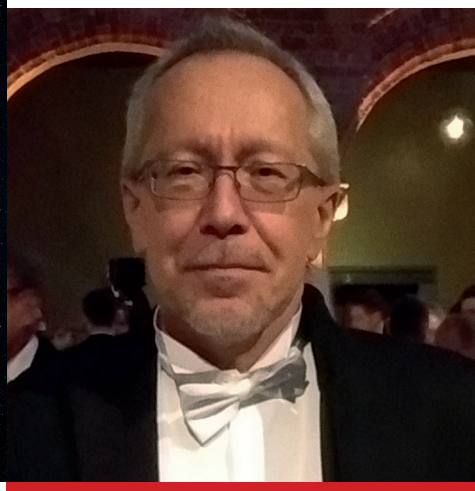
Computational Materials Science Seminar

STATE OF IRON IN THE EARTH CORE: PARADIGM CHANGE

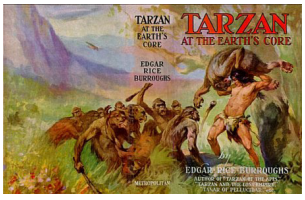
Skoltech
Skolkovo Institute of Science and Technology

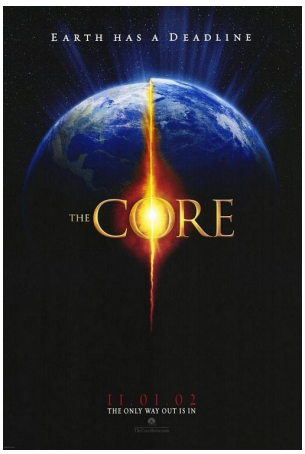
April 25th
16:00-17:00
room 403

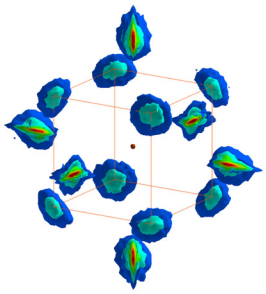


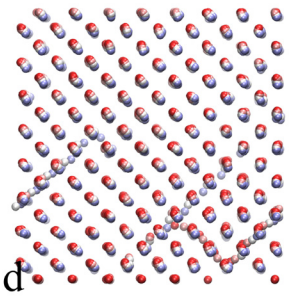
Abstract:

There is a ball of solid (Inge Lehmann, 1934) iron (Al'tshuller et al., 1960) in the center of the Earth. This ball is called the Inner Core. Any theory trying to describe the past of the Earth, explain the present state of the Earth, and predict its future, has to accommodate and explain a number of enigmatic features that the Core possess. The Inner Core drives the geodynamo in the liquid Outer Core that protects the life on Earth from cosmic radiation. There is a possibility that the core-mantle boundary might be the place where heavy hydrocarbons are synthesized. The Inner Core possess low shear modulus, sound waves travelling through the Core are highly attenuated, the Core is elastically anisotropic, and there is an indication that the Inner and Outer Cores rotate with different pace. The properties of the Core are tightly connected to the way in which atoms in the iron phase are packed. The current paradigm is that the stable phase of iron in the Core is hexagonal close packed. I will demonstrate that the first principles molecular dynamics supports another phase, namely body-centered cubic phase of iron. Quite remarkable, this phase has already been observed in experiments but its signature was misinterpreted. I will demonstrate that the stability of the bcc phase allows to resolve all the existing controversies and provide explanation of all above-mentioned enigmatic features.









Speaker

Anatoly B. Belonoshko
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BIO: Anatoly Belonoshko works at the Department of Physics of the Royal Institute of Technology in Stockholm. He graduated from mech-math at Moscow State University and then worked at the USSR Academy of Sciences in Chernogolovka. After defending his dissertation at the Institute of Chemical Physics in Moscow, he went for postdoc to Uppsala University in Sweden. Anatoly's interests are in the field of application of computational methods to study materials under extreme conditions, in particular minerals in the deep interior of the Earth. He published about 150 papers, among them 15-20 papers in Nature, Science, Nature Geoscience, PNAS, and Phys. Rev. Letters. For his studies he was elected a Fellow of American Physical Society in 2017.

Looking forward to seeing you!