DIPARTIMENTO DI FISICA

SAPIENZA
UNIVERSITÀ DI ROMA

Rome, March 11, 2024

**Nomination of Sauro Succi to the 2024 Beltrami Prize**

This letter is to express my most enthusiastic support to the nomination of Sauro Succi for the 2024 Eugenio Beltrami Prize.

I know Sauro since the mid'80s, when he joined the IBM European Center for Scientific and Engineering Computing in Rome, where I was frequently visiting for scientific discussions. In this way, I have personally witnessed the birth of the Lattice Boltzmann (LB) method, out of the problems which plagued Lattice Gas Cellular Automata.

Sauro has made numerous outstanding contributions to computational physics, applied math, and engineering, but his international standing is mostly attached to his groundbreaking work on LB. I am sure that other nominators will cover his pioneering contributions in detail, hence in the following I shall only comment on what I regard as his most unique and far reaching contribution: he was the one who first saw and actually realized the unsuspected potential of the LB beyond its original realm of the physics of fluids.

He is directly responsible for an impressive number of major LB extensions, particularly in the direction of soft matter (foams, emulsions soft glasses, soft flowing crystals), multiscale problems at the physics/engineering/biology interface, as well as quantum relativistic transport in graphene and subnuclear plasmas and lately, also quantum computing for classical fluids. More generally, he has been the pivotal figure in uncovering and deploying the amazing flexibility of the LB to compute complex states of flowing matter, which elude the continuum description and remain computationally unviable for microscopic methods. This is a paramount advance in statistical physics, as it basically bridges the historical gap between continuum and atomistic mechanics, thereby enabling a vast spectrum of engineering applications across many scales and different regimes of motion, from macroscopic fluid turbulence all the way down to microfluidics (for which Sauro received an ERC-AdGgrant in 2017) and nano-biological fluids.

Sauro's exceptional achievements have been recognized through the two major international prizes in computational physics, namely the APS Aneesur Rahman Prize (2017) and the CECAM Bernie Alder Prize (2019), as well as by the aforementioned grant ERC grant. In 2022, in recognition to his contribution to engineering science, he has been elected Honorary Professor at the Mechanical Engineering Department at UCL (2022). As mentioned above, I am firmly convinced that Sauro's achievements have made a very profound and long lasting impact not only on computational physics but also to applied math and engineering science. Last but not least, Sauro has been extremely proactive in promoting and sustaining an international scientific community in this area and also in generating and managing a number of European grants in the area of computational engineering, besides his 2017 ERC-AdG.

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In my view, modern science presents three outstanding frontiers: the extremely small (high energy), the extremely large (astro-cosmology) and the extremely complex.

This latter is perhaps less spectacular than the previous two, but it is by no means less profound and impactful for science and society, and particularly for the development of modern cutting-edge engineering applications.

Based on the above, I am absolutely positive that Sauro's work represents a unique and transformative advance to the latter frontier, which qualifies him as a truly ideal candidate for the most prestigious Eugenio Beltrami Prize.

Sincerely yours,

Giorgio Parisi,