# Nobels neglect fluid dynamics

I was surprised to see that Philip Anderson's obituary (PHYSICS TODAY, June 2020, page 59) did not mention how he viewed the belief held by some in particle physics that their field deserves more funding than other areas. Anderson had said, "There is a great arrogance and immodesty about the whole field." The sidelining of some disciplines of physics in preference to the contemporary, more exotic fields, especially when it comes to awards like the Nobel Prize, is not new.

Since the 19th-century publication of the Navier–Stokes equations, the governing equations in fluid dynamics, many scientists have attempted to solve them. And well-known physicists have worked in different aspects of fluid mechanics. Arnold Sommerfeld, the noted theoretical physicist, had a passion for it, and his "school" was well known for work in it.[1] Much of that work related to stability, transition to turbulence, and lubrication.

Sommerfeld is supposed to have said that before he died he wanted to understand two phenomena—quantum mechanics and turbulence. Theodore von Kármán recalled in his autobiography that Sommerfeld was somewhat nearer to an understanding of the quantum but no closer to the meaning of turbulence.[2]

Werner Heisenberg, a star of quantum mechanics, did his 1924 PhD thesis, "On the stability and turbulence of fluid flow," under Sommerfeld. After World War II, while he was interned at Farm Hall in the UK, Heisenberg contemplated the problem of turbulence stability and the transition to turbulence.[1] Three papers published in 1948 cover his work from that time period.

Outstanding efforts of stalwarts like Ludwig Prandtl, von Kármán, and G. I. Taylor provided the understanding and methodology to examine fluid flow, including turbulence and boundary layers. They thus laid the foundations of aerodynamics, and their work led to rapid development in aeronautics and astronautics.

The field of mechanics, especially fluid mechanics, has been routinely neglected in considerations for the physics Nobel Prize. The importance of the advances mentioned above and their benefit to society underscores the sidelining of the field. Taylor in 1935 privately complained about the Nobel Committee's preference for "atomic physics," owing to nominations being made by previous recipients. Believing that Prandtl should have been awarded a Nobel, Taylor wrote that the prize needed to be opened up to "non-atomic physicists."[3] Von Kármán expressed similar thoughts regarding Prandtl's deservedness.[4] The Nobel Committee's dismissive attitude toward fluid mechanics continues to this day.

Although innovative techniques have created great progress in addressing the problem of turbulence, the general solution to the Navier–Stokes equations remains elusive. The importance and the difficulty of solving the problem of turbulence in fluid mechanics is highlighted by the fact that the Clay Mathematics Institute lists the existence and smoothness of Navier–Stokes solutions as one of its unsolved millennium problems. Let us hope that the one who solves it will win not only the $1 million reward but also the Nobel Prize in Physics.

**WAKE CREATED BY THE FERRY TO FANØ, DENMARK.** Fluids are important to many processes, in nature and in human actions. Yet the study of fluid mechanics seems to garner few accolades. (Photo by Malene Thyssen, CC BY-SA 3.0.)

## References


1. M. Eckert, *Annu. Rev. Fluid Mech.* **47**, 1 (2015).
2. T. von Kármán, L. Edson, *The Wind and Beyond: Theodore von Kármán, Pioneer in Aviation and Pathfinder in Space*, Little, Brown and Co (1967), p. 134.
3. G. Batchelor, *The Life and Legacy of G. I. Taylor*, Cambridge U. Press (1996), p. 185.
4. Ref. 2, p. 40.



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# A memory of Mark Azbel

In their obituary for Mark Azbel in the October 2020 issue of PHYSICS TODAY (page 67), Bertrand Halperin, James Langer, and Roman Mints wrote that "Life in his presence was never dull." How right they are.

In the early 1980s, Mark spent several summers at Bell Labs, where he sat at the extra desk in my office. He was a friendly and soft-spoken man. One day I came into the office, said hello, and sat down at my desk, with my back to him. He picked up the telephone and tapped a few numbers, and I heard one side of an interesting conversation:

"Hello, operator? I would like to make telephone call to Soviet Union please.

"My name? Azbel.

"Azbel. A as in asparagus, Z as in Riemann zeta function, B as in Bogoliubov-Born-Green theory, E as in electron–phonon coupling, . . ."

At that point, I was walking out the door, hand over mouth, trying hard to stifle my laughter.

Azbel finished with ". . . and L as in Landau damping."


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# Whiting's notes on induction-coil size

The article "Sarah Frances Whiting and the 'photography of the invisible'" (Physics Today, August 2020, page 26) was fascinating. It was inspiring to learn of the important contributions she and her group made to x-ray science while using relatively modest laboratory facilities at Wellesley College.

I offer a different interpretation of Whiting's notes on an x-ray photography experiment that was "executed with a 6 in. coil"—the induction coil used to supply high voltage to the Crookes tube that produced the x rays. In the nomenclature of the day, the maximum voltage of an induction coil was measured in inches, referring to the maximum length of air-discharge spark it could make, the most reliable way to measure high voltage at the time. A six-inch coil would generate a pulse of about 130 kV. That was a key detail to record because it related directly to the x-ray energy. The coil diameter was much less important.


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# Isaac Newton was brilliant except when he was not

Andrew Odlyzko's article "Isaac Newton and the perils of the financial South Sea" (Physics Today, July 2020, page 30) is more than just a fascinating read about Newton and financial speculation of the time. It is also, perhaps unintentionally, a commentary on society's assumptions about scientists.

Why would we expect Newton to excel in financial speculation? Because of his mastery of mathematics and complex natural systems and his work at the Royal Mint? Perhaps. Furthermore, as a culture we—and often scientists themselves—assume the portability of scientific wisdom: Because science is hard, scientists are considered to be qualified to master "less hard" nonscientific subjects. I have worked in communications at scientific and technical organizations for decades, and it is not uncommon to find PhDs who assume—and even say—"I could do your job better than you. I just don't have time." An exceptional few are good communicators to anyone outside their field; the vast majority are tolerable to dreadful despite their conviction otherwise.

Of course Newton would flunk the test. He had no financial models at the time, and even if he did, the motion of markets owes more to the unquantifiable forces of expectation and fear than to the quantifiable forces of nature that Newton knew so well.


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