Physics Virtual Colloquium

"Topological Quantum Phases, Novel Superconductors, and Ultra-Thin Films Beyond Graphene"

Zoom link: https://virginiatech.zoom.us/j/96084996911

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Friday, November 6, 2020
2:30pm-3:30pm EST

I will discuss some of our recent work aimed at understanding the electronic structure and spectroscopy of novel superconductors, topological materials, and atomically thin 2D films beyond graphene. [1-5] Illustrative examples will include: (i) How by exploiting electronic structure techniques we have been able to successfully predict and understand the characteristics of many new classes of topologically interesting materials, including magnetic topological materials; (ii) Howe atomically thin "beyond graphene" 2D and layered materials offer exciting new possibilities for manipulating electronic structures and provide novel platforms for fundamental science and applications; and, (iii) with regard to the high-T's, I will discuss recent breakthroughs in modeling the insulating pristine compounds and their transition from the insulating to the metallic state with doping without invoking any free parameters such as the Hubbard effective U parameter. A first-principles description of the competing stripe and magnetic phases in the cuprates also then becomes possible, providing a new pathway for modelling correlated materials more generally.

[1] Y. Zhang et al., Proceedings of the National Academy of Sciences 117, 68 (2020).
[2] A. Bansil, H. Lin and T. Das, Reviews of Modern Physics 88, 021004 (2016).
[3] C. Hu et al., Science Advances 6, eaba4275 (2020).
[4] I. Belopolski et al., Science 365, 1278 (2019).
[5] Z. Hennighausen et al., Nanoscale 11, 15929 (2019).

Bio:

Bansil is a University Distinguished Professor of physics at Northeastern University (NU). He served for over two years at the US Department of Energy managing the flagship Theoretical Condensed Matter Physics program (2008-10). He is an academic editor of the international Journal of Physics and Chemistry of Solids (1994-), the founding director of NU's Advanced Scientific Computation Center (1999-) and serves on various international editorial boards and commissions. He has authored/co-authored over 400 technical articles and edited 17 volumes of conference proceedings covering a wide range of topics in condensed matter and materials physics, and a major book on X-Ray Compton Scattering (Oxford University Press, Oxford, 2004). Bansil is a Highly Cited Researcher (ISI Web of Science/Clarivate Analytics, 2017-2020).

Hosted by Prof. Kyungwha Park, Physics, Virginia Tech