Scientific thinking is based on a belief in the intelligibility of nature, that is, upon the belief that the same cause operating under the same conditions, will result in the same effects at any time. As a result of this belief, scientists pursue the following goals. 1. They Observe. (What conditions seem to affect the phenomena we are observing?) In order to determine the causal relations of physical occurrences or phenomena, scientists seek to identify factors that affect what they are studying. 2. They Design Experiments. (When we isolate potential causal factors, which seem to most directly cause the phenomena, and which do not?) In scientific experiments, the experimenter sets up the experiment so as to maintain control over all likely causal factors being examined. Experimenters then isolate each variable and observe its effect on the phenomena being studied to determine which factors are essential to the causal effect. 3. They Strive for Exact Measurement. (What are the precise quantitative relationships between essential factors and their effects?) Scientists seek to determine the exact quantitative relationships between essential factors and resulting effects. 4. They Seek to Formulate Physical Laws. (Can we state the precise quantitative relationship in the form of a law?) The quantitative cause–effect relationship, with its limitations clearly specified, is known as a physical law. For example, it is found that for a constant mass of gas, at a constant temperature, the volume is inversely related to the pressure applied to it; in other words, the greater the pressure the less the volume — the greater the volume the less the pres– sure. This relationship is constant for most gases within a moderate range of pressure. This relationship is known as Boyle's Law. It is a physical law because it defines a cause–effect relationship, but it does not explain the relationship. 5. They Study Related or Similar Phenomena. (When we examine many related or similar phenomena, can we make a generalization that covers them all?) A study of many related or similar phenomena is typically carried out to determine whether a generalization or hypothesis can be formulated that accounts for, or explains, them all. 6. They Formulate General Hypotheses or Physical Theories. A theoretical generalization is formulated (if one is found to be plausible). For example, the kinetic theory of gas was formulated to explain what is documented in Boyle's Law. According to this theory, gases are aggregates of discrete molecules that incessantly fly about and collide with them– selves and the wall of the container that holds them. The smaller the space they are forced to occupy, the greater the number of collisions against the surfaces of the space. 7. They Seek to Test, Modify, and Refine Hypotheses. If a generalization is formulated, scientists test, modify, and refine it through comprehensive study and experimentation, extending it to all known phenomena to which it may have any relation, restricting its use where necessary, or broaden–ing its use in suggesting and predicting new phenomena. 8. When Possible, Scientists Seek to Establish General Physical Laws as well as Comprehensive Physical Theories. General physical laws and comprehensive physical theories are broadly applicable in predicting and explaining the physical world. The Law of Gravitation, for example, is a general physical law. It states that every portion of matter attracts every other portion with a force directly proportional to the product of the two masses, and inversely proportional to the square of the distance between the two. Darwin's Theory of Evolution is a comprehensive physical theory. It holds that all species of plants and animals develop from earlier forms by hereditary transmission of slight variations in successive generations and that natural selection deter

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