Next, consider a random square-wave input. If the input wave was truly random (having no generating rule), it would be impossible to produce D.C. from the commutator. On the other hand, if the input wave was pseudo-random (having a generating rule), knowing the pseudo-random sequence would allow D.C to be generated. The technique of spread-spectrum which modulates data with a pseudo-random sequence provides an extremely reliable method of communication.

THE NATURE OF RANDOMNESS

Is a gas or a solid truly random or is it pseudo-random? Consider a solid. To compute its dynamics by the finite element method, it is modeled by a large system of coupled oscillators. As the number of finite elements is increased, the number of modes increases along with its overall period. This overall period will become much greater than our life span long before the finite element model approaches molecular levels. In this model of a solid, the system would appear truly random when in fact it was really pseudo-random.

I believe that a case can be made for considering a discrete (at most countably infinite) structure for phase-space. The uncountably infinite real number system was developed around our belief in and our need for a continuum...Feferman(1964). However, the body of data collected in support of any physical law is finite. I do not believe that this data along with our geometrical requirements for the irrational number (square-root, PI, trigonometric functions) and the inductive hypothesis to fill in the untested regions can prove the existence of a continuum.

Let phase-space be modeled as a discrete, finite structure. Let the intermolecular interaction be ignored. Then it may be possible to model the acoustical oscillator as a system of short-cycle pseudo-random generators.

The distribution of velocities provides a challenging modeling problem. One interesting possibility is to use different sampling rates for each of the generators. Our conventional model of velocity states that if $V1>V2$, $V1=\Delta X1/\Delta T1$ and $V2=\Delta X2/\Delta T2$, then $\Delta X1>\Delta X2$ and $\Delta T1=\Delta T2$. Perhaps, the possibility that $V1>V2$ is caused by $\Delta T1<\Delta T2$ instead of $\Delta X1>\Delta X2$ should be studied.

Let the behavior of the molecular interaction be deterministic relative to phase-space vectors of the interacting particles. Then the interaction would provide the rule for coupling these systems of generators into a large composite pseudo-random generator with a very long period. In such a model, the standing waves associated with the initial disturbance would decay into a "random noise."