

kinds of measurements can only be made with equipment too heavy for small balloons to carry. Much information, however, can be obtained with these lighter balloons. This will supplement, in regions difficult of access, the more detailed information which the larger balloons give us in ordinary latitudes."

The region of the North Magnetic Pole, in the wilds of northern Canada, is expected to be one place where small radio balloons will be especially useful. The difficulties of transporting and launching a large manned balloon in the wilderness and the hazards which the balloonists would face on the land-

ing exclude this method from any scientific program. The chances of recovering instruments by rewards would also be small, so that the radio type balloon seems to be the one solution to the problem in wild regions. Yet stratosphere measurements at the North Magnetic Pole would be among the most interesting of all. Ground measurements have been made at this point but upper air information is needed to supplement them.

Prof. J. M. Benade, Indian scientist from Forman Christian College at Lahore, India, developed the idea of using radio signals to transmit cosmic ray intensities, Dr. Compton said.

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CHEMISTRY

Citric, The Acid of Lemons, Found Now in Tobacco

CITRIC ACID, that makes lemons and grapefruit sour, is now being extracted from tobacco in Soviet Russia. Chemists have discovered that what, in part, makes poor tobacco bad for smoking is the presence of citric along with other acids like malic, oxalic and fumaric.

Using the citric acid from tobacco, Soviet chemists hope to free the U.S.S.R. from the necessity of importing this valuable chemical compound. Much of the citric acid which the U.S.S.R. buys each year comes from Italy, where it is extracted from lemons. In 1929 the Soviet Union had to purchase 142 tons of the acid from Italy alone, according to *Industrial and Engineering Chemistry*.

Prof. A. A. Shmook of the Soviet Tobacco Industry Institute has worked out a process for taking the citric acid out of the poorest varieties of Russian tobaccos. High-grade smoking tobacco contains very little acid and at times it is even absent altogether. In the cheap varieties the citric acid may be present in amounts up to 4 per cent., and even higher.

Equally Good Sources

Lemon juice, for comparison, is found to consist of about 3 per cent. citric acid and sometimes reaches 6 per cent. As sources of raw material for the production of the acid, lemons and tobacco are about equal. The U. S. S. R. raises much tobacco and few lemons. Hence

the concentration on a way to obtain the acid from one of Russia's natural resources.

The manufacture of citric acid from fruits or plants containing sugar is not being neglected by the Russian chemists, however. One plant at Leningrad makes two tons of citric acid a year in this way, while another is under construction at Moscow which will have a production of eight tons.

Making citric acid from sugar-bearing substances is accomplished by adding a fungus growth to start fermentation. Citric acid has been produced all over the world in this fashion since 1896.

Two Stages

The process runs in two stages: the formation of a musty fungus film and allowing the fungi to turn sugar into citric acid. Five or six days is necessary for the method. At the end of fermentation the citric acid is separated from the messy solution by a method similar to that in which citric acid is taken direct from lemons.

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When preparing perishable foods, such as chicken salad, for a large gathering, says one health officer, it is wise to prepare small bowls kept chilled, rather than to work with one large bowl, since bacteria get a better start in life in the warmish contents of the big, slowly filled bowl.

ANIMAL PSYCHOLOGY

Dogs Recognize Words By Their Sound Alone

DOGS LEARN the meaning of certain words very well and are not fooled by similarly sounding words. Nor are they fooled by certain other circumstances purposely introduced to confuse them. These facts were brought out by extensive experiments made by Dr. Emanuel Sarris at the Institute for Environmental Research, at Hamburg, Germany.

Several dogs were used. They were given such names as Paris, Haris, Aris, Argos, Niki, etc., some of which have very similar sounds, others very different. The dogs learned to respond to their respective names perfectly. They were then taught a few simple words and phrases of importance in the dog world, such as meat, stick, basket, on the chair, under the table, etc. Once having learned these words and phrases, they recognized them under a variety of confusing circumstances by their sound alone, independent of tone of voice or emphasis, and without the help of signs or gestures. They recognized them when mixed with other words, when the speaker and object were out of sight, and whether the voice was male.

Word Order Not Cue

Thus, the dogs being in one room and the experimenter in another, such commands as the following were given: "Come, Paris, (or Haris, or Aris, etc.) to the meat"; "Come to the meat, Paris," "Paris, come to the meat." In each case the appropriate dog did the appropriate thing. Variety of phraseology and similarity of sounds did not confuse.

Aris was sung to in Greek. In the midst of the poem, one of the words he knows was inserted, but it was sung in the same tone and rhythm as the rest of the poem. Aris recognized it at once and acted accordingly. Later he learned the Greek equivalent of the word.

Aris was taken into a room in the Institute where he had never been before. "On the chair," commanded his master, without moving a muscle. Aris ran all around the room searching and stopped finally at a chair turned over on its side. He looked at it dubiously for a few seconds, then jumped on top of it. In a similar way on different occasions he accepted a stool up-side-down, a stool on top of another, a bench, and a chair wrapped up in paper.

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