Theory and computation highlights in March, 2022
(Contribution to the Director's Monthly Report to JSABOD)

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There has been significant development over the past decade in machine learning and artificial intelligence, with computational learning tools now used routinely in scientific applications. Dr. Nobuo Sato has been co-organizing a month-long program on Machine Learning for Nuclear Theory at the Institute for Nuclear Theory in Seattle. The focus of this program is on the use and future impact of machine learning in nuclear theory, bringing together researchers in lattice QCD and statistical systems, hadron and nuclear structure, quantum computing, nuclear astrophysics and other fields to explore common interests in machine learning tools and applications.

Understanding the strange content of the proton has been an outstanding challenge for years. Recently, Dr. Wally Melnitchouk and collaborators have calculated the strange quark helicity distribution in the proton, Δs, within a nonlocal chiral SU(3) effective field theory [arXiv:2203.06628]. The calculation was performed in terms of hadronic proton to meson + baryon splitting functions and quark distributions in the hadronic intermediate states obtained using spin-flavor symmetry. The polarized strange quark distribution was found to be quite small, with the lowest moment of Δs negative, but consistent with recent global QCD analyses by the JAM collaboration.