Editorial*

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The September issue of Resonance features Friedrich Herman Hund—a legendary German physicist who made everlasting contributions to the development of quantum physics, in particular, atomic and molecular physics. Hund’s academic journey started from the birth of quantum mechanics, and he was part of the legacy of many of the prestigious scientists of the 20th century.

Hund’s early education was in Karlsruhe, and then he studied in Marburg and Göttingen—did his PhD under the supervision of Max Born. During his professional career, he took up positions in many German Universities—Rostock, Jena, Frankfurt, and Göttingen. It appears from his scientific contributions that he developed everlasting concepts purely from his intuition, as the mathematical foundation of quantum mechanics had not been shaped by the beginning of the 1920s.

Hund is known to us from our school days when we started writing electronic configurations to understand the Periodic Table. His rule of maximum spin multiplicity is a unique and everlasting addition to the subject. With later developments of the mathematical foundations, it emerged that electrons with parallel spin have quantum mechanical exchange interactions that lower the energy of a triplet state and define the ground electronic term arising from the same total orbital angular momentum. The rule was empirically derived by him while energetically ordering the spectra of diatomic molecules. Hund invented the concept of quantum tunneling. Although it did not have a firm mathematical background when he invented it, it is now known that tunneling has a purely quantum mechanical origin and is ubiquitous in all quantum systems. Although Hund did not get a Nobel Prize for this work,

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EDITORIAL

five Nobel Prizes were awarded for further developments based on the idea of quantum tunneling. Hund is probably the first one to realize that electronic motion in molecules can be separated from nuclear motion. It was further developed by Max Born and Robert Oppenheimer, which paved the way for molecular quantum mechanics. Hund's realization of molecular orbital as an interpolation of wave function from the separated atom limit to the united atom limit, called the correlation diagram, is noteworthy—it gave birth to molecular orbital (MO) theory.

The 1920s were the glorious years in the history of developments of new quantum mechanics. Indigenous new discoveries were made, which include electron spin, Pauli's exclusion principle, Hund's rule, quantum mechanical tunneling, Born–Oppenheimer approximation, successful quantum mechanical interpretation of covalent chemical bonds, and many others.

The life and science of Hund are documented in three articles in this issue of Resonance. A brief biography highlighting the novel scientific contributions made by him is outlined in the Article-in-a-Box. His personal life and scientific contributions are elaborated in detail in two general articles, one by Sridhar R. Gadre and Nityananda Sahu and the second one by Kalidas Sen. In addition to the scientific contributions of Hund, Sen's article reports, in full, the personal interview of Friedrich Hund taken on his 100th birthday by Klaus Hentschel and Renate Tobies. This interview, published originally in Deutsch, captures the story of the evolution of Hund's life and scientific career. Many of the interesting features covered in this interview remained largely unknown to the English-speaking world. An English translation presented for the first time in this article would be of immense value to the wide readership of Resonance.

Apart from the articles mentioned above, ten other articles written by students and colleagues make this issue of Resonance interesting to read. The article by Premabrata Manna and Satadal Bhattacharyya describes a strategy to numerically evaluate the thermodynamic properties of non-interacting Bose gas confined in a
three-dimensional box which aids in a simple understanding of Bose–Einstein condensation. Marlon Martinez-Reina describes the life and work of Charles Darwin in part through philatelic images of 13 postage stamps—an interesting article written thoughtfully. The inspirational contributions of Libbie Hyman—a zoologist—are documented in an article by Ravidranath G. This article also gives a glimpse of her personal life. While Jyotirmoy Sarkar and Mamunur Rashid continue to explore the external anatomy of the novel coronavirus, in the third part of their series article, Rajendra Bhatia discusses Mazur–Ulam theorem and its proofs in his article on isometries and linearity.

In addition to these general articles, there are five classroom articles featured in this issue. Victor Oxman and Moshe Stupel have conceived an article out of the training of mathematics teachers on the dynamic investigation of conservation of areas described by a parametric function. Rajarshi Ghosh demonstrates an analytical experiment to determine the molecular formula of iron complex for high school students. Ruti Segal and Moshe Stupel present an interesting article on discovering new geometric properties in the context of Van Aubel’s theorem and demonstrates how a quadrilateral first degenerates into a triangle and later into a straight line. It introduces the students to unfamiliar conservation properties which are not dealt with in regular mathematics courses. A survey of techniques in the dynamic graph model is presented as a second part of the proposed three-part series articles by Manas Jyoti Kasyop and N. S. Narayanaswamy. A dynamic graph is characterized by a fixed set of vertex and a set of dynamic edges. While applications of the static counterpart of such graphs are well known, the same for the dynamic graph is yet to be explored. In this article, the authors encourage young researchers to re-engineer the existing algorithms and explore realistic applications of the surveyed techniques on dynamic graphs. Shivalika Sarkar, in her article, demonstrates a video-based analysis for solving problems in mechanics.

I hope the potential readers enjoy reading these articles.
Finally, I thank Ayan Guha for the excellent cartoon that he sketched. It fits the theme of this issue precisely. I always appreciate the hard work and dedication of the editorial staff members, without which the issues of Resonance would not appear in time.