

is a factor predisposing to rheumatic infection," but adds that the results of his research justify going further in studies of the apparent relation between the two conditions.

Of course, it may be months or years before the discovery can be applied to human beings. Many additional laboratory and field investigations need to be conducted, Dr. Stimson says. Nevertheless he has obtained the following positive and "encouraging" results:

Guinea pigs were given scurvy by withholding vitamin C from their diet. They were then inoculated with hemolytic streptococci, "germs" thought to play

a role in causing rheumatic heart disease. The animals developed heart lesions "somewhat comparable" to the most typical lesion of rheumatic disease found in man. Guinea pigs fed on diets lacking other vitamins but not lacking vitamin C did not develop these typical lesions after inoculating with the streptococci.

That is the story so far. When it is finished, vitamin C-containing fruits and vegetables or the vitamin itself, now made in the laboratory, may be able to play a conspicuous part in reducing deaths from heart disease.

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CHEMISTRY

Elements in Earth's Crust Caused by Cosmic Rays

New Hypothesis Suggests That Bombardment For Eons Of Time May Have Formed Them From Iron and Nickel

PENETRATING cosmic rays striking the earth for eons of time may have caused the formation of the varied elements, found in the top few miles of crust, from the supposed iron and nickel core. This is the suggestion of Prof. Gilbert N. Lewis, of the University of California.

Prof. Lewis' theory, entitled "The Genesis of the Elements," appears in the *Physical Review* (Nov. 15). Prof. Lewis is world-famous among chemists for his researches, among them the development, with Dr. Irving Langmuir, Nobel Prizeman, of the so-called Lewis-Langmuir atomic theory.

In summarizing his hypothesis, Prof. Lewis reports:

"The hypothesis is suggested that a great part of the matter in the universe is composed chiefly of iron and nickel, like the metallic meteors, and that such material which is thermodynamically stable with respect to all spontaneous transmutation, except at extremely high temperatures, is superficially attacked by cosmic radiation to produce the material represented by the earth's crust and by the stony meteors."

The metallic meteors consist of more than 99 per cent. iron and nickel, while the stony meteors are much less dense and are more like the rock of the earth's crust.

"It occurred to me," continued Prof.

Lewis, "that if the crust of the earth, and especially if the stony meteors, are representative of the material produced by the disintegration of the primal substance of the metallic meteors, then there should be discernible some immediate genetic relationship between the abundance of the main atomic species of the stony meteors and of the metallic meteors."

Prof. Lewis has found striking agreement in his search for such relationships.

The analysis of metallic, iron, meteors reveals that over 99 per cent. of the mass present consists of two isotopes of iron and two isotopes of nickel. If cosmic rays had energies sufficient to split these iron and nickel atoms in half, two atoms of silicon would be formed for every atom of the twice-as-heavy iron and nickel atoms. Next to oxygen, silicon is the most prevalent element found in the earth's crust, and comprises more than a fourth of the mass of the crust.

In turn, suggests Prof. Lewis, the various isotopes of silicon might be disintegrated by cosmic rays to form magnesium and helium. Magnesium occurs widely, in combination, throughout the earth's crust in great abundance.

Counting three isotopes each of silicon and magnesium together with aluminum and sodium which, conceiv-

ably, could be formed in the two steps outlined, eight of the eleven most prevalent constituents of stony meteors are accounted for.

Concluding his report, Prof. Lewis states "It has been my purpose, not to erect any complete cosmological theory which would state the origin of the disintegrating rays, or where or when the material represented by the metallic meteors has been converted into the material represented by the stony meteors, but rather to present the very strong evidence for a genetic relationship between these two kinds of material, and to consider the various processes by which the genesis may have occurred."

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ARCHAEOLOGY

Empire of Trebizond Is Rediscovered

RE-WRITING history keeps scholars busy these days.

Last year, a Yale professor produced a learned volume showing that historians have overlooked a whole empire of the ancient world, a very powerful empire centered in Arabia.

Now, a University of Wisconsin professor returns from research in Europe to report that he is restoring a medieval empire to a place of importance in the world's story.

Losing whole empires out of history seems incredible. Yet, for four hundred years, the Empire of Trebizond has been so nearly forgotten that medieval specialists were about the only ones familiar with its name. Not even a recognized historical document survived from this empire. There were only casual references in Byzantine volumes. Trebizond looked almost unimportant.

Recently, however, Russian and English archaeologists have unearthed evidence giving Trebizond greater significance as a center of civilization. And Prof. Alexander A. Vasiliev of the University of Wisconsin, who has long been attracted by references to this neglected empire, determined to make a new search for its story.

Early this year, he was granted leave of absence to see what he could find in the manuscript crypts of European and Near Eastern museums, in the catacombs of monasteries and mosques, and the rare book vaults of foreign libraries. Discoveries from his research will appear in book form.

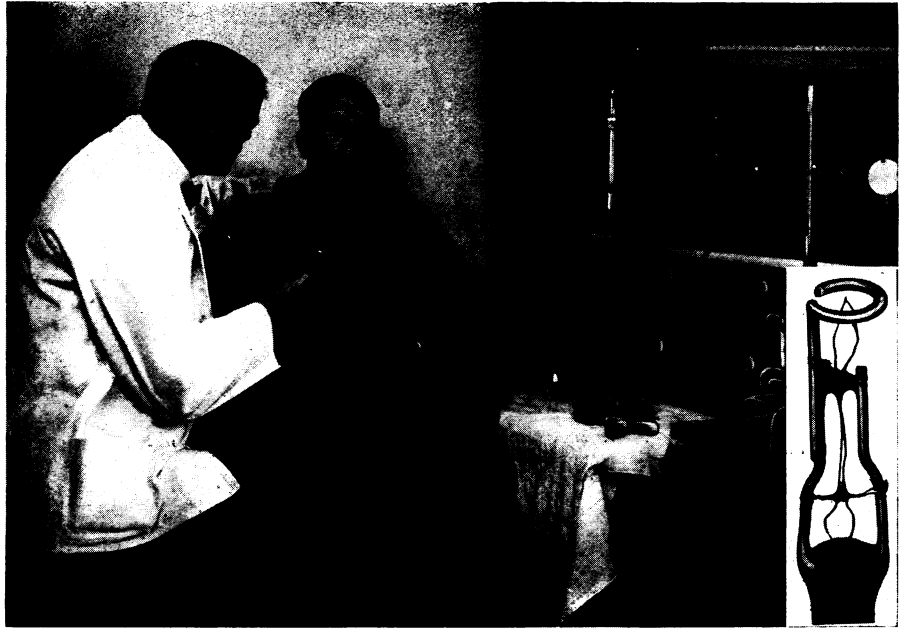
Trebizond began its existence as a

Greek colony 2,800 years ago, on the southern shore of the Black Sea in Asia Minor. The colony passed from Greece to Roman domination, then Byzantine, until the year 1204 A.D. when it proclaimed itself a new and independent empire. The empire lasted only until 1461, when Turkish hordes overran and conquered the country. So completely were people and culture absorbed that nothing of the old regime remained.

The significance of Trebizond, which Prof. Vasiliev stresses, is that it was essentially Greek in culture, from the beginning and straight through all its political history. Situated as it was in the path of well-trodden trade routes and military routes, Trebizond may have been a center from which Greek culture was transmitted to east and west, Prof. Vasiliev has reason to believe. Here, too, other cultures of the civilized world must have met and influences diffused.

Hence, Trebizond, so nearly lost and forgotten, may well be—says Prof. Vasiliev—the long sought link between western and eastern civilizations.

Science News Letter, December 8, 1934



MEASURING THE WARMTH OF A BREATH

With an instrument using as its essential part two wires "fine as a woman's hair," Dr. Francis G. Benedict, director of the nutrition laboratory of the Carnegie Institution of Washington, measures temperature variations in the human breath. Inset: The "business end" of the instrument, enlarged so that the thermocouple wires may be seen.

PHYSIOLOGY

Warmth of Human Breath Now Precisely Measured

Delicate New Instrument Using Wires as Fine as Hair Thus Gives an Index to Temperature of Air in Lungs

THE lover, "sighing like furnace," immortalized in Shakespeare's seven ages of man, can at last have the calorific quality of these sighs accurately measured. So also can a temperature be taken on the gentler warmth of his lady's responding sighs, if any.

A scientific instrument so delicate that it can register the temperature changes that occur during a single breath was described by its originator, Dr. Francis G. Benedict, before the meeting of the National Academy of Sciences in Cleveland. Dr. Benedict is the director of the nutrition laboratory of the Carnegie Institution of Washington, with his headquarters in Boston.

The instrument is of the type known as a thermocouple. It consists essentially of a pair of slender wires of two different metals, delicately soldered together. Changes of temperature of the air surrounding this junction cause fluctua-

tions in a current of electricity flowing through the instrument, and these can be translated into terms of temperature. The sensitiveness of any thermocouple is determined to a large extent by the slenderness of the wires; and Dr. Benedict describes those in his instrument as "fine as a woman's hair."

"We are able to record the temperature throughout an entire respiratory cycle," Dr. Benedict reported. "This is never a constant thing, but varies with the period of the respiratory cycle. The air inhaled passing over the junction cools it off very rapidly. Then as the air begins to be exhaled the temperature rises very rapidly and reaches approximate constancy, but this whole cycle is a matter of but two seconds.

"Even such a point as studying the temperature of the air leaving the nostril shows that there is a central air path which is rather warm, while a milli-

meter or two towards the side of the nostril gets you instantly into a cold zone, which may be an eddy current or still air, through which the warm blast passes out to the room.

"Theoretically there is no such thing as the temperature of expired air. There are two measurements of it, however. One is the maximum temperature of the expired air and the other is an attempt to measure the average temperature of expired air. This latter is extremely difficult and is proportional to the volume, and any temperature measured instantaneously must be applied to the volume at that moment leaving the mouth or nostril.

"It is in the first of these, however, that we are more particularly interested, that is, the maximum temperature of the expired air. This chiefly gives an index of the probable maximum temperature of the air in the lower part of the lungs. With careful control of respiration, that is, having a moderately deep inspiration taken, the breath held for about five seconds and then expelled through a tube, with the nose closed so that there is a slight resistance (and it takes about four seconds to expel it), one gets a very regular temperature. This has been found to be almost exactly one degree Centigrade below that of the body itself."

Science News Letter, December 8, 1934