

the amount of sulphur that can be evaporated out of a given lot of onions should give an indirect measurement of the quantity of the oniony oil present, and hence of the strength of the onions' "breath."

This is just what Mr. Platenius's method does. He steams off the vaporizable sulphur from the sample of onions under

analysis, and then by suitable chemical means precipitates out the sulphur so that it can be weighed. The method is rather slow, so that it is not recommended for routine analysis, but it offers the first accurate quantitative estimate of the relative strengths of different lots of onions to replace the human nose.

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#### PHYSICS

## Method of Striking Key Has no Effect on Tone

**D**ESPITE statements of eminent pianists to the contrary, the tone produced by striking a given key on a piano is the same no matter in what manner the key is struck. Ignace Paderewski is the notable exception among the musicians who cling to the idea that in some manner the way the key is struck influences tone.

New research on this question, which has been a bone of contention between physicists and musicians for years, was presented before the Franklin Institute by Prof. Charles Weyl of the University of Pennsylvania's school of electrical engineering.

Principal demonstration of Prof. Weyl was a giant model of the action of a grand piano consisting of one key, one hammer and one string. With it he was able to show that after striking the key a musician has no more control over the tone than a marksman has over a bullet after he has pressed the trigger of his gun.

According to musicians' views, tone and loudness are separate factors controlled by the manner of depressing the piano keys. Scientists claim that both tone and loudness are determined simultaneously by the piano key. Only the velocity of the hammer at the instant of striking the string is determined by the key. And the same tone and loudness can be produced by any method which would yield the same velocity of impact.

Prof. Weyl showed a "mechanical pianist" in a mechanism which produced more accurately and repeatedly a given tone than any pianist could do. "In fact," said Prof. Weyl, "the device is able to produce many more gradations of tone than the most competent pianist, no matter how great his technique."

The mechanical pianist also demonstrated for the audience gradations of tone so small that no ear could detect

them; yet they were visible on an oscillograph.

Another demonstration with a mechanical striker indicated that the same tone could be produced by three different methods of striking a piano key, corresponding to three different methods of human touch.

"The evidence offered," said Prof. Weyl, "indicates that eminent pianists were unable to detect tone differences five times as great as were detected by the oscillograph equipment. They were also unable to detect the difference between mechanically produced tones and those produced by a pianist.

"My report," Prof. Weyl added, "serves to prove the entirely mechanical nature of the piano as a musical instrument when considered from the point of view of the interdependence of tone and loudness, and also the ineffectuality from the tonal point of view of difference in touch."

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#### BIOLOGY

## Disease Virus Identified As Non-Living Substance

**N**ON-LIVING crystals of definite chemical composition, like the protein in our food, assume the guilt for causing disease hitherto attributed only to living germs, as a result of fresh scientific evidence unearthed by Drs. W. M. Stanley and H. S. Loring of the Rockefeller Institute for Medical Research laboratories at Princeton, N. J. (*Science*, Jan. 25.)

From sick tomato plants, suffering from mosaic disease, the scientists isolated crystals of a protein substance that has the same chemical, physical and biological properties as the protein crystals they previously found guilty of causing mosaic disease in tobacco plants. (See *SNL*, July 20, 1935)

The newly-discovered evidence is of wide importance. It relates to the problem of viruses, such as cause both the mosaic disease of plants, and various human diseases like infantile paralysis. Scientists have thought that these viruses were living organisms, although so small that they cannot be seen under the microscope and pass through the pores of the finest porcelain filters.

Dr. Stanley's investigations show that the cause of this one "virus disease," tobacco mosaic, is not a living substance but a non-living chemical. It may be that the agents which cause other virus diseases are also non-living chemical substances. If this proves to be the case, it will provide an entirely new line of attack on a large group of diseases that afflict animals and man.

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#### BIOLOGY

## Evolutionary Changes Found In Virus of Tobacco Mosaic

**E**EVOLUTIONARY changes occurring in something that is not really alive constitute a paradox arising out of the discovery, by H. H. McKinney of the U. S. Department of Agriculture, that one form of a mosaic disease of plants can change, or "mutate," into another form.

Thus, the ordinary type of tobacco mosaic often mutates into a yellow type, which can be propagated as a continuous pure strain. Similarly, a virus disease of wheat mutates from a green to a yellow form. Other changes of like nature in virus diseases have been observed by Mr. McKinney.

These viruses are among the most puzzling of things with which biologists have to deal. They can pass through the pores of fine porcelain filters, and cannot be seen under the microscope. They cause diseases and at the same time propagate themselves very much as though they were living micro-organisms; yet in other respects they behave as though they were simply non-living chemical substances.

Recently an investigator on the staff of the Rockefeller Institute, Dr. W. M. Stanley, has produced non-living crystals of a protein substance that can cause mosaic disease in tobacco, and which appears to be the virus itself.

If this substance really is the virus, and it really is not alive, we have in Mr. McKinney's mutation observations a most puzzling state of affairs—a biological process taking place in a non-living thing.

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