

# Chinese Physics C

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## Cover Story (Issue 10, 2026): An autonomous AI physicist Determines three-dimensional Proton Structure

Author: Wei-Nan E (Peking University)

Progress in physics research comes not only from deepening our understanding of nature, but also from reinventing the way we explore it. This reinvention often arrives in the form of new tools. Over the past decade, artificial intelligence has transformed how scientists compute and how they discover, however a deeper question remains whether an AI system can shoulder not just an isolated computation, but an entire scientific investigation, from formulating the approach, carrying out the analysis, to validating its own conclusions.

A recent work [1] offers a concrete and convincing answer, drawn from one of the most demanding branches of particle physics: the first-principles study of the strong interaction by lattice quantum chromodynamics (QCD). The problem is to determine a fundamental function that governs how the internal structure of a proton evolves with energy and transverse momentum, a quantity needed to interpret a wide range of high-energy experiments. Its extraction has long been regarded as a labor-intensive challenge, demanding many delicate steps and months of expert effort, with the signal of interest buried in noise.

In this work, an autonomous AI system, PhysMaster [2], is introduced to solve the full problem. Given the raw lattice data, it decomposes the task into subtasks, organizes the relevant knowledge, plans its course through a tree of possible strategies, and then executes the entire chain without human intervention. Where conventional, unconstrained fitting loses the signal, the system draws on physical principles to regularize its model and recover stable results up to a scale the field had found hard to reach. Its final answer agrees with both analytical perturbative theory and the best existing lattice determinations, and a workflow that once took months is completed in hours without loss of precision.

The significance extends far beyond any single kernel. This is an exploratory but inspiring demonstration that a genuinely effective collaboration between scientists and AI is now possible on a real frontier problem: the machine shoulders the engineering, and the human is freed to focus on the physical insight. Should the direction mature, scientists may systematically revisit questions long regarded as too costly to explore, enlarging the discovery space of the basic sciences.

### References

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