forecasting of weather changes and tendencies. He made a forecast of the general climatic conditions for 1934 which proved to be substantially correct, but he refrained from publishing it in advance, being much more concerned with checking up on his method and its results than in its immediate use. Similarly, he has made forecasts for 1935 and 1936—and locked them up in a vault. He will not take them out until the returns are all in for their respective years. Then he will submit himself to an impartial scoring.

His results on the 1934 forecasts, which were drawn for 66 different places, range in his own estimation from "excellent," when the course of events followed the prediction very closely, to "bad," when events and predictions did not fit at all. The score runs: excellent, 27 per cent.; good, 42 per cent.; indifferent, 17 per cent.; bad, 14 per cent.

Science News Letter, August 24, 1935

MEDICINE

New Cancer-Causing Chemicals Are Unique in Structure

Capable of Causing Highly Malignant Tumors, But Action Is Slower Than That of Other Compounds

ANOTHER advance in the search of physicians to discover the cause of cancer has just been revealed at Cambridge, Mass., in the report of Prof. Avery A. Morton and Dr. Daniel B. Clapp of Massachusetts Institute of Technology and Dr. Charles F. Branch of Evans Memorial Hospital, Boston, that they have discovered two new chemicals which will produce the disease in mice.

The two new cancer-causing chemicals are known as triphenylbenzene and tetraphenylmethane. In their preliminary account (*Science*, Aug. 10), the Cambridge scientists state, "In a year's time 12 out of 60 mice had well-developed tumors of a highly malignant type. In the case of tetraphenylmethane 25 mice were painted twice weekly with a 0.5 per cent. solution in benzene. After the same period well-developed epitheliomata were present in eight cases. It is interesting to note that the percentage of positive results is relatively high in spite of the long time necessary to induce the growth."

The carcinogenic action of the two new hydrocarbon compounds is considerably slower than previously reported chemicals which have a similar action. And they differ markedly in chemical structure.

The cancer-causing chemicals known up to now have, in general, consisted of numerous rings made up of carbon atoms. Four or five of these carbon rings were believed in some cases to be linked in a single molecule. Accompanying these condensed ring structures was also a characteristic atom arrangement which chemists call the phenanthrene nucleus.

On studying such widely differing materials as the bile acids and the sex hormones chemists previously had also noted an arrangement of atoms similar to those found in the cancer-causing chemicals.

Proof was not certain, but the suspicion arose that perhaps in the human body cancer-causing substances might be created.

What interests medical scientists in the two new compounds is that neither of them can be derived from the bile or the sex hormones. There is also a complete absence of the condensed ring systems and a lack, too, of the phenanthrene nucleus.

"In an effort," the scientists explain, "to find a common ground on which these widely different classes of carcinogenically active agents can stand we may make the tentative assumption that in the hydrocarbons so far discovered the property of producing cancer resides in the benzene nucleus as modified or affected by substituents attached in either the condensed or open manner. Work is now in progress to limit more exactly the nature and position of the substituents."

Describing the structure of the newfound cancer-producing chemicals, Drs. Morton, Clapp and Branch report:

"In triphenylbenzene a single ring holds three other benzene rings attached in the 1, 3, 5 positions, but in tetraphenylmethane no benzene ring is attached to another. The linkages in this last instance are through a central carbon atom."

Science News Letter, August 24, 1935

India was famous for its steel in the days of Alexander the Great.

MEDICINE

New Discovery Widens Field Of Necessary Research

By PROF. AVERY A. MORTON
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PURE organic compounds which will produce cancer have lately been the subject of considerable interest. One series of these substances, discovered in England, consists of compounds made up of benzene nuclei, each condensed to the other at two or more points. The framework which results bears some outward relationship to that of the sterols, bile acids, and hormones. It was therefore supposed that cancer might originate from deranged metabolism of some product occurring naturally in the animal body.

The recent work of Morton, Branch, and Clapp shows that the production of cancer by pure hydrocarbons is much more general than supposed. Two substances, triphenylbenzene and tetraphenylmethane (known only in the organic laboratory), consist of benzene nuclei in which each portion is attached to the rest of the molecule at only one point. Both are cancer-producing, although their structure is absolutely different from that of other known agents.

The discovery widens the field of cancer research and requires the examination of a large number of organic compounds to see if they possess the power to produce tumorous growths. By removing the specific character of the organic causative agent a broader basis will be needed in explaining the action of these compounds.

Science News Letter, August 24, 1935

PUBLIC HEALTH

Scattering X-Rays Tell of Dust Danger

X-RAYS, scattering upon striking atmospheric dust, warn of the deadly particles of free silica that make certain industrial jobs extra-hazardous.

How this new task has been added to the long list of beneficent works performed by the invisible penetrating rays, was related by Prof. G. L. Clark and D. H. Reynolds of the University of Illinois, before the meeting of the American Chemical Society at San Francisco.

Other dusts make the air thick and produce discomfort, but the real peril to workmen comes from free or uncombined silica. Methods hitherto in use by public health investigators have been diffi-