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SCIENCE AND PROSPERITY¹

By Dr. KARL T. COMPTON

PRESIDENT, MASSACHUSETTS INSTITUTE OF TECHNOLOGY, AND CHAIRMAN, SCIENCE ADVISORY BOARD

I. SCIENTIFIC METHOD AND NATIONAL POLICIES

ONE of the fundamental laws of physical science is that inanimate nature, if left to herself, moves in the direction of chaos. This is a somewhat crude way of stating the Second Law of Thermodynamics. If the molecules of air in a room, for example, were all given uniform motions, and then left to themselves, their interactions with themselves and the walls would quickly change their velocities into the most random possible arrangement of motions, sometimes called the "Maxwell distribution of velocities."

In the field of human affairs many analogies may be drawn with this second law of thermodynamics. Human affairs, if left to themselves, also tend toward chaos. A business organization, if left without a guiding hand, becomes a disorganized business. A farm, if left to itself, becomes a wilderness. An economic policy of "let nature take her course" leads inevitably to economic chaos. A political policy of inaction can lead nowhere but toward anarchy.

¹ Address before the American Association for the Advancement of Science in Berkeley, June 21, 1934.

It is a significant fact that, in physical science, only one way has ever been suggested by which the tendency toward chaos can be circumvented. In slang phrase, there is only one way to "beat" the second law of thermodynamics. This way is by the exercise of intelligence in carrying out a planned policy. It was Maxwell who showed how this might be done in the case of molecules of a gas through the agency of a hypothetical intelligent being, who has been dubbed "Maxwell's demon" and who operates as follows to separate the fast from the slow molecules of a gas, which in nature remain mixed together.

Imagine a partition dividing the room into two parts and provided with a small opening just large enough to let a molecule pass through. Over this hole is a tiny trap-door operated by Maxwell's demon. Whenever he sees a very fast molecule approaching from one side he opens the trap-door and allows it to pass through. Similarly, whenever he sees a very slow molecule coming from the other side, he lets it pass through. So, after a while, he has separated the fast from the slow molecules, with the partition

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