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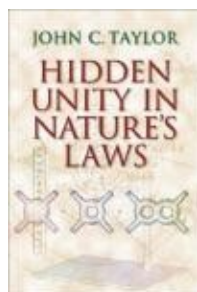
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Sep 2001

Reviews

## 'Hidden Unity in Nature's Laws'

reviewed by Mark Wainwright



### Hidden Unity in Nature's Laws

by John C. Taylor

Avid readers of popular books on the laws of nature are tolerably familiar with a number of facts. They know that electricity, magnetism and the weak force between elementary particles have been unified, that Einstein's theory of special relativity arose from an attempt to reconcile Newtonian mechanics with the laws of electromagnetism, and that his later theory of general relativity had something to do with the structure of spacetime. But as to what these statements mean, they have hitherto remained more or less in the dark. Some are content to take facts like these on trust; others cry, "but what does that *mean*?"

Here is an attractive and necessary book to glad the heart of the second group of readers. John Taylor's book is not a truly popular book: its cover blurb commends it to "any reader with a background in mathematics or physics". It is not that the book is full of equations – it isn't, and the ones there are generally merely state that, for example, some quantity is the product of two other quantities. And many of the mental leaps required of the reader may be familiar: for example, from the fact that the surface of the Earth is finite, even though it has no edges, to the possibility of space having the same properties by being, mathematically, the surface of a 4-dimensional sphere. But in this book one is asked to perform these leaps with a little more agility and confidence than other popular books on the same subjects.

And the rewards are considerable. For readers comfortable with taking the necessary mathematical abstractions seriously, Taylor has provided an insight into the workings of the Universe – as they are currently understood – that has hitherto been hard to obtain without reading rather technical material. He has done it

## 'Hidden Unity in Nature's Laws'

with a light touch and plenty of interesting historical asides. And the book is generous in scope, covering thermodynamics and electromagnetism before moving on to relativity, quantum theory and beyond.

The theme that recurs throughout the book is how seemingly unconnected phenomena turn out, on closer inspection, to be explicable as different aspects of a single, deeper one. The opening chapter, on how the motions of heavenly bodies and cannonballs falling to earth turned out to be modelled by one theory of gravity, provides a well-rehearsed example. The book then moves on to 19th-century ideas of energy (which unified ideas of heat and motion) and electromagnetism, before getting its teeth stuck into the huge theoretical advances of the 20th century.

Taylor is candid about the fact that some of the best theories we have at present are rather tentative. For instance, at high energies (where we can't do experiments) our theories of quantum mechanics and of gravity appear to contradict each other; and there are mysterious, if beautiful, coincidences between the thermodynamics arising from the behaviour of random particles, and that of black holes. On the other hand, the book shows many times that such apparent contradictions and coincidences have often been the spur that led to the next advance in the theory. In this sense the book lets us peer into not only the secrets of the universe, but the mindset of contemporary theoretical physics.

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### *Book details:*

*Hidden Unity in Nature's Laws*

John C Taylor

Hardback or Paperback, 504 pages (2001)

Cambridge University Press

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