

we find that the elements having the electronic configurations d^2s^2 , d^4s^2 and d^6s^2 are almost equally abundant but for the extraordinary abundance of Fe. So also the neutronic configurations d^2s^2 , d^4s^2 and d^6s^2 equally often represent most abundant isotopes. All these regularities show that the tentative scheme here put forward represents one aspect of reality at least and leads us to hope that we may be on the right track. We have not tried to emphasize the regularities exhibited by the lightest and heaviest isotopes because we cannot here regard the present data as final. According to the scheme here put forward X_{129} cannot be expected to be the most abundant isotope of Xenon. X_{132} is nearly as abundant as X_{129} and has a stable configuration ($3d^44s^2$). That there

is some difficulty with regard to this element is also clear from the fact that the chemical atomic weight differs from that calculated from the relative abundance of the isotopes. In the case of light elements up to Oxygen, the configuration of 1 extra neutron and 1 proton seems to be stabler than that of 2 neutrons forming a closed s-shell. Thus although Li_7 is more abundant than Li_6 , considerations of its spin show that its neutron configuration cannot be $1s^2$. In the case of Be, the one neutron cannot be very stable. Possibly this has something to do with the fact that the first discovery of the neutron was made by bombarding Be by α -rays. It is also very interesting to note that the regularity exhibited by the radioactive elements and their isotopes is similar to that shown by elements preceding them.

The Concept of Causality.

THE above is the title of the Seventeenth Guthrie Lecture delivered by Prof. Max Planck before the London Physical Society on the 17th June. Recent advances in theoretical physics have impelled physicists to examine the concept of causality and its position in modern physics. In classical physics the existence of a causal relation was looked upon as a truism. Max Planck considers in his very interesting and thought-provoking address whether the position of the law of causality has been materially altered by quantum mechanics. The Professor starts by defining a causal link. "At the outset," he says, "we agree that in speaking of a causal link between two successive events we mean a certain connection, subject to law, between the two events of which the earlier event is called the cause, the later one the effect"; and again "an event is causally conditioned if it can be predicted with certainty". Starting from this definition he makes a careful examination of the concept in the light of recent advances in Physics and comes to the conclusion that "the world picture in quantum physics is governed by the same rigorous determinism which rules classical physics". One of the most interesting contributions to the enquiry is the way he tries to solve the problem by postulating an ideal mind. The reliability

of any weather forecast depends on the knowledge of the meteorologist who predicts; the more knowledge he possesses of the atmospheric and other conditions of to-day the more reliable will be his predictions of to-morrow. Extrapolating, we may say that "an ideal mind, apprehending everywhere all the physical occurrences of to-day in their minutest points, should be able to predict with absolute accuracy the weather of to-morrow in all its details." This may be extended to other physical events.

Finally, "the law of causality is neither right nor wrong, it can be neither generally proved nor generally disproved. It is rather a heuristic principle, a sign-post (and to my mind the most valuable sign-post we possess) to guide us in the motley confusion of events and to show us the direction in which scientific research must advance in order to attain fruitful results. As the law of causality immediately seizes the awakening soul of the child and causes him indefatigably to ask "Why?" so it accompanies the investigator through his whole life and incessantly sets him new problems. For science does not mean contemplative rest in possession of sure knowledge, it means untiring work and steadily advancing development."