaf electroscope. When radium is used in mass for treatment of the patient the gamma rays only are employed, the alpha and beta particles being screened off—as, for example, by means of 1 cm. of lead. Emanation collected in capillary tubes has the same effect as radium, but its activity is soon lost and ceases in a few days.

Radium, then, has three known types of radiation: alpha particles of helium, which are readily stopped by paper or the skin; beta particles or electrons, which are stopped by 2 or 3 mm. of aluminium; and gamma rays, a type of γ ray, but four times harder than anything which can be produced by bulbs; the gamma rays are produced by the energy liberated in the expulsion of the alpha and beta particles. Radium emanation, or radon, is usually collected in capillary tubes and retains its radio-active properties for a few days only. Substances like lead-foil, or even common salt, placed in the neighbourhood of radium become coated and can be similarly used for superficial applications. Sodium chloride so treated is sometimes dissolved in water and used for injection purposes. The only radio-active substance present in the body is potassium, and the gamma rays which it emits are of greater penetrating power than those emitted by radium.

ACTION

General Effects.—The rays emitted from radium exert a pronounced action on the animal body, and if the dose is sufficient may cause death. For example, if 50 or 60 mg. of the bromide are placed within 8 or 10 cm. of a mousecage for two days the animals die within three weeks. Guinea-pigs and rabbits after a similar exposure also die, though only after several weeks. The symptoms are loss of hair, ulcerations on the skin, especially if the rays have not been screened, nervous symptoms such as paralysis, sexual impotence, and ultimately coma. After death the central nervous system appears inflamed, the whole vascular system is dilated, the capillaries are injected, and the nerve cells in sections show signs of degeneration, though this is not necessarily a primary effect of the rays, but may be the result of capillary haemorrhages. Larger animals do not exhibit these effects in the same degree.

Local Action.—This is of great importance in surgery, because radium is largely used to destroy tissues; for general purposes emanations are to be preferred to the metal, not only on account of convenience, but of economy and safety. The various tissues in the body are not affected equally by radium; the most susceptible is the lymphatic system, including the spleen, the gonads, and, though to a smaller extent, the central nervous system. Thus the testes of small animals atrophy, the epithelium degenerates, and spermatozoa are not formed. The effect on the ovaries is shown by the production of artificial menopause. These results are all associated with inflammatory signs, including marked dilatation of the capillaries. Developing eggs and embryos are very susceptible to the rays; bacteria, on the other hand, are affected only feebly, though the mobile forms are killed more easily than others. One explanation of the selective action of radium on certain tissues is the fact that it decomposes lecithin, and it is just those tissues which are rich in lecithin that are affected most. It has also been suggested with good evidence that the degenerative changes seen after radium are due to the toxic action of this decomposed lecithin. It may almost be accepted on broad lines that the susceptibility of tissues to radium varies with their rate of growth. Tumours are certainly more susceptible than normal tissues, rapidly

growing tumours more than sluggish or benign tumours, lymphosarcoma more than carcinoma. Hence it is easy to understand that tubes of emanation buried in cancerous tissue cause degeneration of the cells and reduction in the size of the growth. In the treatment of deep-seated tumours injury to the intervening superficial tissues must be minimized as far as possible by screening off the alpha and beta rays, the alpha rays in particular having the most intense superficial effect. One other point is worth noting: the gamma rays increase the activity of the autolytic ferments, thus facilitating the absorption of dead cells. Many local conditions are now treated successfully with radium—such as rodent ulcer, lupus vulgaris, and naevi.

Systemic Action.—But besides this local action for which the surgeon uses radium, it is sometimes administered internally to produce systemic effects. Minute amounts of a salt of radium taken by the mouth are very rapidly absorbed, permeate the whole body, and are excreted as emanation and radiation by the lungs, and to a smaller extent by the urine. It is more usual, however, if a general effect is required, to take emanation either by the mouth or as an inhalation. No doubt the best method of administration for systemic effects is to use a water charged with emanation. A usual amount is half a pint daily containing 1.5 to 2 millicuries per litre. After the administration of very large amounts of emanation such as may be given as an inhalation to animals, general depression, marked dyspnoea, and death have been observed; the characteristic changes after death are widespread hyperaemia and changes in the nerve cells of the central nervous system. The indications for the employment of radium for its systemic action are still ill defined. The most successful use to which it has been put is to relieve pain in fibrous arthritis, sciatica, and tabes. The explanation of this action is suggested by the frequency with which the use of this kind of treatment is followed by a general "flare-up" of the affected tissue; indeed, the drinking of radium water may start an acute attack in any part subject to chronic inflammation. The known action of radium in producing inflammatory changes even in normal tissues is exaggerated in the case of tissues which already show chronic inflammatory effects. In other words, we are dealing with a kind of shock treatment somewhat analogous to protein-shock therapy. In chronic gout the effect is often of the same nature; in the gouty the employment of radium may initiate an acute attack, though general improvement is said to follow after some weeks. In this instance the treatment is purely palliative, since the uric acid in the blood is not affected.

Radium has met with a small degree of success in certain blood diseases. It certainly influences both the bone marrow and spleen; after the prolonged use of small doses in normal people the red blood corpuscles are said to be increased as well as the leucocytes in the peripheral circulation. Large doses have the opposite effect. There is nothing remarkable in this action; other substances have a like effect. Radium also increases the coagulability of the blood to a decided degree. In the leukaemias the local application of radium over the lymphatic glands and spleen has caused temporary improvement. It is well known that both

α rays and radium diminish the leucocytes and the size of the spleen in leukaemia, though no permanent improvement in the disease occurs with either. It is interesting to note that the serum obtained from patients recently subjected to α rays, when injected into lymphocytic patients, induces a reaction.

Radium has been used also in many other diseases, such as glycosuria, arterio-sclerosis, and high blood pressure, but the beneficial results sometimes accredited to the treatment are altogether unconvincing. So far as the evidence exists, then, the action of radium is due mainly to its effect on blood vessels and perhaps on lecithin. Thus on the skin the capillaries dilate, leucocytes migrate, and later extravasations of fluid occur. The same type of action may occur in any tissue in the body, and the effect is especially marked on chronically inflamed tissues. The changes noted in the central nervous system always begin in the blood vessels, and the nerve-cell degeneration is probably secondary, though it must be remembered that the central nervous system contains a large amount of lecithin.—*B. M. J. Feb. 9, 1929.*

RADIUM IN THE TREATMENT OF MALIGNANT DISEASE

PROFESSOR GASK AT THE ROYAL COLLEGE OF SURGEONS

A Hunterian Lecture on the use of radium and its emanations in the treatment of various forms of malignant disease was delivered by Professor G. E. Gask at the Royal College of Surgeons of England on January 30th. The lecture was a survey of the results of this treatment as obtained by the Surgical Unit at St. Bartholomew's Hospital, and was followed by a demonstration in the library of the College of patients who had been treated by radium. Professor Gask explained that he was acting only as the mouthpiece of the Surgical Unit, and was describing work which had been carried out by a team. He was fully conscious of the great amount of excellent work done abroad and in this country; if he did not refer further to it, it was not from want of appreciation, but because he thought his audience would prefer to learn the results of the particular investigation of which he could speak with personal knowledge.

CLINICAL RESULTS

In 1921, with some radium loaned to the Surgical Unit by the Medical Research Council, a start was made on the treatment of sarcoma; four patients were treated, of whom only one remained alive. The treatment employed at first was to implant a tube containing a large dose of radium in the middle of the tumour, and leave it there for a short time. In 1922 five patients with sarcoma were treated, of whom again only one remained alive. The treatment of sarcoma was disappointing, and moreover, no large number of cases was available; therefore an attempt was made on carcinoma of the breast, only cases of recurrence, too advanced

for further operative treatment, being taken. These were treated in the same manner, with the buried tube, but again the results were almost uniformly bad. Of three such patients treated in 1922, two in 1923, and two in 1924, not one remained alive.

In 1924 the first case of primary carcinoma was taken. While radium was found to have a very considerable action on the tumour, these cases of advanced growth, where there was metastasis, went on to a fatal issue. It was also clear that the radium was not distributed far enough or evenly enough. The technique was changed, therefore, a smaller dose being given for a longer time. The first patient with primary carcinoma, treated in 1924, remained alive and well to-day. In 1925 six such patients were treated, of whom two remained alive, and in 1926 of another six, four remained alive. Of the thirteen treated in 1927 ten remained alive, and all the thirty-nine treated in 1928 had survived so far. The technique, which had been gradually evolved, was to insert a large number of needles—up to thirty-five—placing them underneath the breast, between the breast and the pectoral fascia, so as to make a kind of barrage; the axillae were dealt with in a similar manner. In one such patient in whom the carcinoma of the breast was well marked, the growth disappeared four months after radium treatment. After mentioning other striking cases of the same kind, the lecturer remarked that it was quite clear that a stage had been reached at which the immediate results of radium treatment could be pronounced satisfactory. The tumours shrivelled, fungating ulcers vanished, and the glands cleared up. This had not happened once or twice, but time and time again.

THE NATURE OF THE CURATIVE PROCCSS

Professor Gask said it was interesting to speculate what happened when radium was applied to a tumour. Physicists had suggested that the result might be due to an enormous agitation of electrons which caused heating of the cells and killed them by coagulation of the protein, but now there appeared to be some scepticism as to the very existence of the electron. While it could not be stated what was going on in the cell, some interesting experiments had been conducted by Dr. Canti and others. The lecturer exhibited a box of mustard and cress in the middle of which radon seeds had been inserted. In this spot the plant did not grow, and surrounding this area was a fringe of stunted growth. He also showed on the screen a section from a well-marked carcinoma of the breast. This patient, after five months, still had a lump in the breast, and it was uncertain whether the tumour was still alive. A local excision was therefore made, and the carcinoma disappeared, only necrotic tissue being left.

ULTIMATE RESULTS OF RADIUM TREATMENT

As regards the final results of treatment, Professor Gask said that time must elapse before it would be possible to make any definite pronouncement. But as a basis of comparison he had taken a chart from the "follow-up" department at St. Bartholomew's showing the survival rate among women who had had various kinds of operations on the breast for

carcinoma. The results were, he thought, appalling. At the end of six months only 85 per cent. were alive; at the end of two years about 60 per cent., after three years 50 per cent., and at the end of six years, which was the full period covered, 20 per cent. Thinking that this might possibly be exceptional, he inquired from Mr. Miles as to the statistics for the Cancer Hospital, and from these it appeared that ten years after operation the survival rate was only 20 per cent.

TECHNIQUE OF RADIUM THERAPY

Professor Gask then proceeded to speak about the introduction of radon seeds, which had the advantage that they could be used in very small confined spaces. The seeds were placed at the periphery of the tumour in such a manner that the whole tumour was irradiated. The first case in which this method was applied was a fungating epithelioma of the tongue; it cleared up in a remarkable way, the like of which he had never seen, with the exception of the disappearance of some gummas under the influence of iodide treatment. He showed lantern views of several cases of epithelioma of the tongue, with a good result in almost every instance. The problem remained how to deal with the glands, and Professor Gask illustrated the way in which needles, each containing 1, 2, or 3 gm. of radium element, were placed over the area.

With regard to tumours of the brain, it was thought that it might be possible to expose the brain tumour and leave radium in position. A case of commencing acromegaly in a woman presented itself; the pituitary tumour was exposed, and one radon seed inserted. The patient lost her symptoms, including headache; her fields of vision became normal, and she was very grateful. It was arguable, of course, that the manifest benefit was due to decompression, and not to radium treatment; on this he ventured no opinion. He related other dramatic cases in which radon seeds had been inserted in brain tumours, resulting in enormous improvement. One woman with a glioma had had ten radon seeds inserted with remarkable benefit, though here again the good result might be due to decompression. With regard to other internal tumours, attempts had been made to treat these in the same manner, so far without much progress.

In conclusion, Professor Gask said that it might fairly be claimed that Madame Curie and the physicists had placed in the hands of the medical profession a new and very potent weapon, of the extent and power of which they were not yet fully aware; that it was useful he was convinced. He confidently hoped that many of these cases, the like of which had previously been treated by operation, could now be cured by this method. Yet a note of warning must be sounded for those who were about to take up the use of radium, which, like all potent agencies in medicine, might be active for evil as well as for good. Surely Shakespeare might be held to have foreseen this when he bade us beware lest we heal the inveterate cancer of one wound by making many.

After the lecture a demonstration was given by members of the Surgical Unit of a remarkable series of forty-nine patients who were

gathered in the library of the College. These patients had been suffering from various forms of malignant disease—of breast, tongue, floor of mouth, lip, pharynx, and brain—and all had been treated either with radium or radium emanations. In all of them the original tumour from which they had suffered had disappeared, and they remained apparently well. Patients were shown in all stages of duration of treatment, from four years to three weeks.—*B. J. M. Feb. 9th 1929.*

RADIUM TREATMENT OF MALIGNANT DISEASE OF THE UTERUS AND OVARIES

A meeting of the Section of Obstetrics and Gynaecology of the Royal Society of Medicine was held on February 15th, with Dr. J. S. Fairbairn in the chair, when Professor J. Heyman (Stockholm) read a paper on the uses of radium in the treatment of malignant disease of the uterus and ovaries.

Professor Heyman opened by stating that for a long time it had been known that certain carcinomas could be cured by radiological treatment, the term "cure" meaning the absence of recurrences for period of five years or longer; cancer of the uterus belonged to this category. Radiological treatment, when carefully adjusted, excited a healing process characterized by destruction of the tumour cells and regeneration of the tissue which was the seat of the destructive process. So in a cured cervical cancer the cervix and vagina were found to be restored to their normal outlines. In most cases, however, a moderate atrophy of the uterus and vagina remained. Only those who had been engaged in radiotherapeutic work for some considerable time were fully able to realize the exceedingly great care and precision with which radiotherapy had to be handled, and the severe damage which might be inflicted on a number of patients by unskilled operators. The Radiumhemmet, founded by Forssell in 1910, was a special clinic for radiotherapy, particularly intended for the treatment of malignant growths; and, from the very beginning, treatment was only applied in the case of inoperable malignant tumours. When undoubted results had been gained in these cases, the treatment of borderline cases, and, lastly, operable cases, was undertaken. Thus, during 1910-18, the inoperable cases in the series made up 80 to 90 per cent. of the total number. But, none the less, in these inoperable cases, five-year results fully comparable with the best results obtained by surgical operation were realized. Forssner and Essen-Möller had led the way in submitting operable cases of cancer of the cervix for radiological treatment. During the period 1914-23 inclusive, 737 cases of carcinoma of the cervix had been treated at the gynaecological department of Radiumhemmet. The followup department was efficient, and was greatly aided by official Government recognition. Of the 737 patients primarily radiologically treated, 170 were alive, free from recurrences five years after the treatment—23.1 per cent. five-year cures. During the period 1914-23, 188 operable cases were treated; of these, 82 were alive, free

from recurrences after five years—43.7 per cent. cures among operable cases. Inoperable and borderline cases during the same period numbered 549; of these, 88 patients were cured and alive, free from recurrences after five years—16 per cent. of cures. A detailed account of the treatment would be found in *Acta Radiologica*, vol. x, fasc. 1. Professor Heyman maintained that the governing principle in the local radium treatment was the small number of relatively heavy doses given within a relatively short period of time, and at intervals adjusted with reference to reaction and course of healing. Thus, within a month, there were three applications which occupied from nineteen to twenty-three hours, and in every case a filter equivalent to at least 3 mm. of lead was used. Finally, percutaneous treatment with radium at a distance showed remarkable primary results; for this at least 2 grams of radium were required. Forty-six patients with cancer of the body of the uterus had been treated with radium from 1913 to 1921; 45.7 per cent. were inoperable. Of these, 20 were alive and free from symptoms at the end of five years—43.5 per cent. In the treatment of cancer of the body the same principles were followed as in cancer of the cervix, the vaginal dose being decreased. Operation was advised if at the end of about two months after treatment symptoms of recurrences appeared. Radiological treatment alone would not yield any lasting results in carcinoma of the ovaries, and it was necessary to adopt a combined surgical and radiological treatment. Radium treatment in these cases was combined with x-ray treatment, and should the tumour become small and moveable surgical aid was called in. It was of the utmost importance that the treatment of gynaecological cases should be left in the hands of the gynaecologist trained in radiology. The point was emphasized that the good results that had been obtained, although largely dependent upon the technique employed, were, perhaps, above all due to the fact that the treatment had been attached to a radiotherapeutic clinic.—*B. M. J. March 9, 1929.*

THE PRESENT POSITION OF LEAD THERAPY IN MALIGNANT DISEASE*

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INTRODUCTION

At the outset it is advisable once more to express the conviction that by prevention only shall we stay the onward march of cancer. Elsewhere

*A post-graduate lecture, with lantern illustrations, delivered under the auspices of the British Empire Cancer Campaign and the Leeds and West Riding Medico-Chirurgical Society, in the Medical School, Leeds, on January 8th, 1929. This investigation was undertaken on behalf of the Liverpool Medical Research Organization.

we have dealt with this aspect of the problem, and have indicated that success in this sphere can be accomplished only if we take into account the numerous sources of, and factors concerned in, the irritation of the human tissues that may result in the precancerous state. On the other hand, the alleviation and cure of cancer, once the disease has developed, appears not to be related to the etiology as such, but rather to the nature of the cancerous process to be arrested by all the remedial measures at our disposal. Until recently these measures have consisted almost entirely of surgical and radiological procedures, and no impression seems to have been made on the rate of increase in the mortality rate. Clearly, the mortality figures must have been reduced in direct proportion to the number of cases saved, but these have been too few in number to counterbalance the increased incidence rate of the disease, which appears in a great measure to be due to the prolongation of life in civilized communities.

In our opinion the saving of more patients stricken with the disease—often men and women in the heyday of their mental attainments and of their value to mankind—will ultimately come through chemotherapeutical or biochemotherapeutical methods. In regard to the latter, immunifacient and cytotoxic effects by means of specific biological substances were first attempted by us twenty years ago, and are still under consideration. The local treatment of malignant affections has almost, if not quite, reached standardization.

CHEMOTHERAPY IN CANCER

Successful chemotherapy is particularly difficult even in connexion with the destruction of parasitic organisms that have gained entrance to the body, but in this direction great advances have been made during recent years. When, however, we attempt the elimination by synthetic products of certain cells developed from, and dependent on, ordinary somatic tissues—"organochemotherapy," as it is called—we are faced by many grave difficulties, and we shall probably be held up in our search for substances with a high organochemotherapeutical index until further investigations have been made concerning the functions of the reticulo-endothelial system, and in regard to the physicochemical conditions in which drugs exert their actions on living tissues. Research work along these lines is in its infancy, but nevertheless must be properly appreciated without delay.

The reasons why we adopted the metal lead as our primary constituent for the chemotherapeutical treatment of cancer have so often been stated that no further explanation is necessary.† A point of importance associated with our work is that the encouragement received from the use of crude products has been sufficient to urge us forward to seek improvements especially in the direction of organic complexes containing lead, and, in a general way, hope of ultimate success in the treatment of malignant disease by chemotherapeutical measures has been kindled in others. It is our earnest desire to foster this hope in order that many more labourers

†The chief matters of interest in this connexion were demonstrated.

may enter this promising field. Interest can best be promoted if we recall a few only of the encouraging developments we have witnessed during our work, and attempt to discover why we have been rewarded with a certain measure of success in the cases now described, some of which have been recorded on previous occasions.

COMBINED TREATMENT OF CANCER

We have mentioned the utilization of all the remedial agents at our disposal in the treatment of cancer, and it is certain that no doctor, no one with humanitarian instincts, would do otherwise than place the safety and cure of his patients foremost in his mind. It will be seen, then, that not all of our patients have been treated by lead alone. Whenever practicable, we have felt it desirable to assist this treatment by the removal of as much of the growth as possible, the subsequent treatment with lead being commenced immediately. In many cases, too, we have utilized our knowledge of the augmented effect of α rays and radium acting in conjunction with lead, and of the fact that this combination may enable us to obtain satisfactory results with smaller doses of each than would be effective if either were employed alone. This, no doubt, may be open to the criticism that in those cases in which combined treatment has been practised it is impossible to say which agent has produced the beneficial result, when this has been obtained. But, even though we do regard the dictates of humanity, surely we have ample evidence in favour of the use of lead, for in a number of cases in which some preparation of this metal has alone been used recovery has followed. So, too, we now have the knowledge, not only as the result of our own observations, but also of those of Carter Wood, Mottram, and others, that while α rays, radium, and lead may each produce a beneficial effect when used separately, an aggregate effect is secured when lead and α rays or lead and radium are applied within a short time of one another.

It will be found, therefore, that some of our cases were treated by lead alone, others by operation followed by lead, and again others by lead and α rays or radium.

INDICATIONS AND CONTRAINDICATIONS FOR TREATMENT WITH LEAD

We have emphasized the fact that in respect of our present practice the general condition of the patient is of paramount importance. With increased experience we have come to regard the situation of the malignant neoplasm as of lesser importance, and to-day we certainly should neither exclude cancer of the lung nor malignant disease of the central nervous system.

The question of malignant disease of the liver and of a kidney is, however, more difficult, for in general examination of the patient we lay considerable stress on the integrity of the functions of these organs. It will readily be appreciated that if either be already affected with malignant disease, or be otherwise previously damaged, there is a greatly increased risk of adding to their functional distress by the administration of lead. At any rate in such circumstances great caution is required.

It may be interesting to recall one case (248) in which there was carcinoma of the left kidney. Careful examination revealed the fact that the right kidney was absent. To have treated a patient with lead in these circumstances would have been to court disaster.

Apart from lesions in these two organs, we must also take into consideration the state of the heart and blood. Severe myocardial insufficiency necessitates the most cautious use of lead, and serious anaemia with a low red-cell count precludes the use of this substance until considerable improvement by blood transfusion or other measures has been effected. In the last place, we must also take into careful account the general condition of the patient in regard to acidosis with ketonuria and other constitutional states.

In malignant disease the progress to a fatal issue varies in different patients in a remarkable manner. In some—usually the young—the course is so rapid that the general condition of the patient appears to be little affected until the very end. In others—for the most part the aged—the disease progresses very slowly and appears to produce no serious constitutional disturbance for a very long time. In most patients, however, the malignant process advances at a steady rate, undermining the constitution of the patient, however strong he may previously have been, and sapping his vitality, until what we describe as a condition of profound cachexia supervenes. Now it is in the presence of a state of definite cachexia that we must hold our hand. So long as the patient is in good condition, with a prospect of about six months of life, if other things are equal, treatment may be contemplated. In this matter considerable judgement and prognostic acumen are necessary.

METHODS OF TREATMENT WITH LEAD

Dosage.—In a general way it may be said that we have tended gradually to decrease the individual doses, while aiming steadfastly at the administration of a high total quantity of lead—that is, 0.5 gram to 0.8 gram or a little more. In a number of cases we have been successful with a smaller total quantity than 0.5 gram of lead, which we believe to be the minimum amount desirable in ordinary circumstances. On the other hand, we have given nearly 1 gram of lead before obtaining a satisfactory final result. Empiricism in this matter is quite impossible; the greatest consideration and care are required if safety to the patient is to be ensured, and a successful result obtained.

Material.—For almost the entire part we have employed a suspension of metallic lead prepared by Professor Lewis and his associates, and the colloidal preparation of lead phosphate made by Professor Heilbron and those working with him. For a time we used a suspension of lead selenide, but this appeared to be almost too stable to give good results, although it is not inert; it is, however, singularly atoxic. Lead-selenium has, however, been successfully employed by Dr. Todd of Bristol, who was the first to make and use this preparation of lead.

Administration.—Injection of the material into a vein in the arm has been by far the most common method of administration. We have, however, in a few cases, injected the preparation into an artery. Two cases

of malignant disease in limbs will be mentioned in which this procedure has been practised, apparently, and so far, with promising results. We look forward to the obvious advantages and possibilities of this route in the treatment of malignant diseases of the limbs, month, and other regions with a readily available and convenient arterial supply. In a few of our earlier cases intramuscular injections were employed. Ionization with lead of malignant ulcers is, too, a mode of attack which we have practised. We have already referred to the beneficial results that may be obtained by the application of x rays or radium at an interval of four days following the administration of lead.

Mobilization.—We apply this term to the process of bringing the lead that is stored in the body again into the circulation, from which it may be taken up by the growth, if this still be present, or excreted. Some years ago we were faced with the difficulty that in certain patients, who had received what we considered the maximum quantity of lead that could be given with safety, the neoplasm was still in existence or had recurred. It occurred to us to mobilize the lead still remaining in the body by the administration of acids or other chemical substances; and we found this possible. Sometimes stippled erythrocytes reappeared in the blood; and excretion by the urine and faeces was increased. We have, however, no direct evidence that the growth takes up the lead in these circumstances. We are at present inclined to think that the metal already attached to the tumour may be released; and in some cases the growth which has not entirely disappeared but is arrested may thereby be released from control and start afresh to develop. Consequently, we now hold the view that so long as any growth remains mobilization must not be practised. Indeed, this procedure should be reserved for those cases in which there has been no sign of neoplastic development for several years, and in which it is desirable that the liver and kidney functions should be normal.

There is no doubt that lead tends to be eliminated from the body in the course of time, and this itself may be a source of anxiety in respect of the possibility of recurrence. It appears most profitable to maintain a supply of lead in the tissues until all danger of recurrence is long past, for we have observed that in such circumstances the placenta in pregnancy several years subsequently, and therefore probably a neoplasm, is capable of taking to itself lead from that stored as the result of previous treatment.

GENERAL CHARACTER OF RESULTS

One of the difficulties that have arisen in the general appraisalment of results has been due to the different methods of tabulation adopted by various authors. Those unable to appreciate evidential values have taken the definite stand of "all or nothing"—that is, absolute cures or failures alone, in their view, are worth recording. Moreover, the primary condition attaching to all forms of scientific treatment—namely, that the method adopted shall be properly applied—has not infrequently been ignored. In this connexion it will be found that where a series of failures has been recorded the patients have been so ill that treatment

could not be completed, or that the treatment was so conducted that the patients died as the result of it. Such groups of cases should be excluded from any estimation of the effect of treatment—they have no evidential value at all.

Again, it cannot be too forcefully reiterated that in the early application of any new method, however important an absolutely curative effect may be, *arrest and alleviation of the disease must equally be taken into account*, for such phenomena afford a valuable indication of the correctness of the principle of the treatment adopted, and give promise of the fruits of complete victory if the pursuit be pressed.

There is another phenomenon of great interest that has been observed by ourselves and others, concerning which we shall have more to say directly. We refer to the complete arrest or even disappearance of the growth with reappearance after a short or a considerable length of time. From this we may provisionally conclude that it is advisable to continue in a modified form the treatment over a longer period of time than previously considered necessary.

Finally, it may be suggested that in all cases in which a beneficial effect is obtained, the restoration of the natural vital processes plays a part in the result.

STATISTICS AND RESULTS

In any assessment of the results of the treatment of human disease, and especially of malignant disease, we are confronted with so many variable factors—site of neoplasm, type of growth, stage of the disease, whether it be primary or secondary, the constitutional condition of the patient, the psychology and experience of the medical attendant, and the rest—that no statistical survey of grouped or general results which takes into consideration a less number than several millions of cases can be more than suggestive. So it is clear that when a practitioner, inexperienced in the method employed, fails in 25 or 50, or even 100 cases, to secure a single completely satisfactory result, as very easily may happen with a new method of treatment, it must be remembered that negative evidence of that sort can never be weighed in the balance against that which is positive.

It has seemed to us, then, that at the present time the clear enunciation of many positives in a variety of circumstances may set in motion philosophical reflection in minds trained to apprehend.

In the following table details of general interest are presented in a simple manner in order that no confusion may be created as to the results recorded, or objections raised on the score of incompleteness of information, as has happened without justification in the past, in spite of the fact that we have on several occasions published full statements of our methods and results, with illustrative cases.

Table of Results

November 9th, 1920-November 9th, 1928

1. Total number of cases treated	566*
2. Died of the disease before treatment could be completed	359
(a) Received less than 0.25 gram Pb	198
(b) Received more than 0.25 Pb, but less than 0.5 gram	161-
3. Died of the disease after treatment concluded	77-
4. Died of intercurrent affections, while under treatment	7
5. Died as result of extensive destruction of disease	5
6. Complete treatment refused	22
7. Too recent for results to be estimated	31
8. Believed cured, but died of other affections (1 from apoplexy, 4½ years' interval; 1 from toxæmia of pregnancy, nearly 5½ years' interval)	2 +
9. Disease completely arrested	12 +
10. Believed cured and treatment stopped	51 +

In any estimate of results the serious type of case for the most part treated must be clearly remembered; it may be described as consisting largely of that in which the condition was considered hopeless. Ignoring, however, any consideration of temporary benefit—amelioration of symptoms and prolongation of life, or fatal destruction of the neoplasm—it appears that we have 303 cases to consider (items 2 (b), 3, 8, 9, and 10), cases which received more than one-half of the minimum treatment advised. Seventy-seven (77) died after full treatment; consequently it might be argued that there were 65 successes as opposed to 77 failures. Moreover, we have reason to believe that at least 40 per cent. of the "too-recent" cases will terminate favourably. Nevertheless, to put our statistics in the worst possible light, we can state that there were 65 successes out of 303 treated—that is, 21.5 per cent. of successful results.

CONCLUSION

In conclusion we may urge two points, the recognition of which seems to us to be of paramount importance in the consideration of the treatment of malignant disease with lead at the present time.

First, no one in his senses would care to suggest that the possession of a knife and a few instruments is all that is required for the surgical cure of cancer of the stomach. Yet some seem to think that for lead therapy in this disease all that is required is that lead shall be pumped into the veins of the sufferer. We now realize that it was not the fault of radium that it was of so little clinical use twenty years ago.

*At the conference in London in July, 1928, speaking from memory, I stated that about 1,000 patients had come under our care in Liverpool. This number is a little in excess of the exact figure. Many cases additional to those given above, however, and recorded in previous tables as "died before treatment could be commenced," and a further number rejected after consultation and examination, help to bring the total of cases seen nearer to the number stated.

Second, the scientifically minded inquirer will not demand that a new method of treatment for cancer operating on the worst and most advanced types of cases shall give far better initial statistical results than those obtainable with other long-established and standardized forms of treatment acting on early and selected cases; but, if it should do so, those capable of appraising evidential values will appreciate the vast possibilities that await full and proper development of the method tested.

I have to thank my colleagues Dr. Leslie Cunningham, Mr J. B. Oldham, Dr. S. B. Herd, and Dr. M. Datnow, not only for the careful way in which they have conducted the laborious task of analysing the case records and tracing the fate of the patients, but also for co-operation in the clinical work, much of which has been conducted entirely on their own initiative and responsibility.

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LEAD THERAPY

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Blair Bell in 1925 called attention to the fact that certain cases of malignant disease had been arrested by the intravenous administration of colloidal lead. After study of the methods employed in Liverpool the treatment of a series of patients was begun at St. Luke's Hospital, New York, and it has been carried out during the last two years. In view of the interest in the method shown by the profession and by the public, this preliminary report is being made of our results.

Many of the patients received large doses of x-rays simultaneously with or subsequent to the administration of the lead. The reason for this was that Blair Bell had reported that the combination seemed useful and it also seemed unfair to the patients to deprive them of a remedy

that had already been shown to have certain palliative or curative effects. X-rays were therefore given to all except a few patients—for example, those with diffuse carcinoma of the stomach of leather bottle type. In these it was felt that the x-rays would only aggravate the symptoms and make the patients worse.

The present paper constitutes an analysis of the effects produced by these treatments on forty patients. It covers a period of two years. These forty patients were in hopeless and advanced stages of the disease. They were suffering from carcinoma or sarcoma and had recurrent or inoperable malignant tumors at the time they were under treatment, and they are selected because they were given not less than from 150 to 663 mg. of the colloidal lead. One patient with Hodgkin's disease and one with chronic myelogenous leukemia were also treated. Twenty other patients, all with advanced and extensive carcinomas, were treated during the same period, but all of these were given less than 150 mg.; only a few were given more than one dose, and in every case the hopeless condition of the patient was promptly apparent and the progress of the disease so rapid that it was early concluded that to persist with the colloid was inadvisable. These twenty patients should therefore be excluded if any attempt is made to judge the therapeutic effects of lead. Nearly all have died of their tumors at a period which would have been expected from the normal course of the neoplasm. A few others are still living but in so cachectic a state as to render any further treatment either with lead or with x-rays inadvisable.

A consideration of the forty cases mentioned shows what may be expected from the treatment of such a class of hopeless patients with lead and x-rays. A survey of the clinical records may be thus summarized: Many of the patients were relatively young, one fourth of them being under 35 years of age and three fourths of them under 50. Twenty-three were men, and the other seventeen were women. The diagnoses made in these are given in the accompanying table. Many of these patients had received prolonged and heavy roentgen treatment without benefit before the lead therapy was begun.

The cases of myeloid leukemia and of Hodgkin's disease were treated as an experiment because the neoplastic character of these diseases has been often asserted by pathologists. The granulation tissue in Hodgkin's disease should be susceptible to lead, since it is generally susceptible to x-rays, and also because lead appears to affect the granulation tissue in ulcerating tumors. The patient with Hodgkin's disease was not in any way benefited. The lead did not alter the white cell count of the leukemia in the slightest degree but the patient later rapidly improved under roentgen irradiation.

All of these patients had been operated on either for the purpose of removing the growth or to obtain microscopic sections. In only two of these cases, a recurrent carcinoma of the breast and a carcinoma of the lesser curvature of the stomach, were microscopic slides not obtained, but a reliable statement as to the microscopic diagnosis made elsewhere was available.

Diagnoses in Forty Cases

Epithelioma (tonsil, cheek, cervical nodes, vulva and larynx) ..	5
Carcinoma of cervical region, possibly of thyroid origin.....	1
Carcinoma of breast	5
Carcinoma of bronchus	1
Carcinoma of stomach	4
Carcinoma of colon	4
Carcinoma of body of uterus	2
Carcinoma of ovary	2
Carcinoma of pancreas	1
Hypernephroma	1
Teratoma of the testis	3
Seminoma of the testis	1
Carcinoma of the bladder	2
Lymphosarcoma of the cervical nodes	1
Sarcoma of the pharynx	1
Myosarcoma of the cervical region	1
Fibrosarcoma of the cervical region	1
Retroperitoneal sarcoma	1
Sarcoma of the femur	2

TREATMENT

With two exceptions, the forty patients were all hospitalized while they were under active treatment. Seventeen of them were permitted to return to their homes at various times during the course of the treatment, coming back to the hospital for a few days while they were receiving the larger doses of both lead and x-ray.

In all, five preparations of colloidal lead have been used: lead prepared according to the method originally described by Bell; two preparations of colloidal lead phosphate, one received through the kindness of Dr. H. J. Ullmann of Santa Barbara, and another prepared under the direction of Dr. G. H. A. Clowes of Eli Lilly and Company; a mixture of colloidal lead and lead selenide containing 2 per cent of lead, furnished by the kindness of Professor Bell, and a proprietary British colloidal lead.

In the earlier cases, treated in 1926 and the first part of 1927, only the original Blair Bell formula was used. The quantity given at a single dose has varied from 30 to 110 mg. In general, it has been our aim to follow the method laid down by Bell and his colleagues and to attempt to give 600 mg. of lead within a period of from six to eight weeks. In only very few cases was it found possible to accomplish this. The anemia and the gastro-intestinal symptoms which sometimes developed rapidly made it apparent that it was advisable to give smaller doses, separated by longer intervals. Half of the patients were never given more than 350 mg., but twelve of them were given more than 550 mg. The maximum dose given was 660 mg. of the original Blair Bell colloid.

Despite this heavy dosage there were no deaths in our patients that could be attributed to lead. No serious complications have been observed.

Anemia, however, has developed fairly regularly following the administration of the larger doses, especially of the Blair Bell lead. A small proportion of the patients experienced chills from two to six hours after the treatment. A slight rise in temperature was very frequent but not constant. A faint trace of albumin was regularly observed the day following the treatment, but it disappeared within two or three days. A few casts were occasionally seen for a day or so. Hematoporphyrin was almost invariably observed in the urine within a few hours after even moderate doses of the Blair Bell colloid. It was not found after the phosphate or other types of colloid. A lead line was observed in more than half the cases, often, as has been pointed out, only around teeth which are dead or where the alveolar mucous membrane has been recently infected. No involvement of the central nervous system has been noted, with the possible exception of three patients. One, after being given 632 mg. for a retroperitoneal sarcoma, developed an extensor paralysis of the right hand a few days before his death. Another patient complained of shooting pains in the muscles of the back and along the distribution of the sciatic nerve on both sides a few minutes after each of the three doses. This pain disappeared rather slowly, lasting for a week after the third dose. The third was a patient with carcinoma of the rectum and extensive metastases to the liver and nodes. She received only 275 mg. of lead and was extremely cachectic at the time it was given. Following the third dose she developed symptoms believed to be due to a lead encephalopathy by one of her physicians, but the liver was extensively involved by the neoplasm and a mild jaundice was present, so that no great importance can be attached to the development of cerebral symptoms.

Sixteen of the patients required from one to four transfusions. Transfusions were given according to the clinical condition of the patient rather than arbitrarily, the condition being judged by the percentage of hemoglobin or the degree of stippling. However, it was generally found advisable to keep the hemoglobin above 60 and therefore transfusions were given frequently in some of the patients who received heavy medication, in order to avoid symptoms of acute anemia. When more than two stippled cells were seen in an oil immersion field, the treatments were interrupted. In one of the patients the hemoglobin fell from approximately normal to 30 per cent, and this followed prolonged irradiation and 325 mg. of lead. Another patient who had received 340 mg. still had a hemoglobin of 80 per cent and felt perfectly well. These cases illustrate the marked differences that exist between individuals in their toleration of lead and the capacity of the bone marrow to regenerate.

In nine of the patients a slight icteric tint was observed following nearly every dose of lead. This generally appeared within twelve to twenty-four hours, at which time it reached a maximum, and after seventy-two hours began slowly to disappear. Two of the patients had severe jaundice, with palpable and tender livers, the bile index in these cases being 30 and 72, and in only four cases was there a sufficient degree of intestinal pain, nausea and distention of justify the conclusion that the patients were suffering more or less from lead colic. In every case, however, it was far milder than the classic colic seen in painters with

chronic poisoning. In one case this followed the administration of 300 mg. of the Ullmann phosphate and 56 mg. of the Blair Bell lead. The pain developed the day following the last treatment and persisted for about a week. During this time there was persistent constipation and pain referred to the left hypochondrium, the epigastrium, or the umbilical region. The patient was somewhat benefited by intravenous treatment with calcium chloride and the condition entirely disappeared within ten days. In one other patient nausea persisted for four months. This was not accompanied by constipation, but epigastric pain was frequently present. The patient died six months after the conclusion of a course of 553 mg. of Blair Bell lead, but, as a postmortem examination was not permitted, other reasons for the nausea could not be determined. However, no visible evidence of cancer en cuirasse was present, as in the beginning, and death was of a sudden myocardial type.

At least fourteen of the forty patients have suffered severely from nausea during the course of the treatment, especially after about 100 mg. has been given. Lead has been demonstrated in the stomach washings of these patients. Many others have complained very little of nausea and only moderately of anorexia. Those with persistent nausea have frequently been known to have peritoneal involvement. In any case, intestinal and gastric tumors are very unfavorable types to treat with lead because of the frequency of this severe nausea. No nephritis has been produced by the lead, nor has it been necessary to desist from the treatment because of the condition of the kidneys, except in a few patients with very large intra-abdominal tumors in which albumin and nitrogen retention would be expected as a terminal complication. In general, the phosphate has given a less severe reaction than the original Blair Bell lead, but whether it is as effective clinically we are unable to judge.

Of the forty patients mentioned, eight are living. Four of these still present extensive tumors and it cannot be believed that the treatment with lead has afforded them much relief or prolongation of life.

SUMMARY

It is therefore our experience that colloidal lead may have a decidedly beneficial effect on patients suffering from malignant tumors, and that occasionally ulcerated surfaces will heal without other treatment and with moderate doses. Further, unless some favorable effects are observed during the early part of the treatment, for example, after the patient has received about 300 mg., no marked improvement is to be expected. The anemia is a serious sequel in that it requires transfusion in many cases. The other complications, aside from nausea and colic, can probably be largely avoided by careful observation of the blood, urine and general clinical condition of the patient. Although numerous analyses were made of the blood of all the patients for various constituents, except in a few instances they were of less value than careful clinical observation of the patients.

While the results reported may seem rather good in that 10 per cent of these forty hopeless cases are in an arrested state, the burden of

treating such a group is very great. The depression and the nausea from which these patients suffer and their continuous complaints require an unusual amount of nursing and medical attendance. The necessity for transfusion adds an expensive and annoying additional form of therapy. Generally speaking, no patient should be accepted without adequate provision for hospitalization, or without, also, ample and expert provision for the administration of roentgen therapy. It may well be questioned whether the results obtained in this series may not be due as much to the efficient use of x-rays as to lead. However, the experimental work of Wood and of Mottram has shown that in animals at least the combination is more effective than either agent alone. Also there cannot be selected from among forty other such patients treated with the same amount of x-rays, but without lead, four such favorable results. The method is certainly one that cannot be used generally by the practitioner who has neither the time nor the facilities for the complete control, both laboratory and clinical, of his patients. While none of our own patients were selected with an idea that any one type could be benefited, it is obvious that carcinoma of the stomach cannot be treated, and in general the tumors sensitive to x-rays seem also to be sensitive to lead, the highly vascular tumors probably being more sensitive than the fibrous types. No striking benefit has been observed in any patient with pulmonary involvement. The patient with chorio-epithelioma of the testis was not sensitive to the lead.

CONCLUSIONS

1. Of a series of forty patients with various types of malignant tumors treated with colloidal lead or lead and x-rays combined, four are at present wholly free from physical signs of their original disease. The time which has elapsed since the disappearance of their tumors is too short to permit the assumption that a cure has been obtained.

2. Several other patients have been benefited temporarily. In the remaining thirty-four patients, death was due to the progress of the neoplasms or to some extraneous lesion.

3. In a series of sixty patients neither death nor serious complications resulted from the use of lead.

4. In twenty additional cases the patients were so cachectic or their neoplasms were so large that it was found necessary to stop the use of lead before the amount had been given which might have been expected to cause any improvement.

5. No selection of patients was made, except to exclude the moribund and those who had advanced renal lesions.

6. The combination of lead and x-rays is often more effective against the neoplasm than either used alone.

7. It may be concluded that the results of this series confirm in a general way the facts demonstrated by Bell that, in a few persons with inoperable and advanced neoplasms, arrest of the disease may be obtained by the combined administration of lead and x-rays.—*J.A.M.A. Jan. 12, 1929.*

**LOCAL ANAESTHESIA IN OPERATIONS FOR
HAEMORRHOIDS AND FISSURE OF THE ANUS**

T. HENRY TREVES BARBER, M.D., B.Sc.,
London.

The use of a local anaesthetic for the operative treatment of haemorrhoids and fissure of the anus has many advantages over a general narcosis.

1. Any one of the numerous operations advocated for the cure of haemorrhoids can be performed quite painlessly, including the most painful procedure—the most dangerous of all with a general anaesthetic—dilatation of the sphincter ani.
2. Its innocuity, both local and general.
3. Its local action, lasting several hours after the operation, thereby curtailing the duration of after-pains.
4. The ease with which it can be employed.

These are all compensations for the extra time required in making the necessary number of injections and the following of an exact technique such as that to be described.

The use of dilute solutions for local anaesthesia (as here used) was first introduced by Schleich, but to Reclus belongs the merit of their popularization and their use in rectal surgery, more especially in operating on piles. For all practical purposes the method here given is his, with, however, some modifications which have been found to be useful. The solution for these operations which is recommended is composed as follows:

Novocain	.. .. .	0.5 cg.
Adrenaline (1 in 1,000)	.. .. .	24 minims
Physiological saline solution	.. .. .	100 c.cm.

Mix and sterilize.

It will be noted that the amount of adrenaline is small, but in practice it will be found to be ample (a dilution of 1 in 1,000,000 will produce a local ischaemia) for rendering the field bloodless, without fear of any subsequent sloughing, notwithstanding the large amount of the solution employed. It is, however, important that the percentage should not be stronger than indicated, and the injections must be well spaced so that a considerable extent of the subcutaneous tissue is infiltrated. When injection is not confined to a localized zone of tissue sloughing never occurs.

The injections are made in the following manner. The patient, having been duly prepared in the usual way, is put in the lithotomy position, the legs resting on some appropriate supports. (1) about six small pledgets of cottonwool are first prepared, their diameter being that of the little finger and their length one inch. They are tied in the middle with a piece of silk or linen thread, one end of which is left four or five inches long to be used as a tractor for removal. Pour into a

sterilized receptacle 15 to 20 c.cm. of the solution, and place the pledgets in it. With the aid of a pair of artery forceps introduce the saturated pledgets one by one into the anus, asking the patient to "bear down" meanwhile; this renders the mucous membrane insensitive and relaxes the sphincter ani, as shown by the gaping of the anal orifice. (2) Swab with iodine the anus and surrounding skin. (3) Take an allglass 5 c.cm. syringe and fill it with the solution; adjust an ordinary (not too fine) hypodermic platinum or nickel needle, push it into the cellular tissue at the junction of the skin and mucous membrane, and begin the injection. Push the needle along slowly, distending the tissues ahead of the needle-point with the solution; in this manner the fluid is infiltrated without pain. The first needle prick is all the patient need ever feel during the whole course of the operation. When the syringe is empty, withdraw the needle, refill and insert it again just beyond the middle of the swelling made by the previous injection. Repeat these injections in the same way so as to encircle the anus, special care being taken to go slowly when crossing the middle line, for the sensibility on the opposite side has not been affected by the injections already given. In all from six to eight injections are necessary—equal to 30 to 40 c.cm. of the solution. (4) Now remove the pledgets by traction on their threads; they will almost fall out by themselves. Fill the syringe and use a long medium-sized platinum or nickel needle. (5) Insert the forefinger of the left hand into the rectum, hook the internal sphincter with it so as to steady it and draw it down. (6) Pierce the tissues perpendicularly to the previous injections and at the same level; push the needle well into the sphincter, injecting meanwhile. It is of the utmost importance to steady the muscle so that it shall not slip away from the needle; this may be quite difficult to do towards the end of the injections, as the sphincter will be felt to "fade away," it having lost tonicity almost completely. Encircle it with six or seven injections—equal to 30 to 35 c.cm. of the solution. The insensibility will now be complete.

Wash the hands again (it is always well to wait about five minutes after the last injection before beginning the operation) and proceed with the preliminary requirement to all rectal operations—namely, stretching of the sphincter ani. In case of simple fissure this may be all that is necessary to effect a cure; in others, and in fistulae, excision, curetting, and the use of the actual cautery can all be employed painlessly, the patient only experiencing a sensation of touch and the realization that something is being done. If piles are present they are now dealt with by any of the numerous methods, according to the choice of the operator. I prefer Mitchell's technique in general to all other methods for the removal of piles, whether pedunculated or with intervals or sulci; with a pair of Kocher's artery forceps clamp the pile and cut off the upper part. A running suture of catgut is passed under and over the forceps, a tie having been made after the first stitch under the clamp at the distal end of the pile to control more securely its blood supply. Now withdraw the clamp; pull the suture taut and tie it off. This is a very safe method, as the sutures will not slip, thus assuring complete haemostasis. The raw edges are turned in, and are therefore less painful. Any number can be dealt

with; the results are excellent. A short piece of large rubber tubing, wrapped round several times with a strip of gauze well smeared with a 1 per cent. antipyrine ointment, is inserted. It relieves pain, and at the same time acts as a compressor against haemorrhage; it permits the free passage of flatus while controlling spasm, and can be removed in twenty-four hours or sooner should it cause discomfort.

I have used this method of local analgesia since 1910, and have never seen a complication of any kind nor a single slough induced by it in the considerable number of operations in which it has been used. The only likely complication is retention of urine, which is encountered also in general anaesthesia; this is due to the way the sphincter has been dilated.—*B. J. M. March 2, 1929.*

VITAMINS AND GASTRIC AND DUODENAL ULCERS

S. HARRIS

About 10 years ago, McCollum, Simons and Parsons stated that the role of food in the aetiology of many diseases "involves increased susceptibility to infection, due to lowered resistance caused by faulty diet." Other workers have come to the same conclusion.

Recent advances have brought out some amazing facts, which should be applied in the treatment of ulcer. Vitamin A protects against respiratory and eye infections, and stimulates nutrition generally. Therefore in ulcer the general nutrition should be considered and the diet should be rich in vitamin A. Milk fat (cream, milk and butter) is the best source of vitamin A, though the green vegetables which should make up an important part of an ulcer diet after the first week are rich in this protective food.

No one doubts that the antineuritic vitamin protects against beriberi; and McCollum thinks that there are borderline cases of nervous maladies due to deficiency of vitamin B. Since vitamin B is essential for the nutrition of the nervous system, whole wheat bread, vegetables and fruits—important sources of vitamin B—should be part of the diet.

The antiscorbutic vitamin C seems to protect not only against scurvy but against infections of the entire gastro-intestinal tract. Therefore a diet rich in vitamin C is advisable for the ulcer patient, with the view not only of aiding in healing but preventing recurrences. Fruit and raw vegetables are the best sources of vitamin C. Since they do not increase gastric acidity, strained orange juice, strained tomato juice, or the strained juice of other uncooked fruits and vegetables should be begun early in cases of ulcer. Patients always like orange juice; it rarely disagrees, and there is no reason why it should not be given on the first day. The first 6 days give three feedings of from $\frac{1}{2}$ to 3 ounces of orange juice, with the milk and cream mixture. After the first week, orange juice, 3 ounces, is given with breakfast, and 3 ounces of strained tomato juice is given with the evening meal. Since the heat necessary for canning tomatoes does not destroy vitamin C, the strained juice from canned tomatoes may be used if fresh tomatoes are not available.

J. A. M. A. p. 1452 Medical Review, Feb. 1929.

TREATMENT OF ACTINOMYCOSIS

HUBERT CHITTY, M.S.LOND., F.R.C.S.ENG.,

Surgeon, Bristol Royal Infirmary.

In an article published in the *British Medical Journal* on March 6th, 1926 (p. 418), I gave an account of four consecutive cases of actinomycosis which had been rapidly cured by small doses of tincture of iodine administered in milk. I believed at the time that iodine given in this way was in a colloidal state. When milk is added to tincture of iodine a point is reached at which the mixture becomes colourless and tasteless. This result is more rapidly attained when cream is substituted for milk, and it appears that the iodine unites with the cream to produce an iodized fat.

In this connexion the observations of Dr. Warwick Preston are of great interest. He records two cases of actinomycosis of the lung which improved rapidly after the injection into the trachea, for diagnostic purposes, of lipiodol—an iodized oil. A subsequent course of iodine and milk completed the cure. This suggests that various iodized fats may have a similar specific action upon actinomycosis.

Black mycetoma is a disease produced by an organism similar to the ray-fungus, and I have received from India reports of two cases which were cured by iodine and milk, and of one old-standing case of "Madura foot" which began to improve rapidly as soon as this treatment was instituted—*B. M. J. Feb. 23, 1929.*

Announcements

THE HOLT SCHEME**To enable Chinese Medical Graduates to Study in England**

Owing to the generous offer of Mr. R. D. Holt of Messrs. Alfred Holt & Company of Liverpool, the Executive Committee of the China Medical Association are able to offer annually to a limited number of suitable Chinese medical graduates free passages to and from England for a period of study. The passages will be given on Messrs. Holts' "C" Class Blue Funnel Line boats (equivalent to 2nd class). As these boats carry male passengers only, women will not be eligible under this scheme.

The selected candidates will be expected to study in the first place at Liverpool University Medical School or Liverpool School of Tropical Medicine, but may afterwards proceed to other centres of study if sanction is obtained from the representative of the scheme in Liverpool, at present Professor Roxby (Warden of the University Students' Hostel).

The Liverpool representative of the scheme is also willing to give a general oversight to the studies and welfare of the students. Return passages will be granted upon his recommendation to Messrs. Holt & Co.

Selection of candidates will be arranged by the Executive Committee of the China Medical Association in Shanghai, who will forward the selected names to the Blue Funnel Line, asking for the grant of passages at dates to be arranged.

It should be noted that Messrs. Holt reserve the right to give notice to terminate this arrangement subject to their finding return passages for any students who have already left Shanghai.

**Preliminary Regulations as Adopted by the Executive
Committee of the China Medical Association**

REGULATIONS

1. Candidates must be of Chinese descent and be graduates of a school of medicine in China recognised by the China Medical Association or National Medical Association or be graduates of the University of Hongkong.
2. They must produce a certificate from the authorities of their school (or other responsible person) of their ability to benefit by studying abroad. A good knowledge of English is essential, and at least two years' hospital experience after graduation is desirable.
3. They must produce two certificates of moral character from responsible persons to whom they have been personally known for at least six months.
4. They must produce satisfactory evidence of their financial ability to live in England for the required time and to pay for the proposed course of study.

5. They must obtain a passport—see notes.
6. Nominations for free passage will only be made by the China Medical Association Executive Committee in Shanghai after a full consideration of each case. Candidates must therefore send in their applications to the Secretary at the office of the C. M. A., Mission Building, 23 Yuen-ming yuen Road.

NOTES

1. No money is available under this scheme, only free passages.
2. The cost of board and lodging in Liverpool in 1928 was 35/- to 40/- per week (say \$20.00 per week). The fees for courses vary and may be ascertained from the Secretary in Shanghai.
3. A passport is necessary for all students proceeding to England, which must be visaed at the British Consulate before starting. There will then be no difficulty en route.
4. Particular attention is directed to regulation (4). It will be necessary for applicants to state how long they desire to stay in England and to indicate the proposed course of study. It is also desirable that they should state what they propose to do on their return to China.
5. Applications for this year must be received by the Executive not later than July 1st.

Special facilities to be granted under the Holt Scheme

The Council of the University of Liverpool has passed the following recommendations of the Medical Faculty:—

- (1) "That Chinese Medical Graduates, if recommended by the China Medical Association, be permitted to enter for the D. T. M. and D. T. H. Examinations."
- (2) "That Chinese Medical Graduates, if recommended by the China Medical Association, be admitted to the courses of study for the Diploma in Public Health."

Notes.

Resolution (1) means that Chinese Medical Graduates whom the China Medical Association recommends will be allowed to take the courses for the Diploma in Tropical Medicine and the Diploma in Tropical Hygiene (under the same conditions as graduates holding registrable qualifications in Great Britain), and on passing the examinations, will be granted the Diplomas.

Resolution (2) means that Chinese Medical Graduates will be permitted to take the courses of study in Chemistry and Bacteriology etc. for the Diploma in Public Health and have all facilities for studying the Public Health Administration in the City of Liverpool. They cannot, however, by a ruling of the General Medical Council, be admitted to the D. P. H. Examination unless registered in Great Britain.

Graduates who do not desire to take the special courses referred to above will be admitted to the general post-graduate training of the Hospitals, or to the facilities in special subjects provided by the University and by the different hospitals recognised by the University. They will also be admitted as Research Scholars.

Graduates can also be admitted to diploma courses other than those specified, but as in the case of the D. P. H. cannot obtain the Diploma unless registered in Great Britain.

The usual regulations with regard to the admission of foreign students will not be enforced in the case of Chinese Medical graduates recommended by the China Medical Association.

Fees for Post Graduation Courses

Diploma in Public Health (D.P.H.) 2 years' course	£15. 0. 0
" " Tropical Medicine (D.T.M.) 3 months course	21. 0. 0
" " Tropical Hygiene (D.T.H.) 10 weeks course	10.10. 0
Apparatus Fee	1. 0. 0
Breakage deposit	10. 0
N.B. The D.T.H. is only open to holders of D.T.M.	
" " Medical Radiology & Electrology (D.M.R.E.)	
6 months course limited to 6 graduates	24. 5. 0
Research Graduates Laboratory fee per session,	
Oct.—July (3 terms)	10. 0. 0
Graduates pay in addition for special materials and apparatus.	

Fees for Hospital Practice*General.*

12 months	£18.18. 0
6 "	12.12. 0
3 "	6. 6. 0
1 "	4. 4. 0

One Dept. only

12 months	£12.12. 0
6 "	8. 8. 0
3 "	4. 4. 0
1 "	3. 3. 0

Examination Fees

Diploma in Tropical Medicine	— Examination	£5. 5. 0
"	Re "	3. 3. 0
	On obtaining Diploma	1. 0. 0
Diploma in Tropical Hygiene	— Examination	5. 5. 0
"	Re "	3. 3. 0
	On obtaining Diploma	1. 0. 0

Book Reviews

GYNECOLOGY (Catechism Series). E. & S. Livingstone, Edinburgh
1/6 net.

A review of a book like this always presents difficulties. Taking it at its own valuation as a tutorial note book to enable a student to revise his work on the eve of an examination, it fairly well justifies its claim. But there are some statements to which the reviewer would take grave exception, and any student coming into his hands for examination who proposed to scratch the cervix with his finger nail would not gain credit by the answer. The description of the formation of a cystocele is not the one usually accepted, and there is no proper description of a rectocele to be found. In the removal of a fibroid polypus no warning is given of the real danger of pulling down a portion of the uterine wall, and making a hole in the uterus as the pedicle is cut through with scissors. The statement that operation for cancer of the uterus has an immediate mortality of at least ten per cent needs to be further explained, or it gives an utterly erroneous idea of the matter. Panhysterectomy for a small early carcinoma carries practically no mortality. In the diagnosis of cancer of the body, a very common sign, that of a watery discharge from the uterus, is not mentioned. Local treatment of the urethra in gonorrhoeal urethritis is not emphasized as clearly as it should be.

For a limited class such a book as this may be of use in giving them a reminder of the main subjects which are likely to be taken up by an examiner.

J. P. M.

Obituaries

Dr. Charles Whittier Young

The sad news of the sudden death of Dr. Charles W. Young in New York on January the twenty fifth was announced in the February number of the Journal. Later correspondence informs us that he died of coronary thrombosis; it occurred suddenly whilst he was at work and he apparently was not conscious of illness.

It is fitting that special note should be made of the fine work done by Charles Young in helping to build up modern medicine in China. He was one of the men with high ideals and strong character who have done much for modern medical education in this land.

At the age of 29 he graduated from Johns Hopkins Medical School, which he had entered with a Bachelor of Science degree from the University of Illinois, and where he previously had assisted in botany. After a years appointment at Johns Hopkins Hospital as resident house officer, he came to China as a medical missionary of the American Board Mission. Later he spent altogether three furlough years at the Pathological Laboratory of the Johns Hopkins Medical School where he at times assisted in instruction, conducted research, and studied the more advanced aspects of his specialty, pathology.

Dr. Young had not been in Peking very long before the North China Educational Union was established and he was one of the

original group of men who established the work of the Peking Union Medical College in 1906, where for twelve years he taught Pathology and Bacteriology. When the college was taken over by the Rockefeller Foundation in 1917 Charles Young was one of those appointed to work in the re-organised school where he served until 1927. From 1913 to 1918 he was Dean of the Medical School. During the last few years in Peking he was a member of the department of medicine in charge of a special unit of work upon Kala-azar. At the time of his death he was Director of the Bender Laboratories in Albany, New York.

That Charles Young's work though scientific was eminently useful and appreciated by China is shown by the number of times the Government chose to honour him. He received the Double Dragon in 1911, Chinese Red Cross Decoration in 1913. The Order of the Excellent Crop Vth class in 1918; IVth class in 1920, and the IIIrd class in 1923.

A more intimate knowledge of Charles Young's life work reveals a man with a strong spirit, wholeheartedly devoted to the highest ideals in missionary service, with a sense of duty and loyalty, and an intense desire to do the right. Would that there were more of such men to carry on, and bring to full fruition the ideals of scientific missionary work which he so faithfully served.

Dr. Frank S. Dymond

The bald announcement in the Shanghai papers of the death of Dr. Francis Spencer Dymond leaves us wondering sadly what happened during the few days before that fatal 1st of March. He was newly arrived at the Chaotung Hospital, Yunnan, to take up the work there so intermittently pursued during the last decade, since Dr. Savin's death. Dr. Lilian Dingle, returned after a long absence, to die there, and now Dr. Dymond, coming back to the home of his boyhood, has laid down his young life and rests with these other two healers of pain.

His father, Rev. Frank J. Dymond, came out to Yunnan in 1887 with that great pioneer Sam Pollard, and has the distinction of serving longer than any other missionary in the province. Dr. Frank was first appointed to the United Methodist Hospital at Wenchow, and came out in September 1926, after qualifying at Bristol University. In the following spring the troubles at Nanking spread their influence to Wenchow, and, unable to remain there, Dr. Dymond spent eighteen months in England gaining further hospital experience. Last autumn he had his heart's wish, and journeyed up to Yunnan, to the district where his father still labours and where his sister too returned by appointment to work.

While in Yunnanfu, he assisted in the C. M. S. hospital until consular permission was granted, just before Christmas last, to travel north fifteen days to Chaotung. The neglected, under-equipped hospital was a grievous

concern to him, but he had made up his mind to buckle to and make it a worthy instrument of service.

A day's journey away, at Stone Gateway, the centre of the work among the Miao, the missionaries called him out on February 14th to amputate the hand of a man who mishandled a blunderbuss. The last news we had of him was of his return to Chaotung on the 18th, having made an extremely favourable impression. The missionaries were "very very pleased with him," and looked forward to many years of happy associations and fruitful service.

An added sorrow is associated with his recently announced engagement.

His elder brother gave his life for King and country in the Great War, and Frank has laid his down for the Kingdom of God. The pride and glory of his sacrifice will redeem for his loved ones the sorrow of bereavement.

F. R. C.

In commemoration of the 75th birthday of Emil Von Behring

The 75th anniversary of the birth of Emil von Behring, the famous founder of the Serum-therapy and a scientist of great scope whose researches saved the life of millions of people, was celebrated on March 15th 1929.

By his death, in 1917, the world had to mourn the loss of one of the greatest benefactors to humanity whose lifework, however, is still familiar to us, specially by his discovery of the Diptheria-Curative-Serum. The present generation which enjoys the outcome

of this eminent man's life-work, scarcely has an idea of the cruel devastation which Diphtheria formerly caused among children everywhere, and this disease was robbed of its terror by the discoveries of Emil von Behring.

Son of a large family, he early became acquainted with the hardship of earning his living. With 12 children his father was not able to give him a high-school education, but by his own intelligence he won the favour of his teachers, and a scholarship at the high school.

At twenty years of age, he entered the Military Medical Academy at Berlin and after having qualified as a doctor, he joined the German Army as a military surgeon. In 1882 he brought forward a completely new theory on the action of bactericidal mediums, and giving up his military career, he carried on further experiments publishing in 1890 his epochal discovery of the blood-serum-therapy. This discovery is epitomised in the statement that the blood-serum of animals recovered from a certain disease, has the power to cure other animals affected by the same disease.

In Diphtheria this theory transferred to man proved to be a sensational success. It was proved when von Behring succeeded in saving, in the following year, in the clinic of von Bergmann, Berlin, many children affected by Diphtheria. Throughout the world the famous results obtained from Diphtheria-Curative-Serum confirmed the truth of Behring's theories, within a short time most doctors throughout the world were successfully using Behring's anti-diphtheritic serum.

Here it should be mentioned also that already in 1890 Behring in collaboration with Kitasato had prepared an Antitetanic Serum, and besides these problems he devoted much of his time to the study of tuberculosis.

In Marburg-Lahn he founded in 1904 his own research institute and laboratories, for the production of Serum, which later on he united under the name of

"BEHRINGWERKE"

well-known to-day for its famous Yatren-preparations, specially Yatren 105.

Emil von Behring belongs to the few representative men of genius, who in their life-time earned recognition for their work. Numerous honours were bestowed upon him: England distinguished him by the honorary membership of the "Royal Institute of Public Health," in the U. S. of America he became honorary member of the "American Academy of Arts and Science" and the "New York Academy of Medicine," the "French Académie de Médecine" in 1890 presented with him an honorarium of 50,000 and 25,000 frs, and the French Government followed with the decoration of officer of the Legion of Honour.

When in 1901 for the first time the "Nobelprize" was distributed, the choice fell on Emil von Behring as the most prominent research worker in medicine. In 1893 in Germany he was promoted Professor, 1895 he became "Geheimer Medizinalrat," and in 1903 von Behring was nominated "Wirklicher Geheimer Rat" with the predicat "Excellency."

He died on March 31st 1917. His remains were buried in mausoleum near Marburg-Lahn.

There he rests, but his work lives and grows. "Not to heal, to prevent" was his idea of the duty of a physician and by his

"Diptera prophylactic" he left us an even stronger weapon, than his Curative serum.

Thus, the 75th Anniversary of this pioneer, links the memory of the past with the work of to-day.

NEW MEMBERS PROPOSED

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|------------------|--|------------------|--|
| Reiss, F. | M. D., Budapest | Private Practice | Shanghai |
| | Proposers: Dr. H. H. Morris
Dr. J. C. McCracken | | |
| Fong-Sung, Sarah | M. D., Boston | M. E. E. B. | Hus Nan College, Foochow |
| | Proposers:—Dr. Horace E. Campbell
Dr. Ruth Wolcott | | |
| Wang, Aimei G. | M.D., N. China Union | L. M. S. | Lester Hospital, Shanghai
Medical College |
| | Proposers:—Dr. Agnes E. Towers
Dr. Dorothy E. Galbraith | | |

NEW MEMBER ELECTED

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|----------------|----------------|---------------|
| Dr. Y. B. Shen | A. B. F. M. S. | Kin hwa, Che. |
|----------------|----------------|---------------|