must become unstable at or near this zero and explode. Thus, for example, the heats of formation of mols of the substances H_2O, CH_4, NH_4 and CO_2 in the gaseous state from the elements C (graphite), H_2, O_2, N_2 are about 57,880, 18,300, 9,500 and 97,000 cal's, respectively, at room temperature. These heat energies are derived from the internal energies of the elements, which, if no instability occurs, are given by the integration of the specific heats down to the absolute zero of temperature with the final state being solid. But the internal energies of the foregoing elements obtained in this way by the writer (May number of the *J. Franklin Inst.*) are 45, 1,100, 2,980, 3,090 cal's, respectively, and are thus not sufficiently large to account for the heats of formation. It was also shown in this paper that the temperature at which instability begins is always above the absolute zero. Thus one of the elements of each of the foregoing compounds becomes unstable at a low temperature. But since the heat of formation of a compound is not likely to be derived from the internal energy of one of its elements only, each of the foregoing elements very probably becomes unstable at a certain temperature. Thus frozen solid masses of these elements in interstellar space are likely to explode when their temperatures have fallen below certain values.

If an external pressure is applied to such a substance to prevent the explosion, and the substance is then allowed to expand doing external work, a state will eventually be reached at which the pressure and the internal energy is zero.[2] The substance is now a modification of the original substance. In the case of *white* tin we have already seen that the modified form is *gray* tin. Such modifications at low temperatures of the elements mentioned should exist, but at present they are not known. The vapors of such elements in interstellar space near the absolute zero of temperature would tend to condense into the stable modifications, but the process would take place almost infinitely slowly.

R. D. KLEEMAN

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ETHYLENE IS A RIPENER OF FRUITS AND VEGETABLES

IN an article published in the *Journal of Industrial and Engineering Chemistry* (Vol. 19, p. 1135, 1927), Chace and Church decry the "wide publicity of the alleged ripening effect" of ethylene on certain green fruits. They state that the treatment of green bananas with ethylene in a concentration of 1–5,000 produced no acceleration of color or respiration increase, in opposition to the data which I have reported. It should be noticed that Chace and Church and Denny recommended concentrations less than 1 part of ethylene to 5,000 of air in the coloration of citrus fruits, whereas I have recommended 1 to 1,000 for the ripening of fruits at temperatures above 65° F. Chace and Church report no effect of ethylene upon the ripening of dates, and state there occurred "no material difference in composition between the treated and untreated fruits" of lemon. Denny had previously reported a marked action on the stimulation of respiration in lemons under ethylene treatment to produce coloration. It seems unreasonable that the respiration can increase and still produce no effect on composition of the fruits. The data reported by the authors simply show that these workers in the U. S. Department of Agriculture do not know the proper conditions for ripening fruits with ethylene.

An editorial in the *Scientific American* hastens to state that "the investigations carried out by Messrs. Chace and Church tend to disprove Dr. Harvey's conclusions." The statement that "these investigators have carefully studied the effect of ethylene on citrus fruits, dates, persimmons, bananas, tomatoes, pomegranates and avocadoes and find that while the color of the fruit is affected, none of the changes ordinarily connected with ripening are observable" is unjustified even by the article referred to. The effect of these publications is to bring under suspicion unjustly the process of ripening fruits with ethylene gas, a process which has been successfully used by hundreds of fruit jobbers to produce quicker ripening and a product of superior flavor.

The statement by Chace and Church that the use of ethylene on persimmons "will be of no use to the grower because they could not be shipped after ripening" is not to the point, for every fruit jobber knows the advantage of shipping fruits in the firm condition. The difficulty of ripening such fruits after shipment has been removed by the discovery of this process whereby they may be quickly ripened at destination. We should be able now to import fruits from the tropics which were not available before.

The ripening effect of ethylene on fruits and vegetables can be demonstrated easily by any one who is willing to carry out the simple instructions for the process, namely: the green fruit should be put into a reasonably tight chamber, the temperature should be preferably at 65° F. but may be higher in some cases, and the concentration of ethylene should be established at 1 cu. ft. for each 1,000 cu. ft. of air space. The gas may be renewed each day. The fruit should be so packed into the space that there is free air circulation and an abundant supply of oxygen to care for a rate of respiration which is much increased.

[2] *J. Phys. Chem.*, 31, 1669–1673, 1927.

Ethylene causes an increased rate of digestion of starch, which may make fruits sweeter, it causes changes in the cell wall materials just as in ripening fruits, it causes the disappearance of tannins and of organic acids to some degree, and increases protein cleavage. These same changes when occurring in fruits on the tree may be taken as evidences of ripening.

The work of E. M. Harvey, J. T. Rosa, R. P. Hibbard, W. A. Gardiner, and others than the parties to this controversy has proven that ethylene and some related compounds have remarkable effect on stimulating enzyme actions. These compounds act as coenzymes, if such a blanket term is permitted, for the hydrolytic enzymes and may act as hydrolytic catalysts themselves according to data by Rhea and Mullinix. The triple bond as in acetylene has a different action from the double bond of ethylene and propylene. The addition of elements at the double bond seems to destroy the action, except in some compounds which may yield ethylene. The formation of the oxide from ethylene destroys the effect. One is inclined to wonder if this catalytic action on hydrolyses is not a function of the double bond which may take on hydrogen and hydroxyl ions and again yield them easily to anhydrides. The surface tension effects, solubility in aqueous and lipoid phases, as well as the low molecular weight may give these double bond compounds properties not possessed by other such compounds found in plants.

I had been asked by two journals which have published articles in this controversy to write articles for them on the ethylene process. The data of value for commercial application had already been published sufficiently, and explicitly. I can see no reason why one should be required to publish before he is ready to do so. Charles Darwin would have had a slim chance of accumulating data for eighteen years if he had lived under our present system of reporting scientific results.

R. B. Harvey

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BANANA STOWAWAYS

In reference to the note of Mr. L. A. Adams in Science of February 24, 1928, it may be of interest to record that in the summer of 1909 a laborer engaged in carrying bananas from a refrigerator car to a warehouse in Madison, Wisconsin, was terrified by having an animal leap from a bunch he had just placed on his shoulder, and attack his throat. The creature was captured and brought to our laboratory. It proved to be a female Marmosa, probably *M. murina*, and carried a litter of young on her back. The whole family was kept alive for some days, but eventually died of malnutrition. Twice in the last twelve years we have received specimens of a small boa snake, taken from banana bunches, one at Madison, and one at St. Croix Falls, Wisconsin.

George Wagner

University of Wisconsin

Under the above caption in Science for February 24, L. A. Adams mentions the finding of opossums of some species of the genus Marmosa in a bunch of bananas at Urbana, Ill.

I have in my collection two specimens of small opossums, each taken in Colorado Springs. One is *Marmosa cinerea,* and was found in a bunch of bananas about August 2, 1905. I saw an account of the capture in a local paper and secured the animal, keeping it alive for several days. Like Mr. Adams' animals it ate grasshoppers as well as other food. I was told that when caught it had a young one clinging to it, but that had disappeared before the animal came into my possession. The specimen was a female.

The other example, *Marmosa zeledoni,* is a skin given me by C. E. Aiken, October 5, 1912. He told me the animal was given him in the flesh by a man who had killed it in a commission warehouse, thinking that it was a rat. The type locality of this species is Navarro, Costa Rica, and doubtless the animal reached here with bananas. Both of these specimens were identified by the Bureau of the Biological Survey.

If my memory does not play me false, Victor Borcherdt, of Denver, told me that he had known of several instances of small tropical opossums being found in bananas in the city.

Edward R. Warren

Colorado Springs, Colo.

GALILEI OR GALILEO?

Would it not be time to call the great Italian by his right name? He is always referred to as *Galileo.* But *Galileo* was his given name, while *Galilei* was his family name. The French and Germans have always referred to him as *Galilei.* Of course the objection will be made that this is a paltry matter and that the usage *Galileo* is time honored. Still it is wrong. How would it do, if we referred to noted men bearing the names William Williams or Samuel Samuels as William or Samuel?

A. Kampmeier

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