

Solid Matter May be Waves

Physics

So-called "solid" matter—the bricks of our homes, the sidewalks we walk on; in fact, even the tissues of our own bodies, may consist ultimately of waves, or vibrations. Such is one of the startling conclusions that might be drawn from experiments at the Bell Telephone Laboratories in New York by Dr. C. J. Davisson, in collaboration with his colleague, Dr. L. H. Germer. An extended account of the researches is given by Dr. Davisson in the *Journal of the Franklin Institute*.

The experiments indicate that electrons—one of the important parts of the atoms of matter—may really be waves, and not the infinitesimally tiny particles that previous scientists have supposed them. What Dr. Davisson and his associate have done is to study the way that a beam of electrons, given off from a glowing electric light filament, is reflected from a crystal of nickel. They found that the electrons were reflected in the same way that light waves would be reflected. That is, if the beam hit the face of the crystal at an angle of 45 degrees, for example, it left at the same angle. As the physicist expresses it, "The angle of reflection is equal to the angle of incidence."

At first glance, says Dr. Davisson, this might not seem inconsistent with the theory that the electrons are actual particles. But the electrons are supposed to be so small that some 25 million million would make a row an inch long. The size of the atoms is about a hundred thousand times as great, for only about 250 million of them are required to fill an inch. Furthermore, the distance between the adjacent atoms, in the nickel crystal, is something like 250,000 times the diameter of an electron.

"The difficulty of picturing the regular reflection of particles as small as electrons from a surface made up of bodies as large as atoms is at once evident," says Dr. Davisson. "If we were to fire a load of birdshot against a pyramid of cannon balls, we should not expect to find a little cloud of shot moving off in the direction of the regular reflection from the face of the pyramid. A surface made up of cannon balls is much too coarse-grained to serve as a regular reflector for particles as small as birdshot."

"The analogy is not such a good one, really, for we do not think of electrons rebounding from the sur-

face of an atom in the way that shot rebound from a cannon ball. We have been accustomed to think of the atom as rather like the solar system—a massive nuclear sun surrounded by planetary electrons moving in closed orbits. On this view the electron which strikes into a metal surface is like a comet plunging into a region rather densely packed with solar systems.

"There is a certain small probability, or at least there might seem to be, that the electron will strike into an atom in or near the surface of the metal, be swung about comet-wise, and sent flying out of the metal without loss of energy. The direction taken by such an electron as it leaves the metal should be a matter of private treaty between the electron and the individual atom. One does not see how the neighboring atoms could have any voice in the matter. And yet we find that the high-speed scattered electrons have a preference for moving off in the direction of regular reflection, a direction which is related to the plane of the surface. Three atoms at least are required to fix this plane, so that the direction taken by the electron is deter- (Turn to next page)

Bible Sites Located

Archaeology

No less than 1,312 of the places that made Bible history in ancient Palestine have been accurately located by archaeologists, according to Dr. George S. Duncan, professor of Egyptology and Assyriology at American University in Washington.

Picks and spades wielded by scientists are unearthing so much important evidence about the Bible that it is like a new book, Dr. Duncan pointed out.

"Hebrew architecture was deeply influenced by Egypt," he stated. "Solomon's temple and its utensils were modeled after Egyptian patterns. Temples on the Nile contain altars, tables with bread, and arks with cherubim, all recalling the Bible descriptions."

"Archaeology shows that the first chapters in Genesis are old traditions originating in Babylonia. The Hebrews monotheized them and spiritualized them and made them the vehicles of most important religious truths. It is a great mistake to make the chapters standard for scientific knowledge. The Bible is a religious book, not a scientific treatise."

Science News-Letter. May 19, 1928

New Theory in Sociology

Sociology

Sociologists who moralize on poverty, bad housing, and delinquency are not dealing with reality at all, according to Prof. Robert R. Kern, professor of sociology at George Washington, who has concluded that the first step toward solving the problems of the universe is to solve the problems of the individual person.

"Making people over, so that they get rid of foolish fears and other inefficient behavior is a real task for sociologists," he states. "How a human being will behave can be predicted and his behavior can be altered by understanding and applying principles of physiology."

Prof. Kern, in cooperation with his students, has conducted over 1,000 experiments in predicting and reorganizing behavior. The students use themselves as subjects of the experiments and by understanding their own bodily mechanisms they are better equipped to understand why other people and large groups of people act as they do.

Emotions are inefficient as guides in

the opinion of this sociologist, who believes that social problems should be attacked from a realistic physiological point of view.

"A man may have developed a dislike for milk because of some highly emotional and disagreeable experience with it," he explains. "Now, milk is wholesome, and if he were to get sick he might be seriously handicapped by his unreasonable aversion for it. Yet, the very sight of it produces a physical disgust that is so real that it must be taken seriously."

"The first problem is to help him trace the mechanism of the neural hook-up that has been established in his body. He sees how the sight of a bottle of milk sets up the same old nervous mechanism, carrying a current over the same nerve route, effecting the same visceral muscles, and producing the sensation of nausea. Then, he tries to direct and re-route the nerve current by substituting for the old emotion an unemotional attitude of thinking how the milk will be good for him." (Turn to next page)