how became the basis for the revival of academic research in West Germany. The zone included the University of Göttingen and several Kaiser Wilhelm research institutes—soon renamed after Max Planck. It also had many of the most prestigious scientists still in Germany, among them Otto Hahn, Werner Heisenberg, and Max von Laue. German scientists lobbied for the revival of German science under Allied control, which fit well with British plans to use a science-enhanced zonal economy in support of the British economy, now bankrupted by the war. With British support, German scientists founded new scientific institutions and revived old ones important for the future Germany. They also gained connections in the American zone that aided the founding of the Federal Republic of Germany in 1949.

Technology transfer across boundaries and cultures is difficult to accomplish. In the end, O'Reagan concludes that despite its vast scale and scope, the German technology transfer was only partially successful. Much of the technology was already known, many of the US microfilm reels remained unread for lack of content indices, many of the buildings sent to the Soviet Union remained unbuilt for lack of blueprints, and many of the displaced scientists remained underused for lack of need.

O'Reagan's masterful study of the Allies' technology transfer in all four zones and in all of its many facets, successes, and shortcomings is a most welcome contribution to Allied occupation history and to the history of technology in general.

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Creating atomic nuclei on a lattice

A major goal of contemporary nuclear physics is to explain the structure of atomic nuclei and their reactions in a microscopic way. That approach, also known as the *ab initio* method, starts from two- and many-body forces between protons and neutrons and applies quantum many-body theory to deal with the multitude of nucleons. Many methods, including Faddeev–Yakubovsky equations, the no-core shell model, coupled cluster methods, many-body perturbation theory, and quantum Monte Carlo, have been designed to treat such strongly interacting multiparticle systems.

Nuclear Lattice Effective Field Theory
An Introduction
Timo A. Lähde and Ulf-G. Meißner
Springer, 2019.
$59.99 (paper)

The methods listed above use continuous spacetime coordinates. A recent alternative approach instead represents a physical system in a finite volume with discrete spacetime coordinates subjected to sampling by Monte Carlo methods. That sounds simple and straightforward, but it is not, as the new book by Timo Lähde and Ulf-G. Meißner, *Nuclear Lattice Effective Field Theory: An Introduction*, explains thoroughly. Meißner, a professor of physics at the University of Bonn in Germany, is well known for his research on effective field theories in nuclear and particle physics. Lähde, a staff member at the Research Center Jülich in Germany, has been heavily involved in lattice calculations in condensed-matter and nuclear physics.

The text's first two chapters provide helpful background information not specifically about lattice calculations. One offers a general introduction to effective field theories (EFTs), and the other introduces nuclear forces in chiral EFT. The authors give several beautiful examples that demonstrate the basic ideas underlying an EFT. The section entitled "A Short Recipe for the Construction of an EFT" is a remarkably concise and clear explanation of the concept. The book's introduction to chiral EFT-based nuclear forces, in which nucleons and pions are the typical active degrees of freedom rather than quarks and gluons, is also clear and accessible.

The main body of the book consists of six chapters that present lattice methods in a systematic way. The first of those chapters introduces the basic mathematical concepts of the lattice approach, such as Grassmann fields, transfer matrices, and auxiliary fields. The next chapter addresses chiral nuclear forces, with a special focus on how they are put on the lattice. The discussion evolves from leading order to next-to-leading order and finally next-to-next-to-leading order. Each order is presented in small steps that make the chapter easy for the unacquainted reader to follow.

Subsequent chapters are devoted to the characteristic problems that arise with increasing numbers of nucleons. The authors discuss at length methods for how to extract phase shifts on the lattice for two and three nucleons, and they carefully weigh the advantages and disadvantages of the Luescher, spherical wall, and auxiliary potential methods. Increasing the number of nucleons beyond three, as the authors show, creates the need for Monte Carlo sampling of lattice calculations. The last chapters move up to medium-mass nuclei and to chiral forces up to next-to-next-to-next-to-leading order. The authors report on some of the first attempts to solve these thorny problems, but they acknowledge that actual solutions are still in the future.

Lattice methods are technical and beset by a cumbersome mathematical apparatus. Thus any explanation of them could be difficult to read for outsiders or newcomers to the field. However, Lähde and Meißner manage to get the complex material across in a digestible way by breaking it up into small steps and knowing when repetition is helpful. They also introduce from scratch such basic concepts as phase shifts, without referring the reader to another book. Such care makes *Nuclear Lattice Effective Field Theory* self-contained, which is a great practical advantage to the reader. The six appendices further enhance the self-contained character of the text by summarizing notations and conventions and providing more details about useful mathematical functions, nuclear force properties, and the application of Monte Carlo methods.

Nuclear Lattice Effective Field Theory offers interesting insight into the endless problems that the pioneers of lattice methods had to confront during the past 20–40 years, such as rotational symmetry breaking, the sign problem, and the unfavorable scaling of Monte Carlo algorithms. Solutions have been worked out for most hurdles, and thus we can say that nuclear lattice EFT has come of age; the field is ready for more comprehensive and systematic applications in nuclear theory.

Apart from work by some of the authors' collaborators, the method has not yet been applied widely in nuclear theory. Lähde and Meißner's helpful primer has the potential to stimulate increased efforts by serving newcomers as an essential guide to the field.

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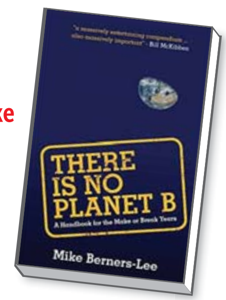
The challenges and opportunities of the climate crisis

There Is No Planet B

A Handbook for the Make or Break Years

Mike Berners-Lee
Cambridge U. Press, 2019.
$12.95 (paper)



People are causing Earth's climate to change and climate changes create serious risks for humanity. We have a wide range of well-studied response options, and the expected benefits from many of them greatly exceed the expected costs. Those conclusions result from multiple independent lines of evidence and have been reaffirmed by hundreds of comprehensive scientific assessments. Subject-matter experts examined the evidence, independent scientists reviewed the findings, and scientific organizations stood behind the processes and outcomes. I am not aware of any scientific institution with relevant subject-matter expertise that has looked at the evidence and reached contradictory conclusions.

Despite the robustness of those scientific conclusions, we continuously fail to respond to climate change. We struggle even to have an effective public conversation about whether to respond and, if so, how. That may be the most ominous implication of climate change—that our social institutions aren't up to the task of addressing major issues, even when we have unambiguous scientific information in favor of doing so.

But climate change is, possibly, also an opportunity. If we figure out how to approach our climate problem, we might create a template for addressing a wide range of challenges and opportunities facing humanity in the 21st century. That is the key insight and basic premise of Mike Berners-Lee's book *There is No Planet B: A Handbook for the Make or Break Years*. It's a terrifically important idea that may be the key step in the pathway toward humanity's future.

Berners-Lee emphasizes that climate