Science Notes

BY WILLIAM G. HAYNES.

The Unsolved Mystery of Why the Stomach Does Not Digest Itself.

It has often been questioned why the stomach does not digest itself. Proteids in the shape of tissues of other animals rapidly dissolve when introduced into the gastric juice but the stomach tissue itself is never attacked by its own gastric juice. Among the various reasons that have been suggested are the protective influence of the mucous secreted along the digestive canal, and the existence of anti-enzymes, which counteract the activity of the digestive juices. Neither of these theories has, however, been accepted as capable of explaining the complete and continued immunity of the digestive tract to digestion. It cannot even be asserted that it is simply because these tissues are alive that they are thus protected, since the living mucous membrane of the urinary bladder, for example, is dissolved by the pancreatic or gastric juice of an animal of the same species. Even the living mucous membrane of the intestine is apparently digested by the gastric juice of the animal to which it belongs if food is not introduced at the same time. The protection of living tissues to digest fluids is thus limited. On the other hand, however, some aquatic forms of life, such as protozoans, worms, crustaceans and insects have been kept alive at times for a month, in a solution of trypsin that would quickly have dissolved a mass of dead protein.

So a correspondent to the Journal of the American Medical Association for July 18, 1914, concludes that the stomach is an active gastric secretion and of the intestinal mucous membrane to pancreatic juice still remains a mystery. Some unknown protective power of adaptation under certain circumstances must be admitted as one of the innumerable factors of evolution of which we are still ignorant.—H. W. S. in Science Conspectus.

Limits of Experimental Investigation.

The problem as to where the limits accessible to experimental investigation are reached has ever been one appealing to the human mind. While it would be premature to answer the question in an absolute manner, assigning to scientific work a boundary never to be exceeded, the limits corresponding to the present state of science can be ascertained with a high degree of accuracy.

The lowest temperature obtainable by artificial means, until twenty years ago was —87 deg. Cent., liquid carbonic acid being used for its production. When then Prof. Linde, by the construction of his refrigerating machine, opened up new fields to cold storage scientists succeeded in working at temperatures as low as —190 to —200 deg. Cent. Since hydrogen does not boil above a temperature of, say, —253 deg. Cent. the use of this liquefied gas allowed even lower temperatures to be reached, while helium, the boiling point of which lies at —269 deg. Cent., quite recently enabled Dr. Kamerlingh-Onnes nearly to reach the temperature of absolute zero.

As pointed out by Prof. Kurt Ardnt, in a lecture held at the Society of German Chemists, the temperature of the electric arc forms a counterpart to this lowest temperature reached by artificial means. It is true that the temperature of the electric arc is anything but uniform, 3,000 to 4,000 deg. Cent., being recorded at some places, while others show temperatures as low as 1,000 deg. Cent. Whenever constant temperatures are to be used for purposes of scientific investigation they must therefore be produced by means of electric radiators. Thin nickel wires traversed by electric currents will be sufficient in this connection up to 1,000 degrees, while Heraeus' platinum furnaces are used above this limit, and iridium metal (which it is true, cannot be drawn out into wires or hammered) between 1,500 and 2,000 deg. Cent. Since the melting point of tungsten is as high as 3,000 deg. Cent., its use allows even higher temperatures to be reached, though on account of its sensitiveness to atmospheric oxygen, this element must be kept in the vacuum. The highest temperatures (up to 2,700 deg. Cent.) tehrefore are preferably produced by the aid of carbon resistances used in connection with several types of electric furnaces.

The most varied instruments are used to gauge the low and high temperatures thus produced. Degrees of cold can be determined with mercury thermometers only as far as —38 deg. Cent., which is the freezing point of mercury. Liquid thermometers, filled with liquids, such as pentane, will suffice down to temperatures of, say, —100 deg. Cent., when pentane becomes plastic. Resistance themometers, designed by William Siemens (and based on the increasing electrical conductivity of platinum with decreasing temperatures) serve for the measuring of temperatures still lower. The relation between temperature and the resistance of platinum being known, temperatures above —1,000 deg. Cent. can be gauged by this means. Thermo-electric pyrometers (based on the production of electric currents by heating the contact between certain metals and metal alloys) are used in determining temperatures between 500 and 1,500 degrees, while optical pyrometers—in connection with which the surface brightness of incandescent bodies is determined by an optical process—must be resoted to in the case of temperatures even higher than 1,500 degrees. The greater the brightness of an incandescent body, the higher, of course, will be its temperature.

As regards, next, the measuring of time, stop watches will be sufficient for intervals of, say, one-fifth of a second as a minimum. Any more rapid phenomena must be allowed to record themselves of their own accord. In the case, for instance, of explosive phenomena, the pressure of explosion is made to displace a minute mirror, whence a reflected beam of light falls on a revolving drum coated with photographic paper. The displacement of the mirror, as produced by the pressure of explosion, is thus recorded photographically, instervals of, say, 1-50,000 second being gauged in this way.

While ordinary chemical scales, of cause, insure an accuracy of 1-10 milligramme, extra-sensitive weighing machines, such as those used in comparing standards of weight, allow differences as small as 1-500 milligramme to be ascertained.

Especially sensitive, however, are the processes used in determining lengths, the interferometer allowing the three-hundredth part of a milionth of a millometer to be gauged, a length far too small to be conceived by the human mind. The ultra-mycroscope, finally, enables the one-hundred-thousandth part of a millimeter to be visualized in gold solutions.—Scientific American Supplement.