THE WORLD UNIVERSITY RANKINGS ARE HERE
2011-2012 RANKINGS
ANALYSIS, DATA, INSIGHTS AND SCORECARDS
POWERED BY THOMSON REUTERS

Knocking on Heaven's Door: How Physics and Scientific Thinking Illuminate the Universe and the Modern World

Like 3

11

1 September 2011

What are they up to down there?

All becomes clear in an admirable account of the hunt for the Higgs Boson, writes Athene Donald

I would imagine that most physicists can remember where they were when the Large Hadron Collider was switched on at Cern. I certainly do: sitting on a research assessment exercise panel in a hotel in a very wet Lake District. The excitement around the table was palpable as we all followed what was going on via the BBC website on our laptops. I don't suppose any of us were sitting there on the edge of our seats waiting to see if a black hole was going to swallow up Geneva, followed swiftly by the rest of the world, but no doubt there were people elsewhere fearing the worst. This book by the eminent US theoretical particle physicist Lisa Randall discusses, among other things, why physicists were so certain that a black hole was not going to consume us when the beam was first switched on (or at any point subsequently). It is a book written by a leading proponent of that highly technical branch of physics known as string theory, but one in which she attempts to make these tricky subjects accessible to everyone, without an equation in sight (barring the occasional E=mc2).

Her self-stated aim is to describe "experimental research at the LHC and theoretical studies that try to anticipate what they will find. It also describes research in cosmology - how we go about trying to deduce the nature of the universe, and in particular that of dark matter hidden through the universe." But she has other ambitious aims here, too -exploring "more general questions that pertain to all scientific investigations". Thus there are several different strands permeating the book and, as Randall says, "in some respects it is two books in one - but books that are best read together".

Knocking on Heaven's Door is clearly very timely. As I write this review, the search for the so-called Higgs Boson, aka the God particle, has once again been in the news as both the LHC and the US high-energy accelerator, known as the Tevatron, ramp up their energies to produce data that may - or may not - show tantalising hints of this elusive particle.

It is, of course, possible that by the time this book hits the shelves in the UK and this review appears, there will be some formal claim that the Higgs has been seen, but it seems improbable. The understandably reticent recent statements from Cern suggest that enough statistics for possible "events" that will reveal the existence of the Higgs are unlikely to be recorded before the end of 2012. Until then, all we will have from the LHC (and presumably from the Tevatron, too) will be more hints, suggestions and tantalising inconclusive signatures. So with reasonable certitude, I think I can say that this review will appear before anything hard and fast is proved. But this book gives an admirable description of what the Higgs particle is, and why the possibility of its discovery is viewed with such excitement.

UNIVERSITY of CAMBRIDGE ESOL Examinations
Cambridge English Advanced
Certificate in Advanced English (CAE)

THE SUBSCRIPTION OFFER
Join the world of higher education...
SUBSCRIBE NOW ▸

Printable version
E-mail to a friend
Comment on this story
View comments on all stories

Click on images

Knocking on Heaven's Door: How Physics and Scientific Thinking Illuminate the Universe and the Modern World

Particle physics and cosmology are fields far removed from my own brand of physics, which is much more concerned with the physics of the everyday world (such as that contained in our cells, our food and the search for new materials for sustainable energy generation). Thus I read the book, if not as a layman, at least as very much a non-specialist. I found Randall's description of the Higgs to be very clear. Older readers may remember that back in 1983, William Waldegrave, the science minister of the day, issued a challenge to the particle physics community to explain, on a single sheet of paper, what the millions of pounds the UK government was pouring into Cern's search for the Higgs were being spent on. Randall may have taken considerably more than one piece of paper for her explanation, but it is admirably lucid.

Nevertheless, I would concur with Randall that this book represents two different books; indeed in some senses I think there are three, as I'll explain below, and they don't always sit well together. She is at her best in the book's early sections, where she discusses what scientists do, how they measure things and the limitations of those measurements, their approach to tackling and modelling problems, and how they deal with uncertainty and risk. These chapters are beautifully written, clear and honest discussions of how scientists approach their work. Indeed, they are chapters that should be recommended to anyone over the age of about 12 to explain the processes that enable scientists to make discoveries, and to state with what certainty some hypothesis or theory is "true".

With all the anxieties over climate change, for instance, the importance for everyone to grasp what the science does and doesn't say, and where science stops and politics and societal issues start, cannot be overstated. The damaging furore over "Climategate" rested to a large extent on a lack of comprehension about what the various leaked emails from researchers at the University of East Anglia really meant, because much of the (tabloid) press has little idea - or apparent interest in finding out - what the scientific methods and analysis involved actually implied. These chapters are an impressive overview of what scientists (of any kind) get up to, how they work and why science is an inherently creative endeavour, just as much as poetry or art.

The second "book within a book" here deals with the LHC itself and the experiments that are currently being carried out there. These sections are more uneven. There are parts that are almost lyrical, notably Randall's description of the construction of the LHC: "The complexity, coherence and magnitude, as well as the crisscrossing lines and colour are hard to convey in words. The impression is simply awe-inspiring." It is a machine larger in scale than anything man has attempted before, and just about every part of it can be described only by superlatives. For instance, to give an idea of scale, there are 1,232 cylindrical dipole magnets, each of them weighing 30 tonnes and using about 40,000 times the current of a typical light bulb.

But as Randall gets into the detail of all the different types of particles that we know about, and how we've learned about them - things I'm sure that she is totally on top of, but is trying to describe in simple language - the writing becomes a bit more laboured and turgid. At times things seem to get repetitive, and yet she never really manages to describe the absolutely fundamental theory that is the Standard Model in a straightforward way, although it is constantly referred to. It is almost as if it is taken as read, which seems quite out of keeping with the rest of the book.

The third "book" I identified within this book is a section on cosmology, the other extreme of length scales from the ultra-small that the LHC will reveal - although, as Randall shows, there are strong linkages between the two. I understand the motivation for including this fairly brief section towards the end of the book, but it still felt like an afterthought that could have been dispensed with. She couldn't do it justice and the book is already long.

So *Knocking on Heaven's Door* is an impressive but not quite perfect book. Parts are wonderful and I would recommend them enthusiastically to anyone. Other parts will be of interest to the reader who wants to understand what the fuss about the LHC is all about, but arguably they could have been trimmed for greater impact. Nevertheless, Randall has done a tremendous service to the physics community in devoting her considerable talents to writing such an accessible text.

The Author

Lisa Randall received her undergraduate degree in physics and her doctorate in theoretical particle physics from Harvard University. She completed a postdoctoral fellowship at the University of California, Berkeley and was a Harvard Fellow for a year before her appointment to the department of science at the Massachusetts Institute of Technology in 1991. She was the first tenured female particle physicist at both MIT and at Harvard, joining the faculty of the latter institution in 2001.

Randall was featured in *Newsweek* magazine's 2006 "Who's Next" issue as "one of the most promising theoretical physicists of her generation". The publication of her book *Warped Passages: Unravelling the Mysteries of the Universe's Hidden Dimensions* (2005) led to a collaboration with the Spanish composer

Hector Parra, in which Randall wrote the libretto for *Hypermusic: A Projective Opera in Seven Planes*. She attended the opera's 2009 premiere at the Pompidou Centre in Paris with friends and says it was "amazing".

In the little free time she has, Randall enjoys rock climbing, hiking and skiing, but says that it is visiting museums that truly makes her happy. While on sabbatical in Los Angeles last year, she co-curated *Measure for Measure*, a multimedia exhibition for the Los Angeles Art Association, with artist Lia Halloran.

Chloe Darracott-Cankovic

Knocking on Heaven's Door: How Physics and Scientific Thinking Illuminate the Universe and the Modern World

By Lisa Randall

Bodley Head, 464pp, £20.00

ISBN 9781847920690

Published 1 September 2011

Reviewer :

Athene Donald is professor of experimental physics, University of Cambridge. Her research focuses on physics at the interface with biology.

Comment on this story

You must fill in all fields marked *

Story date 1 September, 2011

Your Name*

Your Email*

Comment*

Post

Please note: By adding a comment you confirm that you have read and agreed with the code of conduct under our Terms & Conditions. Comments posted on timeshighereducation.co.uk may be moderated.

© 2011 TSL Education Ltd. | Contact us | Feedback | Terms & conditions | Privacy policy | Site map | Issue index | How to advertise |