NEW TRENDS IN PHYSICS

PASCUAL JORDAN (*Germany*)

Quantum physics has, in a certain sense, divorced itself from the principle of causalty in its older form. But this separation is a necessary consequence of complementarity. In classical mechanics we could safely predict the future positions of moving, solid bodies. But when the Heisenberg principle of indeterminacy shows that as to an electron, exact measurement of its initial situation with respect to its location and rate of speed is not possible, it is likewise impossible to predict its future course. We must accept as valid this loosening of the laws of causality into laws that are only laws of statistical probability. The indeterminacy is not due to our possibly later correctible inability to observe accurately—it is innate within things themselves.

Because of what we have learned of the "quantum hit theory of radiation," and the possible biologically decisive effect of radiation on genes, we now know that indeterminancy in atomic physics has great significance for biology.

I find also a striking analogy between the electron and human personality. An electron may be characterized by the speed of its wave-length, otherwise by its position and corpuscular nature, In extreme cases we could get a purely corpuscular electron, or a purely wave-length electron extending endlessly into space. So, in human psychology, within the same individual, various personalities with differing tendencies can strive for supremacy. Thus the concept of repression in psychology is like that of complementarity in physics.

As to free will, the principle of complementarity operates in decisive fashion. The physicist understands that it is impossible to predict, calculate in advance, or pre-determine the acts of a living human being. This is not because of our imperfect knowledge, but flows basically from the very laws of the phenomena of nature.

In physics the theoretical advances of our time may be summed up in two great theories: the quantum theory and the theory of relativity. The latter happens to have no relation either to psychology or biology. But as a result of the quantum theory and its study of mesons, for example, we have learned something new about time and causality. On occasion, with or in the explosion of an atomic nucleus under bombardment of a very fast particle of matter, the usual order of events is reversed: the explosion comes first, then is followed by its cause. This has enormous implications for psychology and parapsychology, since such reversals of the cause-and-effect sequence are proved logically possible and philosophically valid.

I am sometimes asked whether we shall be able to explain and understand parapsychological phenomena within the framework of modern physics, as for example explaining telepathy on the basis of brain-waves, emanations, or rays? I believe this concept must be rejected out of hand. We may say with great certainty as to physics that, apart from meson physics, there are no physical phenomena in which broad, unexplored areas remain, such as might be validly linked with parapsychological phenomena. Yet we can assert with equal firmness that what we know empirically about telepathy and the like can in no way be explained by resorting to electro-physiology.

I think we must once and for all give up the attempt to situate, explain, or convey parapsychical phenomena in the three-dimensional reality as we conceive it specifically on the basis of our study of physics. We must adopt a radically different attitude, remembering that three-dimensional space, as we usually conceive it, is not an immediate

experience, but the result of prior work by our mind and prior cognition of what we observe. It is a framework we ourselves have created. Perhaps we must follow Zollner in thinking that our "three-dimensional" space is in turn imbedded in multi-dimensional space. We might also ponder Prof. Wenzl's suggestion as to two-dimensional time. As yet we cannot say; we have yet much empirical work ahead of us. But I believe that modern atomic physics will help us to understand and analyze phenomena which today we find it hard, if not impossible, to grasp.