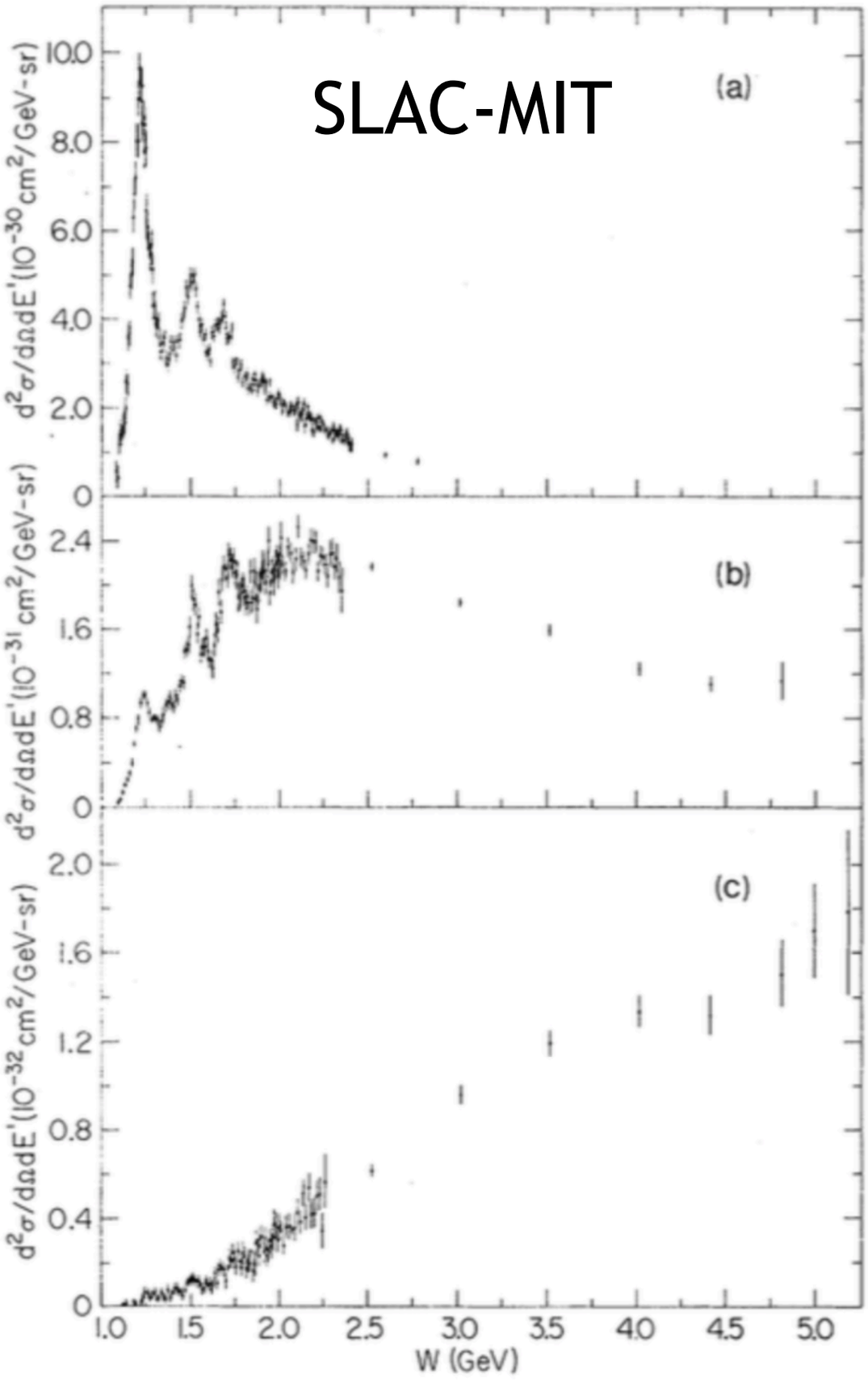
Theory at SLAC

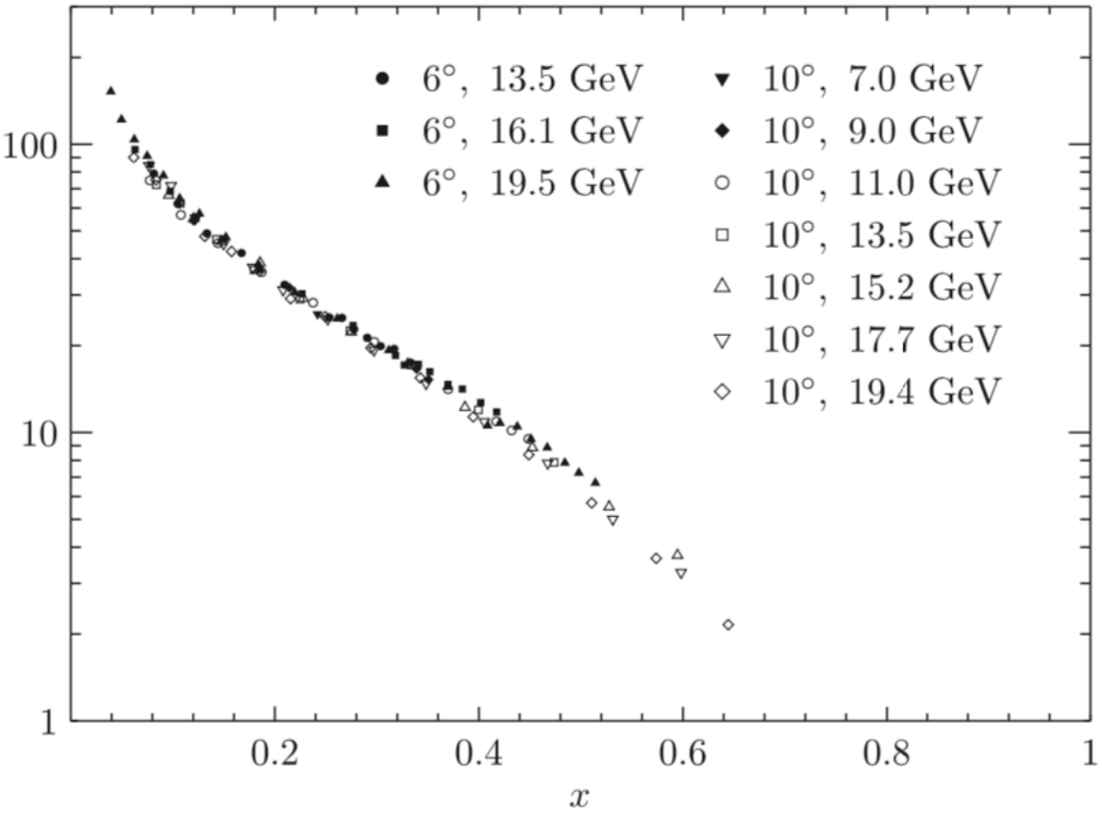
M. E. Peskin

September 2019

SLAC-MIT



Bjorken



a sampling of SLAC Theorists

KIPAC: Tom Abel, Roger Blandford, Leonardo Senatore, Risa Wechsler

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SIMES: Tom Devereaux, Srinivas Raghu

tpd, sraghu@slac.stanford.edu

HED: Frederico Fiuza

fiuza@slac.stanford.edu

HEP: Lance Dixon, Alexander Friedland, Tom Rizzo, Philip Schuster, Natalia Toro

lance, alexfr, rizzo, schuster, ntoro@slac.stanford.edu

KIPAC:

formation of cosmic structure: galaxies and clusters from the evolution of dark matter

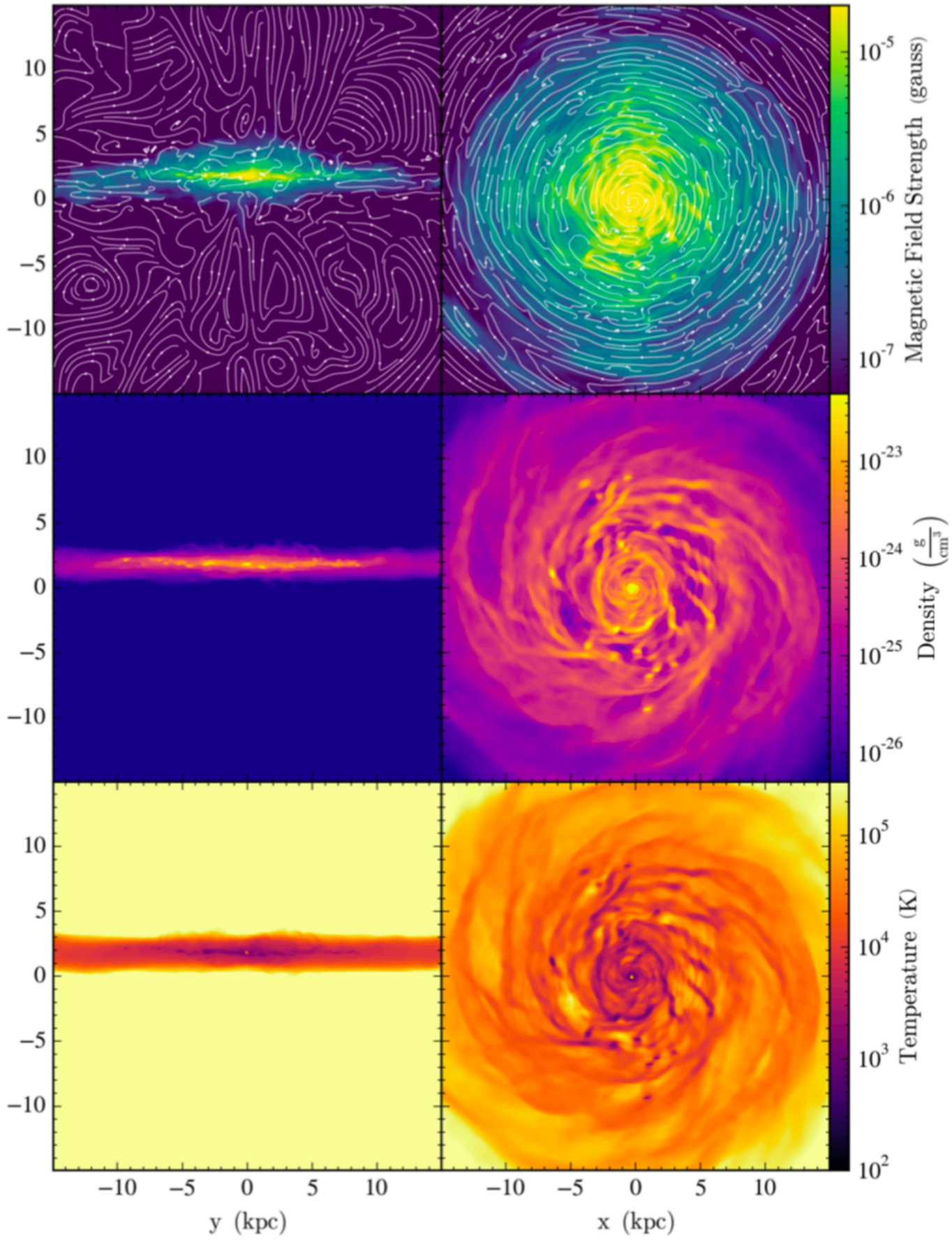
formation and evolution of stars in a galaxy — with physics on many length scales

physics of the most energetic objects in the universe: active galactic nuclei, X-ray sources, gamma ray bursts

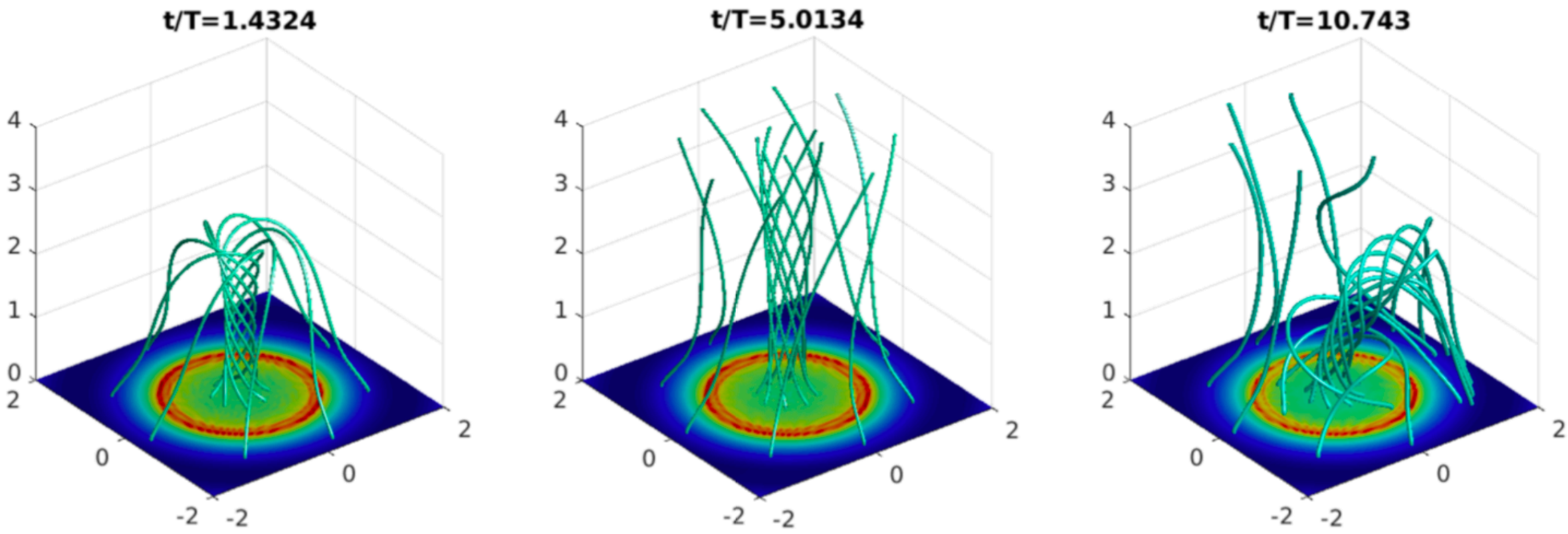
formation of a galactic magnetic field

using ENZO

Iryna Butsky,
Jonathan Zrake,
Ji-Hoon Kim,
Hung-I Yang,
and Tom Abel



magnetic fields heating the corona around a black hole, a model of a cosmic X-ray source



Yajie Yuan, Anatoly Spitkovsky, Roger Blandford, and Dan Wilkins

SIMES:

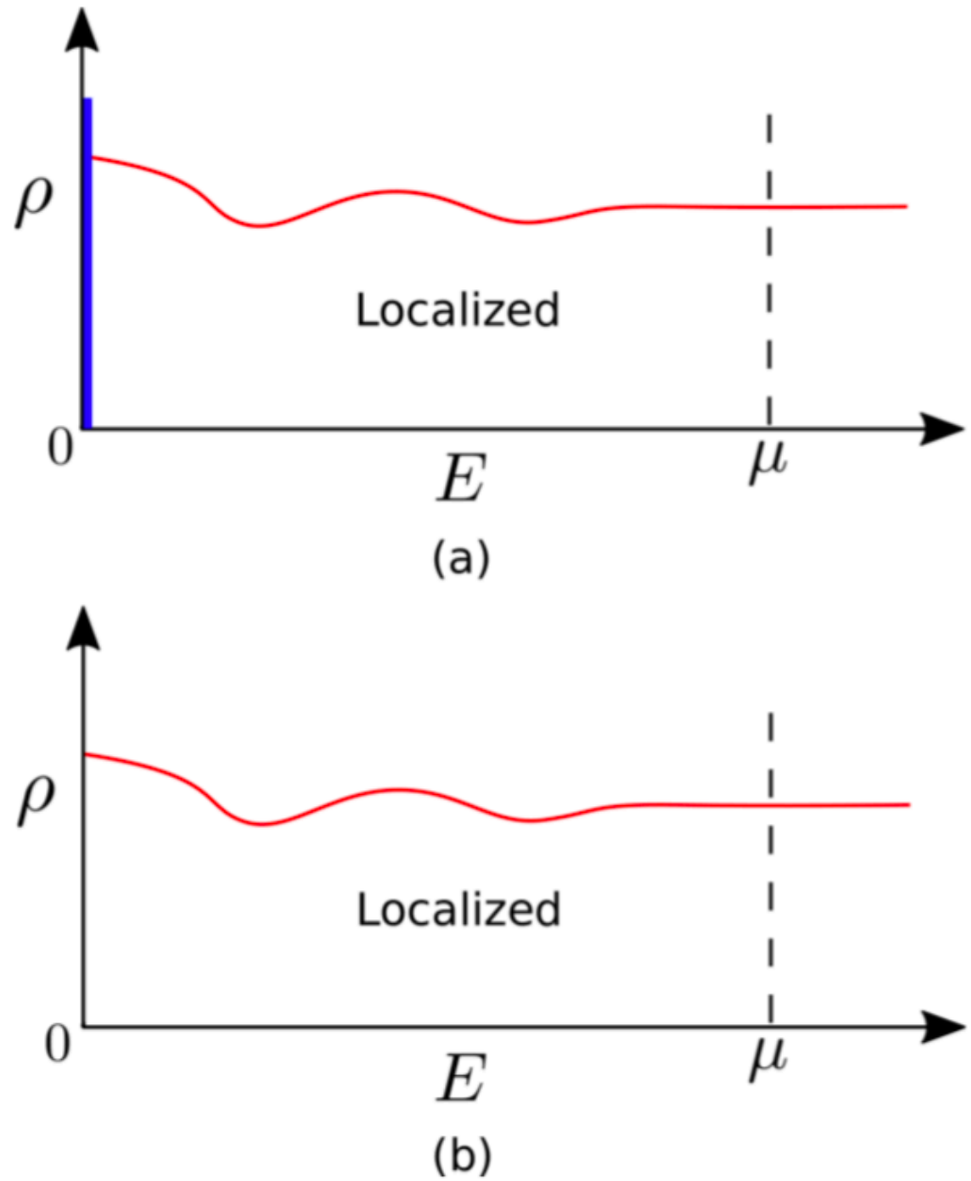
exotic materials: high-Tc superconductors, topological insulators, strongly-coupled 2-d electron systems, non-Fermi liquids

transition from an integer quantum Hall system to an insulator in the presence of disorder

a very non-obvious self-duality predicts

$$\rho_{xx} = \rho_{xy} = h/e^2$$

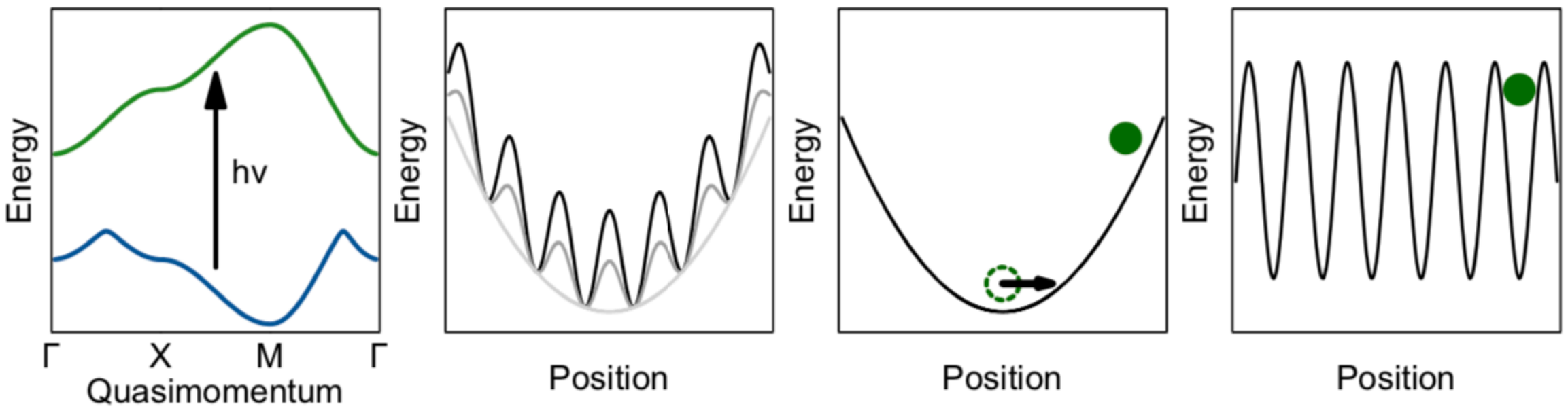
at the critical point



Prashant Kumar, Yong Baek Kim, Sri Raghu

study of the Hubbard model, a 2-d model system for antiferromagnetism and pseudogap behavior, using an artificially created lattice of cold atoms.

how do you get the information of electron densities and correlations out? Use an analog of ARPES in X-ray scattering



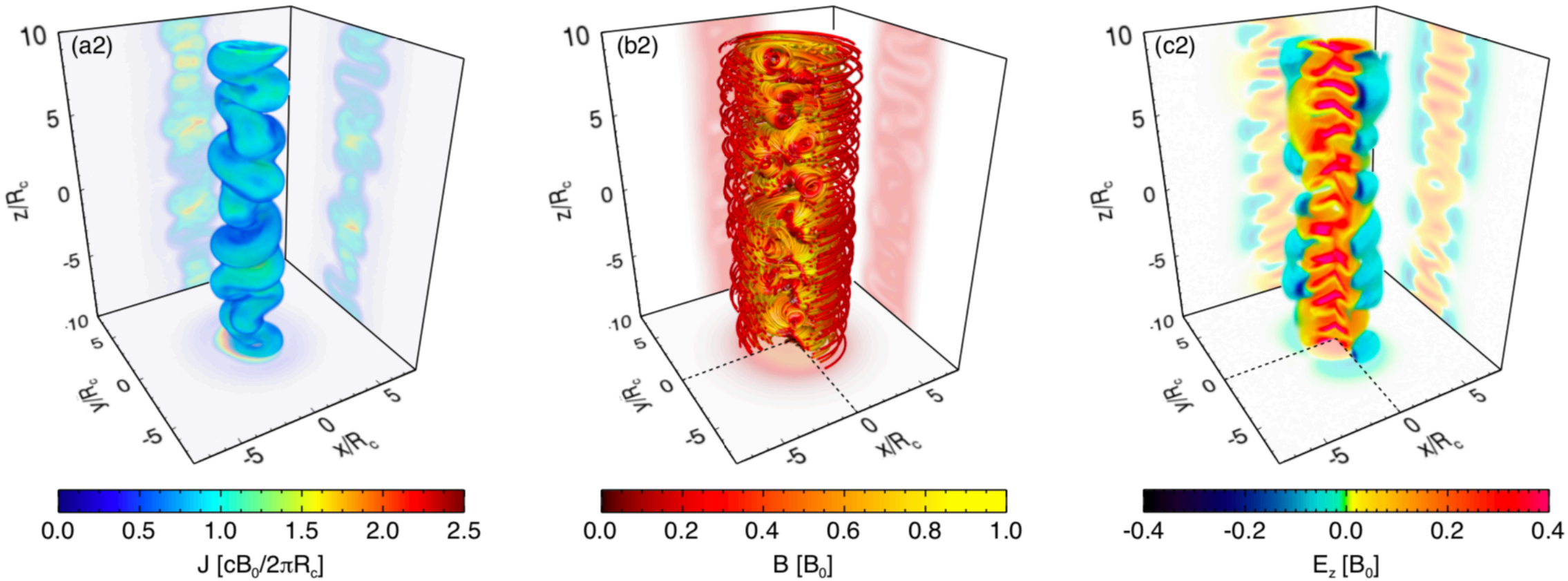
Peter Brown, Elmer Guardado-Sanchez,Benjamin Spar, Edwin Huang,Thomas P. Devereaux, and Waseem Bakr

HED:

use of high-power lasers interacting with plasma as a source of accelerated electron beams

exploring the detailed MHD of cosmic ray acceleration

simulation of the kink instability in a jet emerging from an active galactic nucleus



Eduardo Alves, Jonathan Zrake, and Frederico Fiuza

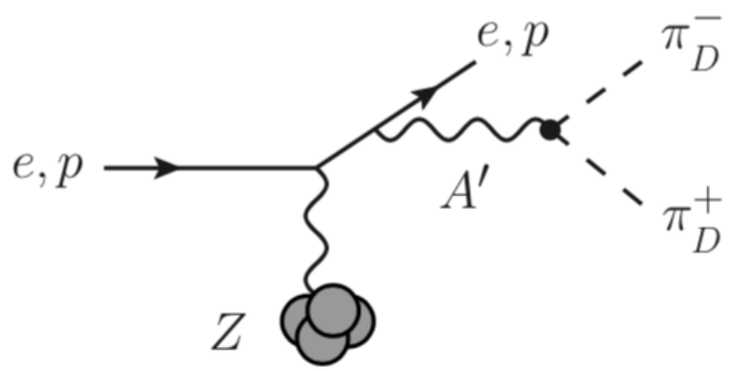
HEP:

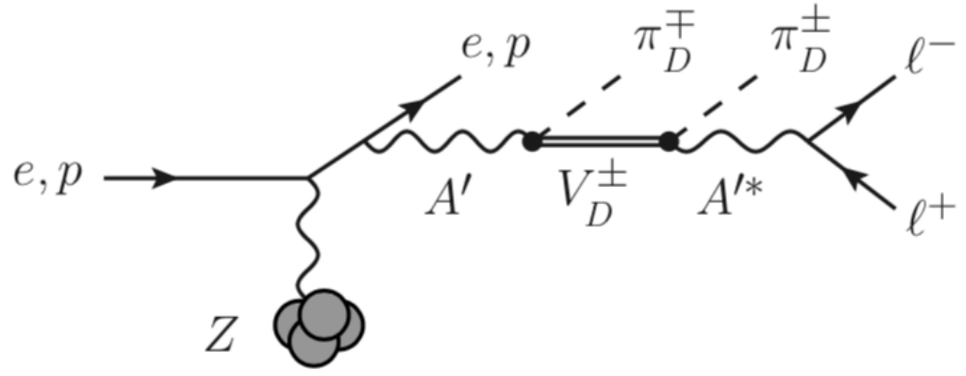
new models of cosmic dark matter, and production of dark matter particles in the laboratory

exploring the center of a supernova using the neutrino signal

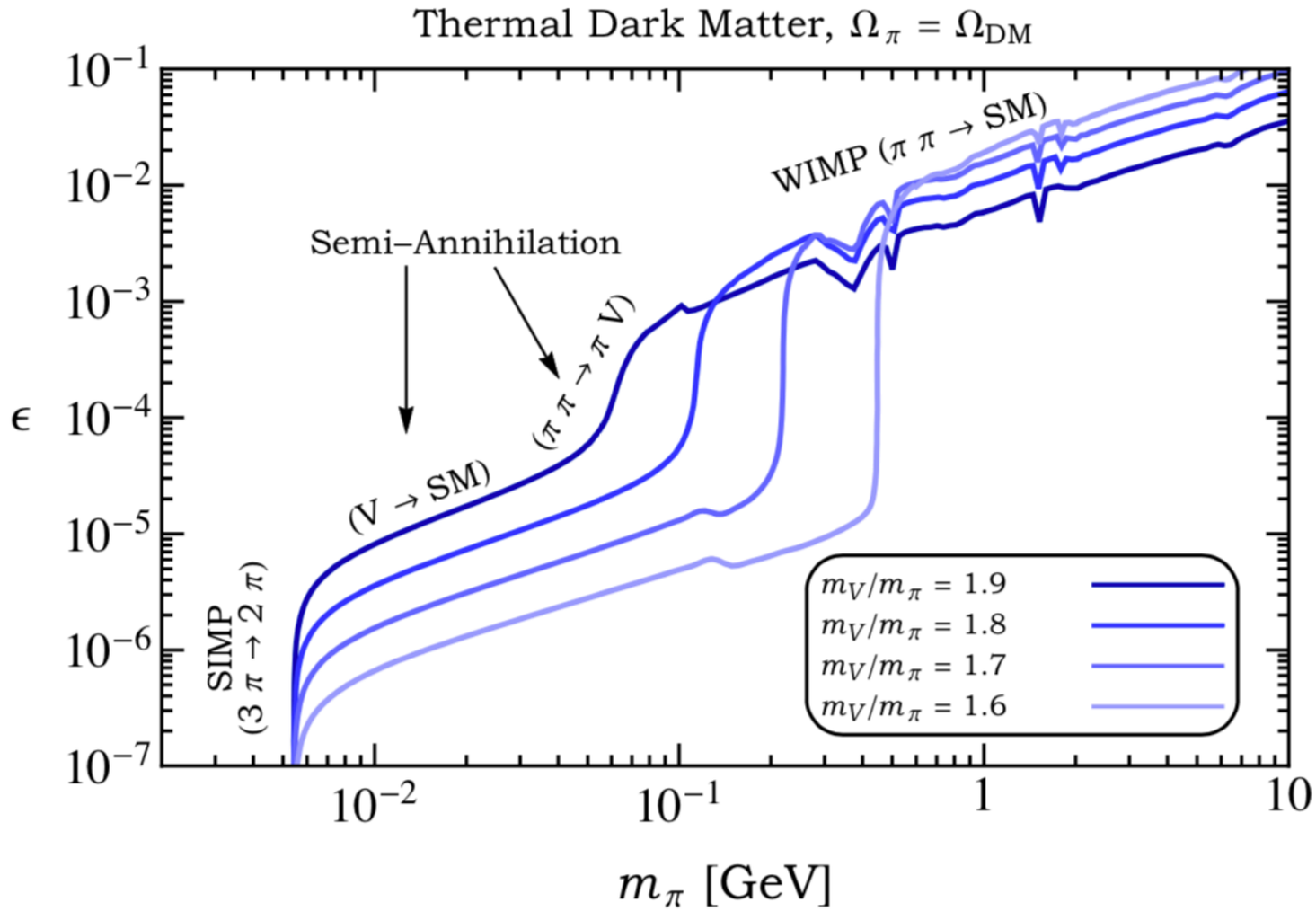
prediction of the rates of complex processes observed at the Large Hadron Collider

could dark matter arise from a parallel strong interaction theory whose particles could weakly to our through a “dark photon”?





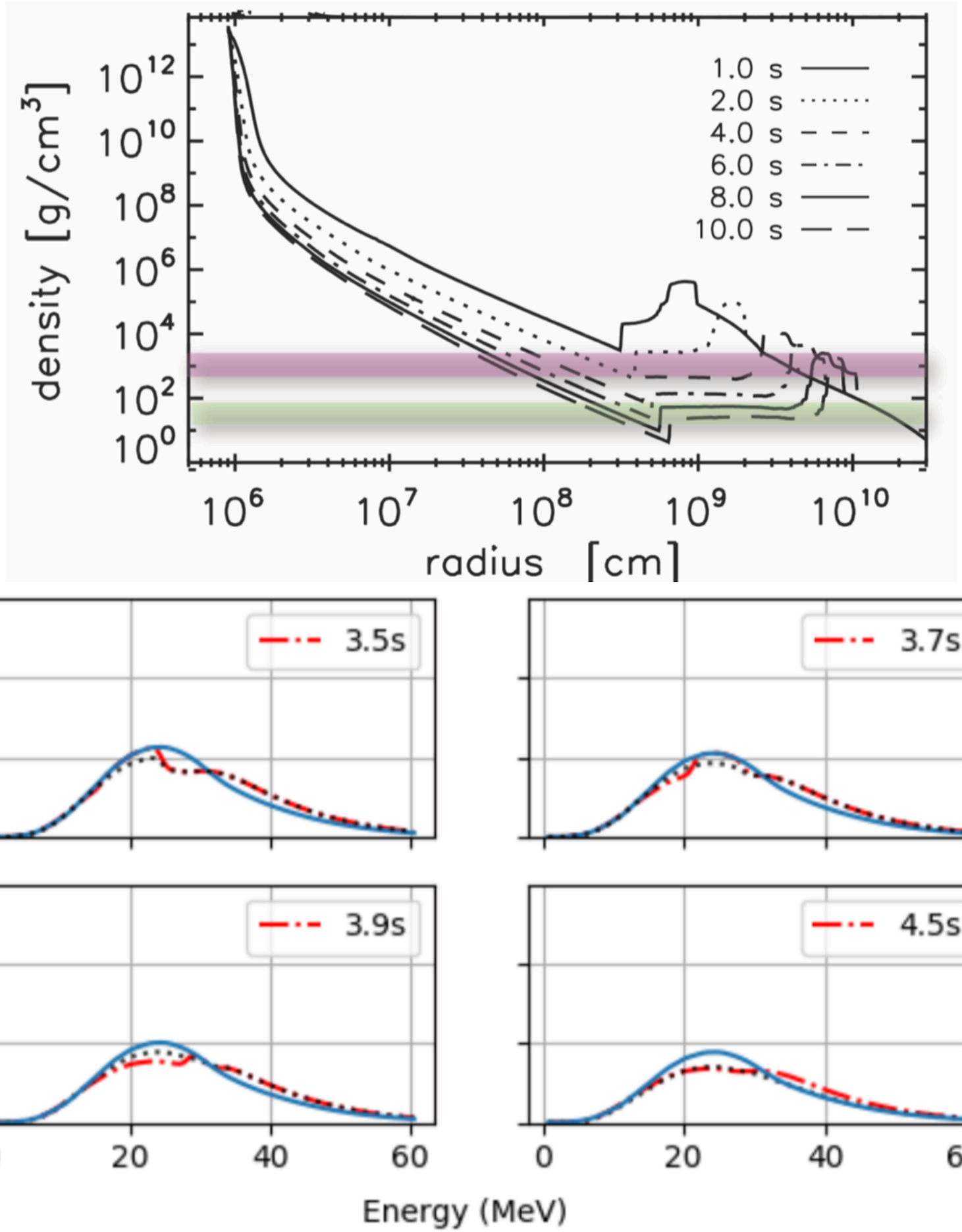
Asher Berlin,
Nikita Blinov,
Stefania Gori,
Philip Schuster,
and Natalia Toro



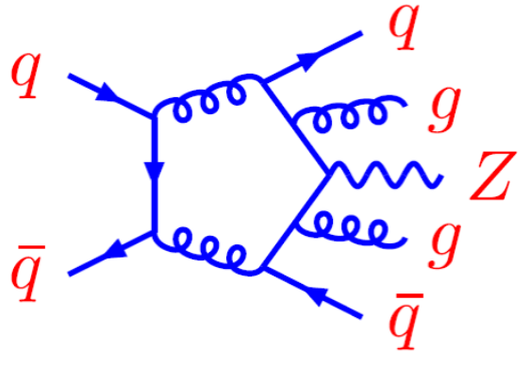
neutrino mass implies that, as neutrinos stream out of a supernova, they can change flavor.

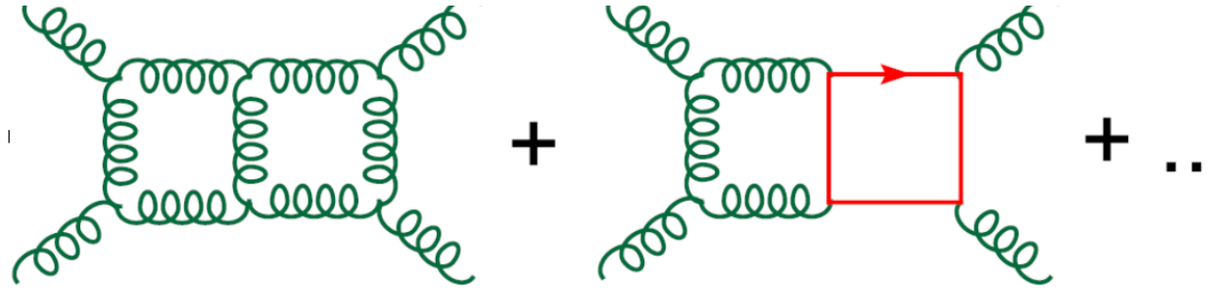
What do we observe as the neutrino burst passes the earth?

Payel Mukhopadhyay and Alex Friedland



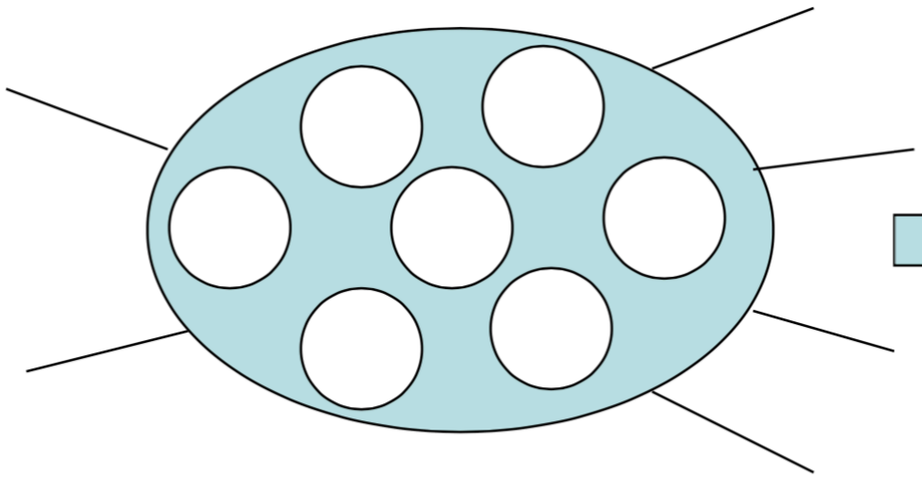
to compute the rates of quark and lepton reactions at the LHC, ordinary methods of Feynman diagram calculation are not sufficient.

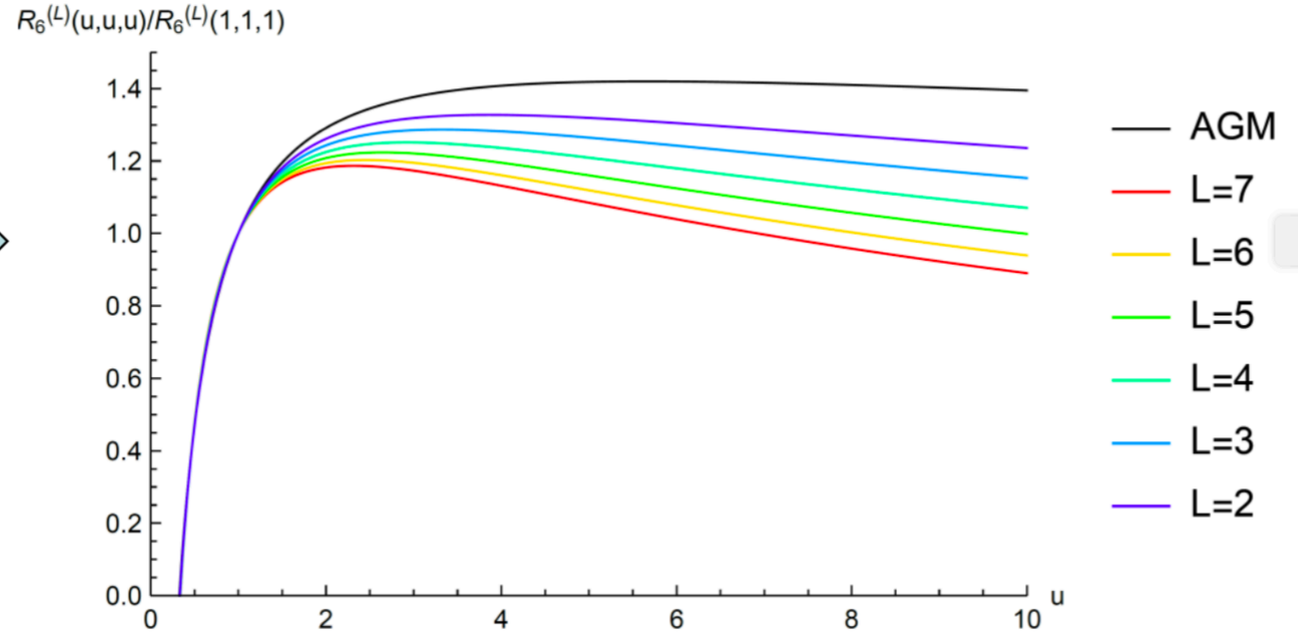




(1531 diagrams in all)

need to invent new methods: "unitarity", "bootstrap", new special functions, "cosmic Galois group"





Simon Caron-Huot, Lance Dixon, Falko Dulat,

Matt von Hippel, Andrew McLeod and Georgios Papathanasiou

We are thinking about many fascinating questions and pushing the boundaries in many directions.

Please contact the faculty and staff on slide 3 to ask about rotation opportunities.