field? What generates it? And, as we shall now explore, this also leads to unearthing the deeper implications of the Bell Labs observations.

Ampère's magnetic field

One problem we immediately confront, is that almost all current textbooks present nothing but lies about Ampère's law—the standard definition of a magnetic field. What is presented as Ampère's law, is actually Grassmann's law, which has no physical basis. Grassmann modified Ampère's experimentally derived law, because, as he reported, Ampère's law does not fit Grassmann's mathematics. And the "mathematical" complications that Grassmann found in Ampère's original law for how electrical currents generate a magnetic field do indeed lead to a correction in the inverse square law of Newton—another reason which Grassmann cites for altering Ampère's Law. Gauss and Weber, on the other hand, expanded upon this aspect of Ampère's law, as Laurence Hecht has shown.[6] Hecht explained that this work of Gauss and Weber led them to discover the sub-atomic and sub-nuclear domains, 50 years before their empirical confirmation. Weber was already exploring the possibilities of nuclear fusion of hydrogen in publications presented in 1870!

The point is not that Gauss and Weber were ahead of

6. Laurence Hecht, "The Atomic Science Textbooks Don't Teach: The Significance of the 1845 Gauss-Weber Correspondence." *21st Century Science & Technology*, Fall 1996.

Eddington's folly

Down to the present day, Sir Arthur Eddington's theory of stellar thermodynamics has been the dominant influence on the theory of the solar interior and stellar interiors in general. According to this theory, the kinds of structures now being discovered would have no reason to exist. The late solar astronomer Richard N. Thomas went beyond the Eddington approach, however. The following is a pungent excerpt from his draft preface to a planned book on stellar structure and stellar mass loss. The book was to be a collaboration with an astronomer trained in the school of Victor Ambartsumian at Byurakan Observatory in Armenia. It was not well advanced at the time of Thomas's death in 1996, however. Thomas was the senior organizer of the NASA-CNRS series of volumes, Nonthermal Phenomena in Stellar Atmospheres *and the author with Grant Athay of the 1961 classic,* Physics of the Solar Chromosphere.

While the preface excerpted below is vectored primarily toward the question of what causes stars to shed matter to the interstellar medium, this excerpt gives a good indication of the "fog-bound" character of most thinking about stellar and solar structure, right into the era of helioseismology.—David Cherry

Beginning with Eddington (1920s), models of stellar-interiors producing energy/mass fluxes have been almost exclusively the province of "speculative" theoreticians: those who proceed by hypotheses largely unrelated to detailed stellar observations. Their stellar data are essentially mass, wavelength-integrated visual flux, and "color"—translated into (incomplete) stellar characteristics by inapplicable thermodynamics. The approach reflects Eddington's speculative-belief that an astronomer living on a fog-bound planet, knowing all the "laws" of terrestrial laboratory and theoretical physics, could eventually predict the existence and details of all observable stellar phenomena free from observational guidance. This outlook was encouraged by his seeming success in constructing a thermodynamically universal stellar-structural model/pattern, the same for all varieties of Eddington-defined "normal stars" across the Hertzsprung-Russell plane. Such universal structural model required the same thermodynamic-universality for the origin of the radiative-energy flux that "stars" *must* (and were so observed to) produce. . . .

If there are any real-world stars satisfying: 1) Eddington's hypothetical-definition of a "normal" star as thermally-quiet and producing *only* a radiative-energy flux from the star; and 2) modeled by Eddington-type closed-system, quasi-Equilibrium thermodynamics [as written]. But predating Eddington's modeling, there were extensive observations of bright stars (including the Sun, because of its proximity) not satisfying the characteristics of Eddington-normal ones: they exhibited mass-loss by outflow, so were not "thermally-quiet," but were aerodynamically-"open" systems. Moreover, they exhibited a variety of non-Equilibrium spectroscopic features. . . . If one . . . could not avoid the observationally-established existence of "peculiar"-stars (including the Sun), at least some of which are thermodynamically-open systems because of observed mass-outflow/flux . . . then Eddington could not avoid observing the contradiction of his basic principle—the thermodynamic-universality of stellar structure—even while he constructed his "standard-modeling," and his successors elaborated it. . . . That one could not find an alternative "theoretical"/Universal model to represent "peculiar" stars is not so serious; it is serious, for Eddington's outlook, that two such [alternative models] could exist without the fog-bound astronomer being aware of it. . . .