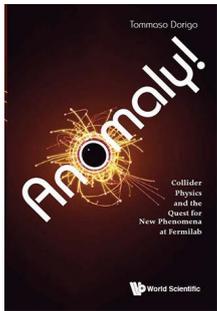


# RECENSIONI



TOMMASO DORIGO

## ANOMALY!

COLLIDER PHYSICS AND THE QUEST FOR NEW PHENOMENA AT FERMILAB  
WORLD SCIENTIFIC, SINGAPORE, 2016

hardcover: pp. XVIII + 285, £ 91.00

ISBN: 978-1-78634-110-5

softcover: £ 40.00

ISBN: 978-1-78634-111-2

ebook: £ 32.00

ISBN: 978-1-78634-113-6

A passionating story of discoveries that have not been

Tommaso Dorigo, researcher at INFN-Padova, was a direct witness of most of the facts he narrates in the book, mostly related to a single team of researchers: the hundreds-people strong CDF collaboration at the Fermilab's Tevatron accelerator in the USA.

"Anomaly!" provides a very honest and not always flattering description of how large HEP collaborations work, what makes experimental physicists excited, and of the occasional interference between scientific goals and "human factors" such as personal ambitions, career issues, personality clashes, the fear of being scooped. The author, who complemented his personal recollections with many interviews and archival searches, proves to be a highly skilled communicator of science to the general public, as already known to the readers of his often controversial blog "Quantum Diaries Survivor" ([http://www.science20.com/quantum\\_diaries\\_survivor](http://www.science20.com/quantum_diaries_survivor)). Thanks to a well-chosen alternance of narration and explanation, several sections read like a novel.

The main theme of the book, as indicated by the title, are the "anomalies" (or outliers) that tantalized the CDF collaborators –and sometimes the external world– but were nothing more than red herrings. Dorigo, an expert of statistics applied to experimental particle physics (former chair of the Statistics Committee of the CMS experiment and main coordinator of an inter-disciplinary European Training Network merging HEP and statistics), uses these stories as cautionary examples and makes repeatedly the point about the arbitrariness of the conventional 3-sigma and 5-sigma thresholds for claiming "evidence" and "discovery" of a phenomenon.

Slightly off topic given the title of the book, three full chapters are devoted to the ultimately successful search for the top quark, whose first evidence was very far from being an "anomaly" as it was predicted by the main-stream theory and the "global fits" were already pointing at the right mass range. Here Dorigo is interested in the opposite lesson: the conventional thresholds on  $p$ -values were originally motivated by the principle that extraordinary claims demand extraordinary proofs, but are hard to justify when a "discovery" is actually a confirmation of the dominant paradigm. (The author explicitly comments on the similarity with the Higgs boson discovery two decades later.) The saga of the top quark hunt, which contains many funny and even heroic moments, is also an occasion for Dorigo to elaborate on the over-conservative attitudes that dominate in large teams when stakes are high.

In general the topics of this book have clearly been chosen more by the importance of the lesson they teach, than by their ultimate impact on Science; *e.g.*, almost an entire chapter is devoted to a measurement of the Z boson mass that was already known in advance to be doomed to obsolescence very soon by the experiments at the LEP accelerator, more suited for that kind of measurement; and surprisingly it turns out to be a passionating story, ending with a mysterious attempt by a rather unsporting competitor from another US laboratory to sabotage the first CDF report of this measurement at an international conference. In some other cases the choice of topics is quite apparently driven by their entertainment value, as in the hilarious (in retrospect) episode of the "Sacred Sword", a radioactive contamination incident that ended well for its protagonists but forced them into a long quarantine, together with another

colleague unrelated to the incident who was kept against his will as he was a perfect "control sample", having the same geographical origin.

The author's role in this book is at the same time that of an insider and a neutral observer, attending the crucial meetings and observing the events unfold as a collaboration member among many others, with the remarkable exception of the final story where he plays a role himself as internal reviewer of one of the eponymous anomalies. In spirit and form, "Anomaly!" reminded me of Gary Taubes' celebrated "Nobel Dreams", but with more humour and explicit subjectivity. Although Dorigo's goal is very far from being "scholarly" or historically rigorous, this popular book may also appeal to readers interested in sociology of science or in the epistemological problem of how a scientific community finally settles on a single consensus in spite of initial collective biases and conflicting individual interests, in the vein of Andrew Pickering's "Constructing Quarks", Peter Galison's "How experiments end", and Kent Staley's "The evidence for the Top Quark, Objectivity and Bias in Collaborative Experimentation". The latter, in particular, is particularly interesting to compare with the chapters of "Anomaly!" that narrate the same story.

The author mentions that the editor limited the content to the Run 0 and 1 of the CDF experiment, in fear that too much material could discourage potential readers; I really hope that this book will achieve a well-deserved success, mostly for the egoistic reason that I am longing to read how the author would recount the stories of the anomalies that he witnessed in Run 2, some of which have only been explained in very recent years.

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