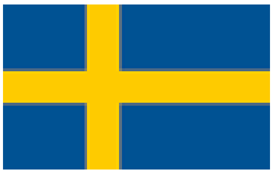

IX

SWEDISH—UKRAINIAN SEMINAR

in THEORETICAL PHYSICS

April 14, 2026

Mixed on-line/off-line regime*

Program **

10.00–10.05 – Opening

10.05–10.45 – **Angelo Vulpiani** (Dipartimento di Fisica, Universita di Roma "Sapienza")
"Something about L.F. Richardson: a tribute to a great scientist, coherent pacifist and prophetic visionary"

10.45–11.25 – **Ramon Wyss** (KTH, Sweden)
"From earthquake forecasting to predictions - the ArtEmis project"

11.25–11.40 – Coffee break

11.40–12.10 – **Yuliia Lashko, Viktor Zhaba, Viktor Vasilevsky (BITP of the NAS of Ukraine, Kyiv, Ukraine)**
"Unveiling 8Be near the 7Li+p and 7Be+n thresholds: twin resonances and astrophysical S-factors"

12.10–12.40 – **Borys Gryniuk** (BITP of the NAS of Ukraine, Kyiv, Ukraine)
"A few-body problem within variational approach"

12.40–13.00 **– Dmytro Anchyshkin** (BITP of the NAS of Ukraine, Kyiv, Ukraine)
"A Particle Spectra in Relativistic Heavy-Ion Collisions"

*** Join Zoom Meeting**

https://indico.fysik.su.se/event/9665/

****EE Time, CET is one hour earlier**

Something about L.F. Richardson: a tribute to a great scientist, coherent pacifist and prophetic visionary

Angelo Vulpiani

Dipartimento di Fisica, Università di Roma "Sapienza", Piazzale A. Moro 2,

I-00185, Roma, Italy

Lewis Fry Richardson (1881- 1953), had been one of the great scientists of the 20-th century. His name is linked to many important ideas and methods in different fields, but also physicists and mathematicians themselves often do not know who he was.

LFR did not follow the main stream of his time: according to G.I. Taylor he seldom thought on the same lines as his contemporaries and often was not understood by them. During his (almost hidden) life LFR gave astonishing contributions to science, anticipating in a visionary way many important ideas and methods which now are widely used, and often known even at popular level:

- the introduction of the fractal dimension;
- energy cascade in turbulence and idea of self-similarity;
- non gaussian diffusion in turbulence;
- the idea to apply mathematics to predict the weather;
- anticipation of the idea of parallel computation;
- the first attempt to use mathematics to model the psychology of war.

Unveiling 8Be near the 7Li+p and 7Be+n thresholds: twin resonances and astrophysical S-factors

Yuliia Lashko, Viktor Zhaba, Viktor Vasilevsky

BITP of the NAS of Ukraine, Kyiv, Ukraine

The resonance structure of 8Be near the p+7Li threshold is investigated within a microscopic many-cluster, many-channel model including the three-cluster configurations 4He+3H+p, 4He+3He+n, and 4He+d+d. This framework provides a unified description of the main binary channels 4He+4He, p+7Li, n+7Be, and d+6Li, while explicitly accounting for the internal structure and polarization of cluster subsystems, i.e. their deformation in the interaction region.

Particular attention is given to the twin resonances with J^\pi=1+, 2+, 3+, and 4+, as well as to the negative-parity 1- and 2- states. The 2+ states below the p+7Li threshold are identified as Feshbach-type resonances produced by coupling of the open 4He+4He channel to the closed p+7Li, n+7Be, and d+6Li channels. We demonstrate that cluster polarization plays a critical role in the formation of these twin positive-parity resonance states. In contrast, the 1- and 2- resonances near the n+7Be threshold are much less sensitive to cluster polarization. The 2- state and the lowest 1- state are associated with neutron scattering on the ground and first excited states of 7Be, whereas the second 1- resonance is consistent with 3He scattering on 5He.

We also study the reactions 7Li(p,4He)4He, 7Be(n,4He)4He, 7Be(n,p)7Li, 6Li(d,4He)4He, 6Li(d,p)7Li, and 6Li(d,n)7Be. For the first three reactions, the calculated astrophysical S-factors reproduce both the magnitude and the low-energy behavior of the data within experimental uncertainties. The 6Li+d channels are underestimated at low energies, consistent with the shifted threshold and the absence of a broad subthreshold 2+ state in the present model. Overall, the results show that a single microscopic many-channel cluster approach can consistently describe both the 8Be resonance spectrum and the associated low-energy reaction observables.

A Particle Spectra in Relativistic Heavy-Ion Collisions

Dmytro Anchyshkin

BITP of the NAS of Ukraine, Kyiv, Ukraine

A quantum generalization of the Cooper-Frye recipe, which is widely used in the description of heavy-ion collisions, is proposed. The calculation of the single-particle spectrum arising in relativistic collisions of nuclei is carried out within the framework of thermal quantum field theory. The starting point of the analysis is to solve the initial-value problem for particle radiation from a space-like hypersurface. In subsequent steps, a single-particle spectrum is obtained using the "lesser" Green's function, taking into account the states of hadronic matter. Based on these results, several specific examples of particle emission are considered.