

of being refuted. You cannot prove it wrong. So, I would like to suggest that one can define science as the keenest tool the human mind has yet developed for the detection of error. Note the consequences of this little epigrammatic definition. In the first place it implies--and this should be spelled out--that what a scientist does is first to see some kind of--I will call it a vision because I want to push this, perhaps harder than it should be. He sees a vision of physical reality.

He cannot tell you, "Well, I see this vision because I measured an electrical current yesterday." But there is a certain kind of, let us say, harmony or pattern that he sees perhaps in the whole universe, as Einstein did. You remember his famous remark when he refused to accept quantum mechanics--"I cannot believe that God plays dice with the cosmos." This violated Einstein's esthetic vision of what a proper universe should be.

But, he has a vision which is physical; he sees the reality. In this vision there should be elements that can be tested. If you will, the scientist makes up a universe; it may be even just a universe of semiconductors, but he makes up a pattern. And now he says, "All right, if my pattern is correct, then this should follow. Now we will go to the laboratory and we will test it." If it does not follow, the first thing that the great experimenter does is not to say, "My vision is wrong," but to say "The experiment is wrong. What did I do wrong in the experiment so that I did not get what I should have?" And it is only after the experimentalist has torn that experiment to pieces and isolated every element and seen that the vision is not true, that he will reject the hypothesis, if one wishes to call it this.

The priority here goes to the idea, and the experiment is used not to generate theories, but to test them.

Notice the role of mathematics in this system. It is, as the Cartesians insisted, a logically precise tool. But in this system its major function is to find the logical holes in the theory. That is, you can have mathematics, or it is nice to have mathematics, because this is the best probe you have. If you can put things into mathematical language, then you can perhaps find, by using mathematical logic which is precise, whether you have missed something here or made a wrong turning. But notice, that unlike Heisenberg, it does not insist upon mathematics. It is perfectly possible to have