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This Week's Citation Classic®

Chandrasekhar S. Stochastic problems in physics and astronomy. *Rev. Mod. Phys.* 15:1-89, 1943.
[Yerkes Observatory, University of Chicago, Williams Bay, WI]

In this review are considered certain fundamental probability methods increasingly applied to a wide variety of problems as different as colloid chemistry and stellar dynamics. "A common characteristic of all these problems is that interest is focused on a property which is the result of superposition of a large number of variables, the values which these variables take being governed by certain probability laws":[1] the problem of random flights, stellar dynamics, Brownian motion, and probability after-effects. [The *SCI®* indicates that this paper has been cited in over 2,930 publications, making it the most-cited paper for this journal.]

The Quest for Perspectives

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After the early preparatory years, my scientific work has followed a certain pattern motivated, principally, by a quest after perspectives. In practice, this quest has consisted in my choosing (after some trials and tribulations) a certain area which appears amenable to cultivation and is compatible with my taste, abilities, and temperament. And when after some years of study, I feel that I have accumulated a sufficient body of knowledge and achieved a view of my own, I have the urge to present my point of view, *ab initio*, in a coherent account with order, form, and structure.

There have been seven such periods in my life: stellar structure, including the theory of white dwarfs (1929-1939);[2] stellar dynamics, including the theory of Brownian motion (1938-1943);[1,3] the theory of radiative transfer, including the theory of stellar atmospheres and the quantum theory of the negative ion of hydrogen and the theory of planetary atmospheres, including the theory of the illumination and the polarization of the sunlit sky (1943-1950);[4] hydrodynamic and hydromagnetic stability, including the theory of the Rayleigh-Bernard convection (1952-1961);[5] the equilibrium and the stability of ellipsoidal figures of equilibrium, partly in collaboration with Norman R. Lebovitz (1961-1968);[6] the general theory of relativity and relativistic astrophysics (1962-1971); and the mathematical theory of black holes (1974-1983).[7]

[According to Chandrasekhar, as quoted in the *New York Times*,] It's all theoretical. It's very difficult to describe my work. I was very young when I started.... Usually my work has become appreciated only after some length of time.[8]

[ED: S. Chandrasekhar won the Nobel Prize in 1983 for his discovery of the maximum mass of white dwarf stars,[9] which has become known as the Chandrasekhar Limit. The previous paragraphs were prepared by Chandrasekhar in 1983 and published in 1984.[10] They are published here with the permission of the Nobel Foundation. Chandrasekhar sent these paragraphs to us as his *Citation Classic* commentary. The following paragraphs, from commentaries published by others at the time of his Nobel award, have been combined with Chandrasekhar's commentary and approved by him as a *Citation Classic* commentary on his 1943 *Reviews of Modern Physics Classic*.]

"Chandrasekhar's work was an exotic byway of physics of little interest to anyone except specialist astronomers until the 1960s, when the discovery of pulsars and their interpretation as rotating neutron stars brought it into the limelight. In the 1970s, X-ray stars were interpreted as black holes, and as far as observations can tell the Chandrasekhar Limit is indeed a key guide to the evolution of real objects in the Universe."[11]

"Chandra's career has emphasized the importance of beauty in theoretical physics and of brooking no shortcuts or expediency in one's work. His love for mathematical beauty is shared by many pure mathematicians, but he expresses it more exuberantly (possibly because experimental physics is a reassuring background, even if not used by him explicitly). One year a class of his consisted of only two students but he made no shortcuts in his teaching. This strict maintenance of standards paid off when the whole class won the Nobel Prize (T.D. Lee and Frank Yang in 1957)."[12]

1. **Chandrasekhar S.** Stochastic problems in physics and astronomy. *Rev. Mod. Phys.* 15:1-89, 1943. (Reprinted in: **Wax N**, ed. *Selected papers on noise and stochastic processes.* New York: Dover, 1954.) (Cited over 2,930 times since 1945.)
2. ————. *An introduction to the study of stellar structure.* New York: Dover, (1939) 1957. 509 p. (Cited 700 times since 1945.)
3. ————. *Principles of stellar dynamics.* New York: Dover, (1943) 1960. 313 p. (Cited 595 times since 1945.)
4. ————. *Radiative transfer.* New York: Dover, (1950) 1960. 393 p. (Cited 3,325 times.)
5. ————. *Hydrodynamic and hydromagnetic stability.* New York: Dover, (1961) 1981. 652 p. (Cited 2,905 times.)
6. ————. *Ellipsoidal figures of equilibrium.* New York: Dover, (1969) 1987. 254 p. (Cited 10 times.)
7. ————. *The mathematical theory of black holes.* Oxford, England: Clarendon Press, 1983. 646 p. (Cited 105 times.)
8. **Webster B.** Scientists who won the 1983 Nobel Prizes for physics and for chemistry. *New York Times* 20 October 1983. p. B13.
9. **Chandrasekhar S.** The maximum mass of ideal white dwarfs. *Astrophysical J.* 74:81-2, 1931. (Cited 45 times since 1945.)
10. ————. On stars, their evolution and their stability. *Les Prix Nobel 1983: Nobel Prizes, presentations, biographies and lectures.* Stockholm, Sweden: Almqvist & Wiksell International, 1984. p. 58-80.
11. **Gribbin J.** Inside the stars. *New Sci.* 100:254-5, 1983.
12. **Salpeter E E.** The 1983 Nobel Prize in physics. *Science* 222:881-5, 1983.

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