

DISCUSSION BY CHARLES C. HEWITT, JR.

This review is directed to an attitude summarized in the paper in the following paragraph:

“All probability and all applications of statistical data are based on partial ignorance. If we knew just how a pair of dice were imperfect, were held, and thrown, and blown, and how the surface on which they bounced reacted, we could predict from tried and true engineering formulas just how the dice would fall. If we knew more about each insurance risk than we do know or even than it is at all practical to determine, we could rate each risk better, and we could build a foundation of statistics which would enable us to rate each risk still better, until, in the ultimate we could predict the actual event insured against so that savings would replace insurance as a means of mitigating the ‘risk,’ provided, of course, that our understanding and our knowledge were both built up far beyond the present ability of mankind to know, and to use knowledge.”

Modern developments in the physical sciences in combination with modern developments in probability and statistics go to the deepest roots of the determinism (expressed by Mr. Sarason) which has dominated Western thought for five hundred years. Results which, two generations ago, were conceived of as the inevitable consequence of known causes are, today, being represented as averages resulting from random juxtaposition of known and unknown factors, both measurable and unmeasurable. Physical laws which were taught as absolute only a generation ago are, today, represented more properly as a macroscopic averaging or balancing of the often erratic individual behavior of a very large number of microscopic particles.

This philosophical retreat from the *certain* to the *averaging of the uncertain* is humbling to all mathematicians. No less a great than Albert Einstein has said, in protest, “I can’t believe that God plays dice with the universe.” The practical mathematician is reminded that he deals only with mathematical models. No one of his models will ever fit perfectly into an empirical mold. The childlike joy of being absolutely correct is gone, and his subconscious feeling of superiority over other intellectual craftsmen is disturbed.

However, even models and their improvement can and do provide genuine stimulation to the intellect, and their useful adaptation to practical situations can and does provide real challenge. In the fields of probability, statistics and decision theory, a whole new storehouse of mathematical

models has become available to the practicing mathematician in the business of insurance – the actuary. Some of these models are beginning to find their way into our *Proceedings* and into the *Transactions of the Society of Actuaries*.

AUTHOR'S REVIEW OF DISCUSSION

Mr. Hewitt's comment on the statistics of causation goes to the root of "natural laws." I stand corrected! We would have to understand the First Cause to be able to understand how ultimate particles of matter act in order to predict with certainty whether or not our "natural laws" would be followed in any specific case.

One of the interesting aspects of the difference between exact reasoning of Mr. Hewitt's kind and ordinary reasoning lies in an analysis of the following question. "Does a human being really have such a thing as free will?"

The pragmatic answer is, "I don't know whether I have a free will or not, but I sure have a lot of fun acting as though I have free will." (And the person who answers is not interested in the specific meaning of the word "acting." "All the world's a stage.")