

ADVENTURES — IN — THEORETICAL PHYSICS

Selected Papers with Commentaries

World Scientific Series in 20th Century Physics Vol. 37

Stephen L. Adler

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*Dedicated with love to my father Irving,
the memory of my mother Ruth,
and my sister Peggy*

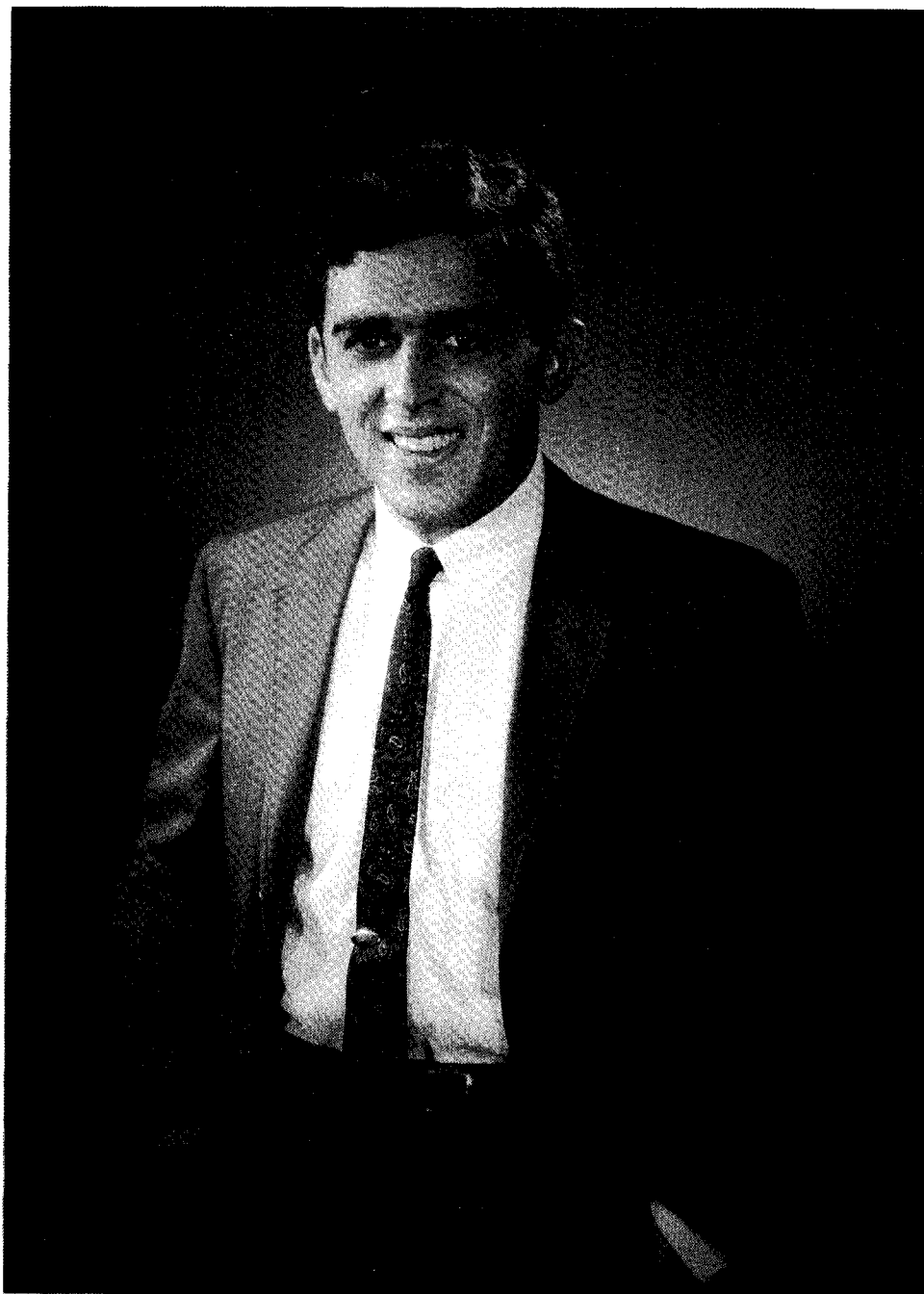


Photo by Bachrach

Stephen L. Adler, July 1966, just before moving to Princeton to join the Institute for Advanced Study.
For a photo taken in 1995, see reprint R1.

Preface

When I was asked by K. K. Phua to do a book for World Scientific based on my work, he suggested a volume of essays or a reprint volume. I have decided to combine these two suggestions into one, by preparing a reprint volume with commentaries. Some of the commentaries are drawn from historical articles that I have written for publication, others are drawn from unpublished historical accounts written for institutional archives, and yet others have been written expressly for this volume. In the commentaries, I try to relate the reprinted articles to the time-line of my career, and at the same time to analyze their relations with the work of other physicists whose work influenced mine and vice versa.

In keeping with these dual aims, I have arranged the articles and the commentaries in approximately chronological order, but occasionally deviate from strict chronology in order to group topically related articles together. In choosing which articles to include, I have been guided by two generally coinciding measures, my own estimate of significance, and the citation count. However, in occasional cases I have included infrequently cited articles where I felt that there was an interesting related story to tell. Often, when finishing a line of work, I have written a long summarizing article or review; some of these are too long to be included in their entirety, and so I have included in the reprints only the sections most relevant to the narrative in the commentaries. Similarly, I have not included among the reprints the summer school lectures I have given on current algebras, anomalies, and neutrino physics, but references to them appear in the commentaries. In the last decade, I have published two books related to my work on generalized forms of quantum mechanics, and included many research results directly in these books in lieu of first writing papers. It is feasible to give only brief descriptions of these projects in the commentaries; I have included just a few papers from this period, all in the nature of follow-ons to the first book.

In both the texts of the commentaries and the reference lists that follow them, reprinted articles are identified by a sans serif R, so that for example, R1 designates the first reprinted article. Numbers in square brackets following each reference in the reference lists give the pages in the commentaries where that reference is cited. There is also an index of names following the commentaries, and a list of detailed chapter subheadings in the Table of Contents.

I wish to thank Tian-Yu Cao for a critical reading of the commentaries and much

helpful advice, Alfred Mueller for a helpful conversation on renormalon ambiguities, Richard Haymaker for a clarifying email on dual superconductivity parameters, and William Marciano, Robert Oakes, and Alberto Sirlin for calling my attention to relevant references. I also wish to thank the following people for sending me helpful comments on the initial draft of the commentaries after it was posted on the archive as hep-ph/0505177: Nikolay Achasov, Dimi Chakalov, Christopher Hill, Roman Jackiw, Andrei Kataev, Peter Minkowski, Herbert Neuberger, and Lalit Sehgal. I am grateful to Antonino Zichichi for permission to use the quote from Gilberto Bernardini in Chapter 2, to Mary Bell for permission to use the quote from John Bell in Chapter 3, to James Bjorken for permission use his quote in Chapter 3, and to Clifford Taubes for helpful email correspondence and permission to use his quotes in Chapter 7.

My editor at World Scientific, Kim Tan, has given valuable assistance throughout this project. Miriam Peterson and Margaret Best have patiently assisted in the conversion of my TeX drafts to camera-ready copy and with indexing, the latter a task that was shared with Lisa Fleischer and Michelle Sage. I am also indebted to Momota Ganguli and Judy Wilson-Smith for bibliographic searches, to Christopher McCafferty and James Stephens for help with computer problems, and to Marcia Tucker and Herman Joachim for assistance, respectively, in scanning and duplicating certain of the papers to be reprinted. Finally, I wish to express my appreciation to the Institute for Advanced Study (abbreviated throughout the commentaries as IAS) for its support of my work, first from 1966 to 1969, when I was a Long Term Member, and then from 1969 onwards, when I have been a member of the Faculty, in the School of Natural Sciences. My work has also been supported by the Department of Energy under Grant No. DE-FG02-90ER40542.

In addition to the publishers acknowledged on each individual reprint, I also wish to thank World Scientific for the use of material originally prepared for their volumes commemorating the 50th anniversary of Yang–Mills theory. Chapter 3 on anomalies is largely based on an essay I contributed to *50 Years of Yang–Mills Theory*, edited by G. 't Hooft, and the parts of Chapters 7 and 9 dealing respectively with monopoles and projective group representations are based on an essay I wrote for a projected companion volume on the influence of Yang–Mills theory on mathematics. Also, some material in Chapters 2 and 3 overlaps with the contents of a letter on antecedents of asymptotic freedom that I wrote to *Physics Today*, which appears in the September, 2006 issue.