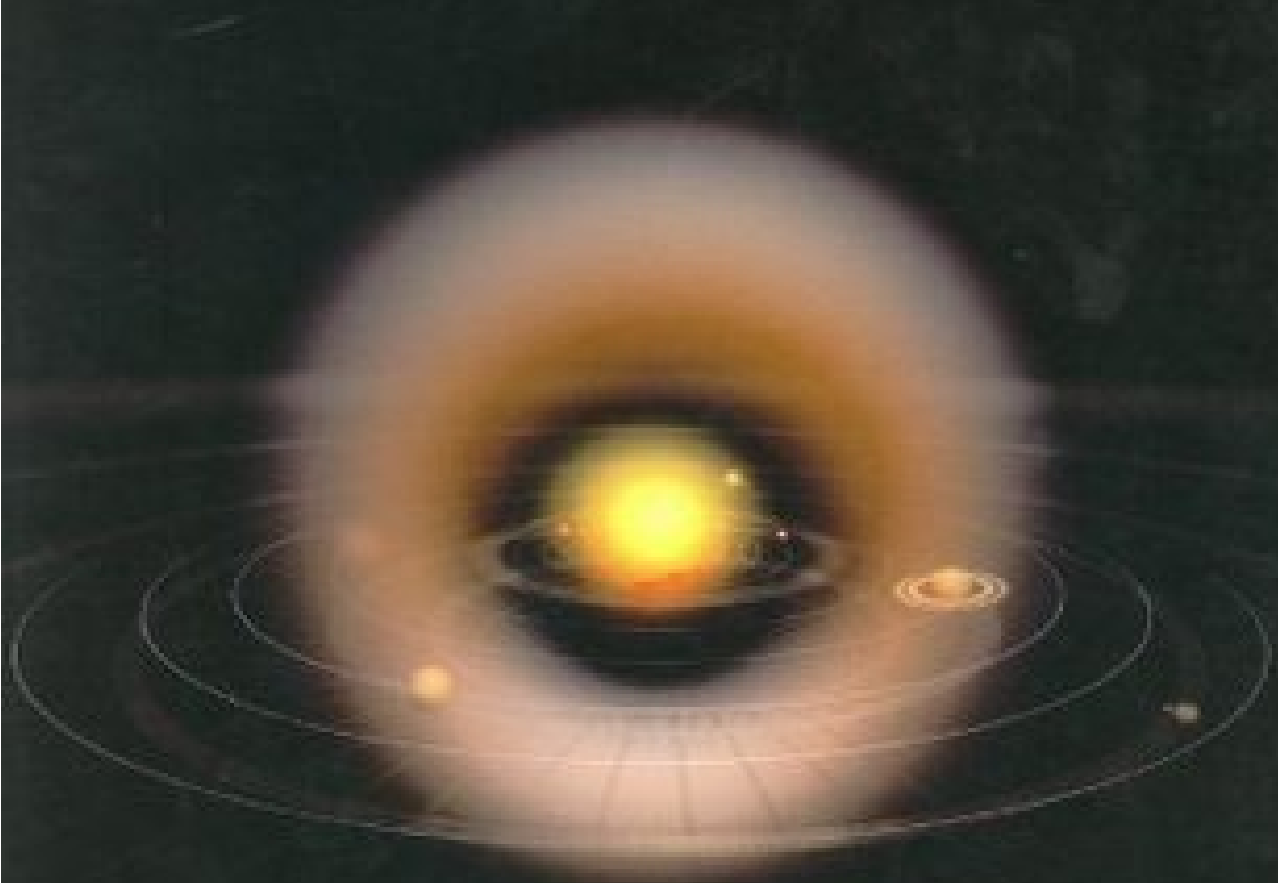


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# THE ILLUSTRATED ON THE SHOULDERS OF GIANTS

THE GREAT WORKS OF PHYSICS AND ASTRONOMY



EDITED, WITH COMMENTARY, BY

# STEPHEN HAWKING

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# The Illustrated On The Shoulders of Giants The Shoulders of Giants

Stephen Hawking

the 1st variation of this innovative examine the medical discoveries that modified our belief of the world, by way of the popular physicist and bestselling writer Stephen Hawking, bought over 65,000 copies. Now it's to be had in a gift-worthy designated variation with colour pictures and illustrations depicting The Illustrated On The Shoulders of Giants theoretical versions of the planets and their The Illustrated On The Shoulders of Giants orbits—making Hawking's amazing insights all of the extra accessible. This unique compilation relies on seven vintage works of physics and astronomy which, learn in chronological order, hint the evolution of contemporary science. THE ILLUSTRATED at the SHOULDERS The Illustrated On The Shoulders of Giants OF GIANTS comprises choices from at the Revolution of Heavenly Spheres by means of Nicolaus Copernicus; Principia via Sir Isaac Newton; the main of Relativity by way of Albert Einstein; Dialogues referring to Sciences by way of Galileo Galilei with Alfonso De Salvio; plus concord of the area by way of Johannes Kepler. it's also 5 vital serious essays and an unique biography of every physicist, written by means of Hawking himself.

Com todo o mérito que o trabalho científico de Stephen Hawking possui, penso que deu um tiro pouco certo ao dar forma a uma iniciativa (sua ou de alguma editora a acenar com dólares) onde tem uma participação quase nula. Hawking somente seleccionou os five físicos/astrónomos que mais o marcaram, assim como as suas mais importantes obras. Aparte disso, deu o aval à escrita de prefácios com menos conteúdo que uma página da Wikipédia e com poucas opiniões pessoais que poderiam ter dado um toque pessoal à compilação. Em suma, há muito pouco Stephen Hawking num livro assinado, não por si, mas pela sua fama. Ora, os filósofos/matemáticos/físicos escolhidos são bem conhecidos por si mesmos, vejamos: Nicolau Copérnico - "As Revoluções das Orbes Celestes" (somente o livro I, a obra completas é mais volumosa que os "Ombros de Gigantes") - A sua obra prima, The Illustrated On The Shoulders of Giants mundialmente famosa por defender uma teoria heliocêntrica (não totalmente) dos corpos celestes, é uma sucessão metódica, correcta, necessária e entediante de geometria euclideana, onde o leitor chega a esquecer o propósito de tantas proposições e teoremas: explicar o movimento dos corpos celestes, através das observações a olho nu, comparando-as às de famosos astrónomos/filósofos gregos e árabes. Tudo isto está resumido em tabelas, pelo que o leitor mais curioso pode comprovar as observações por si. A teoria, considerada revolucionária, é explicada (com pouca clareza, para "escapar" à Igreja Católica) em meia dúzia de páginas, após four hundred de teoremas e tabelas. Galileu Galilei - "Diálogo sobre Duas Novas Ciências" - Muito mais interessante que a The Illustrated On The Shoulders of Giants obra de Copérnico, Galileu explica, por si só, Resistência dos Materiais, Astronomia, trajectórias em planos inclinados, de projecteis, queda livre de corpos (incluindo as célebres experiências na Torre de Pisa), num diálogo filosófico baseado nos platónicos, protagonizado por Sagredo, Salviati e Simplicio. Não é, The Illustrated On The Shoulders of Giants obviamente, o método mais adequado para a aprendizagem destas novas ciências, mas torna a leitura mais fluída e menos maçadora, explicando ainda, de maneira acessível e a todos os Simplicios The Illustrated On The Shoulders of Giants (incluindo eu), as suas teorias. Johannes

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Kepler - "Harmonias do Mundo" (Livro V) - Kepler formulou three leis, ainda hoje válidas, do movimento dos planetas, descobrindo que as suas órbitas eram elípticas, que a sua velocidade de translacção period proporcional à distância ao Sol, através do facto The Illustrated On The Shoulders of Giants de que a área coberta entre dois pontos referentes à posição do planeta e um terceiro no centro do Sol, é sempre a mesma para um igual período de translacção. Estas formulações importantes ocupam four páginas da obra, sendo que o restante trata uma pseudo-ciência chamada de "música das esferas", onde o astrónomo tenta associar a posição dos planetas entre si através de escalas musicais (obviamente que nada disto pode dar certo). Se a ciência realmente importante (fora as observações e teoremas necessários) traduz-se em four páginas do livro V, imagino que alguém andou a desperdiçar anos de trabalho e de génio num assunto mais próximo da astrologia do que da astronomia. Isaac Newton - "Princípios Matemáticos da Filosofia Natural" - Não sei o que se possa ter passado nos 50 anos que separam os últimos trabalhos de Galileu e Kepler da publicação unique das ideias de Newton, mas o próprio método de escrita científico é completamente ímpar à época. A obra está escrita numa linguagem científica bastante mais próxima da genuine do que os precedentes, Newton segue com maior rigor o método científico e são postas de lado as questões religiosas. Pegando nos trabalhos de Kepler e Galileu, Newton The Illustrated On The Shoulders of Giants formulou a teoria da gravitação universal. Claro que isto não lhe faz jus, o génio (e muito, muito trabalho) criou um novo ramo da Matemática, praticamente sozinho, a que chamamos hoje em dia de cálculo diferencial e necessary (Leibniz formulou de maneira algo diferente, mais compreensível e que suplantou até hoje o método das fluxões de Newton), pois de outra fórmula não teria a ferramenta matemática necessária à resolução de muitos problemas a que se propôs. Mecânica dos fluidos, pêndulos, pares acção-reacção (das three leis da mecânica clássica) e natureza da luz foram alguns dos campos tratados na obra mais importante desta colecção. Na verdade, sem a descoberta do cálculo (que european não acredito que fosse descoberta por Leibniz sozinho nem por outro matemático até Euler) ainda estaríamos algures nas vésperas da Revolução Industrial. Albert Einstein - Colectânea de Papers respeitantes à Relatividade Restrita e Geral - Entre Newton e Einstein surgiram alguns matemáticos que (e volto a sublinhar), graças à abertura dum dos campos mais revolucionários e potencialmente prolíficos da Matemática pelo físico inglês, entre eles os já citados Euler e Leibniz, Cauchy, Gauss, Riemann, Lagrange e Weierstrass, desenvolveram métodos matemáticos que deram origem à formulação, primeiro, das equações The Illustrated On The Shoulders of Giants de Maxwell para o electromagnetismo e, depois, das de Lorentz. O toque de génio de Einstein é postular que a velocidade da luz é constante no vazio. Peguemos num exemplo que não deixe dúvidas, apesar de possuímos instrumentos capazes de medir variações de velocidades à escala da velocidade da luz: ao conduzir o The Illustrated On The Shoulders of Giants meu carro, a 100km/h ou 0,028km/s (numa auto-estrada para não entrar em transgressão) ligo os faróis. A luz que é emitida pelos faróis viaja a uma velocidade de 299792,458km/s e não de 299792,486km/s (a sua somada à da Terra). Isto implica, não para o meu carro que viaja a uma velocidade bastante baixa em termos relativistas, mas para uma Millenium Falcon que viaja a uma velocidade mais próxima da da luz, que a Estrela da Morte observa uma nave mais "comprida" do que ela é na realidade. É por isso que os projecteis das naves do Império raramente lhe acertam. Esta também lhes parece mais "lenta" e avermelhada à medida que se aproxima da velocidade da luz. De que forma o Han Solo, o Chewbacca e a própria nave aguentam a tremenda aceleração imposta sem se desintegrarem ao nível atómico, é um mistério insolúvel para o próprio Einstein. Explicadas as propriedades da

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relatividade restrita, Einstein formulou o efeito fotoelétrico e a Relatividade Geral, bastante mais complexa pois enuncia que um campo gravitacional (o Universo sofre a influência de uma ordem de grandeza bastante elevada de campos gravitacionais individuais e em conjunto, complicando as contas) influencia, não só a matéria, como a luz, que é somente energia, podendo encurvar a sua trajetória (de tal forma que, para uma massa suficientemente elevada, a luz é encurvada de tal forma que entra em órbita ou é absorvida pelo objecto). A partir daqui Einstein desdobra-se em formulações matemáticas de tensores. Como o limite do meu conhecimento matemático de cálculo se situa nos Teoremas de Stokes e Gauss e na derivação parcial, tudo isto não passa de magia negra. Fico-me pelo significado físico. Concluindo, uma obra bastante maçadora, onde aconselho a quem queira aprender sobre estas matérias que aproveite a escola, pois lá é ensinada, ao contrário da opinião da maioria dos alunos (e ex-alunos, onde me incluo), com bastante mais clareza e (nem sempre) de uma forma mais apelativa.

## **The Illustrated On The Shoulders Of Giants**

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