What Machines Will Do

A continuing attack on the fundamental structure of the heart or nucleus of the atom, the prime problem in physical science, is the objective of the new cyclotrons. There is still much to be learned and enticing theories to be tested.

Both equipments will mobilize the most advanced developments in atom smashers in recent years. Particularly important to operation are the concepts proposed in 1945 by Dr. E. M. McMillan, professor of physics in the University of California's Radiation Laboratory, which made possible the synchrotron and synchro-cyclotrons.

In the giant cyclotron, which is sometimes called a synchro-cyclotron, the frequency of the electrical charge used to accelerate particles is slowed down because the speeding particles tend to lag a little at higher energies. Thus the acceleration is synchronized to accommodate the laggard particles.

In the synchrotron, which accelerates electrons, the synchronization is accomplished by increasing the strength of the magnetic field of the ring-shaped magnet. This jerks the lagging electrons up to the accelerating point in time to receive regularly spaced jolts of high energy power.

One possibility of the new giant cyclotrons will be the production of large number of mesons, in pairs, with which it might be possible to fission chemical elements other than uranium, thorium and plutonium with release of atomic energy. This is a theory that scientists are anxious to test. It may possibly give rise to new kinds of atomic bombs or other applications of atomic energy.

Dr. Philip M. Morse, director of Brookhaven, explained:

"Nuclear physics today is in a position of development which can be compared to that of chemistry 50 years ago. At that time chemists knew a great deal about valences and combining weights of elements, but did not know how the forces acted which made molecular bonds. In the last 50 years this has come to be well understood. In nuclear physics today we know that atomic nuclei are held together by some new force—we call it nuclear force—and we know it is not an electrical, chemical or gravitational force, and that it is specifically a nuclear phenomenon. To study and understand this new force we must have instruments which will make or break this force at will under controlled laboratory conditions.

"The best theories concerning this force find it necessary to talk of interchange of charge between particles in the nucleus. This inter-change of charge is supposed to be accomplished by means of a meson which is shared alternately by different particles within the nucleus. With new and higher energy accelerators we hope to be able to gain experimental evidence which will clarify or substantiate these theories, and lead to broad extensions of our present knowledge of the nucleus."

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PSYCHOLOGY

Noise Doesn't Mask Talk

➤ ALTHOUGH a loud continuous noise will "drown out" another noise and make conversation impossible, the effect is entirely different if the masking noise is intermittent, as in a burst of machine-gun fire.

Interrupting the noise cuts down on its effectiveness as a mask, but the extent to which it is cut down depends also on the frequency of the interruption, on the pitch of the drowned-out sound and on the loudness of the noise. This is shown by research at the Harvard Psycho-Acoustic Laboratory reported at the meeting of the Acoustical Society of America in Washington.

If the noise is on and off only once in ten seconds, the conversation can be heard without too much difficulty. But, on the other hand, if the interruption is very high—on and off 5,000 times a second—you can hear almost as well as if there were no noise.

If you are listening to speech accompanied by a noise that is interrupted 300 times a second, the speech will sound intermittent to you, but you will hear practically every word just as if you were listening in a quiet room.

A curious effect was discovered, however, when the investigators tried filling in the intervals between words with a noise. For this purpose they used what scientists call "white noise," that is, a noise containing all the frequencies at random.

Now the speech no longer sounded intermittent. The words were understood just as well as when there was no "masking" noise.

This illusion is like that noticed when you drive past a picket fence. If you are standing still, the pickets block your view so that you cannot see what is behind the fence. But if you are moving at the right speed, and the pickets are not too close together, you will get a view of what is behind the fence and the pickets, if you see them, will appear no more than a vague blur.

The intelligibility of conversation is less, if it comes in abruptly and is chopped off suddenly. You can make out more in the same length of time if it comes in and fades out more gradually.

These investigations were reported to the meeting by Drs. George A. Miller and J. C. R. Licklider of Harvard and Dr. W. R. Garner of the Johns Hopkins University.

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