Physical Research Laboratory, Ahmedabad

Colloquium 18-10

Speaker: **Dr. Navinder Singh**
Associate Professor, Physical Research Laboratory, Ahmedabad.

Title: **"The physics of flight: Bernoulli versus Newton"**

Time: **Wednesday, 29 August 2018, 16.00 hrs.**

Venue: **Nanosims Lecture Hall, PRL**

Abstract

Air travel has become one of the most common means of transportation. One wonders about the lifting capacity of uniquely designed wings of Boeing airliners. You might have peeped through the window of an airliner and have noticed the moment of ailerons and flaps when plane takes off or lands, and that might have excited your curiosity. The physics behind these mechanisms is both interesting and challenging. The common question which is generally asked is: How does an airplane gain lift? And the most common answer is via the Bernoulli principle. It turns out that it is wrongly applied in common explanations, and there are certain misconceptions in this field. In an alternative explanation the push of air from below the wing is argued to be the lift generating force via Newton's law. There are problems with this explanation too. In this presentation we will try to clear these misconceptions, and the correct explanation, using the Lancaster-Prandtl circulation theory, will be discussed. The physical meaning of the Kutta-Joukowski condition will be illustrated. At the end, a brief discussion of a new viewpoint advanced in PRL will also be presented which goes beyond the Lancaster-Prandtl theory. This talk will discuss the physics of paragliders and powered paragliders.

The Speaker

Dr. Navinder Singh did his B.E. in Electronics Engineering from GEC Bathinda, after which he shifted to theoretical physics and obtained his PhD in theoretical condensed matter physics from the Raman Research Institute (RRI), Bangalore in 2006. His postdoctoral training was from IOP Bhubaneswar; Holon Institute of Technology, Israel; and the University of Toronto, Canada. He is currently a faculty member in Theoretical Physics division at PRL. His research interests are in the nature of electronic transport and magnetic properties in strongly correlated systems like strange metals and in the theory of (un)conventional superconductivity. He has published over 40 papers in peer reviewed journals and has authored a book entitled "Electronic Transport Theories: From Weakly to Strongly Correlated Materials", CRC Press (2016). For PRL's science popularization activities he has contributed to the design of several experimental set-ups. He is also interested in hydrodynamics and aerodynamics.

ALL ARE WELCOME