

20世纪
科普经典
特藏

The New World
of Mr Tompkins

物理世界 奇遇记

[美]G.伽莫夫 [英]R.斯坦纳德 著
刘 兵 评点



科学出版社
www.sciencep.com

04
G194



The New World of Mr Tompkins

物理世界奇遇记

〔美〕G.伽莫夫 〔英〕R.斯坦纳德 著

刘 兵 评点



E2007003910

科学出版社

北 京

图字: 01 - 2004 - 3929

Originally published by Cambridge University Press in 1999.

This reprint edition is published with the permission of the Syndicate of the press of the University of Cambridge, Cambridge, England.

THIS EDITION IS LICENSED FOR DISTRIBUTION AND SALE IN THE PEOPLE'S REPUBLIC OF CHINA ONLY, EXCLUDING HONG KONG, TAIWAN AND MACAO AND MAY NOT BE DISTRIBUTED AND SOLD ELSEWHERE.

图书在版编目 (CIP) 数据

物理世界奇遇记 / (美) 伽莫夫 (Gamow, G.), (英) 斯坦纳德 (Stannard, R.) 著; 刘兵评点. — 北京: 科学出版社, 2006

(20 世纪科普经典特藏)

ISBN 7-03-016649-3

I. 物… II. ①伽…②斯…③刘… III. 物理学—普及读物 IV. 04-49

中国版本图书馆 CIP 数据核字 (2005) 第 152541 号

责任编辑: 胡升华 郝建华 / 责任校对: 李弈莹
责任印制: 钱玉芬 / 封面设计: 黄华斌

科学出版社 出版

北京东黄城根北街16号

邮政编码: 100717

<http://www.sciencep.com>

中国科学院印刷厂印刷

科学出版社发行 各地新华书店经销

*

2006 年 2 月 第 一 版 开本: B5 (610 × 1430)

2006 年 2 月 第一次印刷 印张: 17 1/4

印数: 1—5 000 字数: 345 000

定价: 29.00 元

(如有印装质量问题, 我社负责调换〈科印〉)

序

20世纪在科学发展史上是一个辉煌的世纪，以物理学和生物学的创新性成果为标志的科学成就，极大地改变了世界的面貌，改变了人类的认知水平、生产方式和生活方式。20世纪也是科学史上的一个英雄世纪，一大批别具一格的科学大师风云际会，相继登场，使科学的舞台展现出前所未有的绚丽风采。20世纪发生了两次世界大战，二战催生的原子弹，使社会公众了解了科学的巨大威力，也促使人类认真地审视科学，了解到科学必须要与人类的良知，与人文精神结合在一起，只有合理地利用，才能造福于人类，才能有利于和平，有利于人类社会的可持续发展。进入20世纪80年代，人类更进一步认识到必须携起手来保护生态，控制环境污染，探索可持续发展的道路。可持续发展理念的形成，是20世纪阶级社会发展观进步的一个重大的事件。

回顾20世纪科学走过的道路，从突飞猛进的科学创造，到科学与人文伦理的深度撞击，形成与人文精神交融并进的局面，最终在人类文明史上留下了不同寻常的篇章。

20世纪诞生的科学和思想大师所取得的非凡的科学成就、创造的充足科学和思想养分，孕育了一批优秀的科普作品，为公众提供了丰富的精神食粮。人们可以跟着爱因斯坦、薛定谔、伽莫夫、沃森、温伯格、霍金等等科学大师的生花妙笔去领略科学创造的历程、登攀一个个科学顶峰的征程和科学高峰的神奇景观；可以跟着卡逊在寂静的春天里思考知更鸟的命运；可以跟着萨根去观察宇宙和生命……。今天这些科学大

师和思想大师大部分都已离开了我们，但那些优秀科普作品是他们留给后代的不朽的精神财富。

20 世纪已经过去，21 世纪已经肯定是一个全球化、知识化的世纪，也是科技国际化、网络化的一个时代。可持续发展依然是人类唯一的发展道路，自然科学、社会科学、人文精神将交叉融合，世界的文化环境会发生很大的变化，东西方文化将会在激荡过程中进一步融合升华，创造出具有国际化，又有民族特色的新文化。在未来 15 年，中国要基本完成向一个创新型国家过渡。建立创新体系、创新机制配套的基础是要大幅度提高国民的文化教育水平和科学素质，把我国庞大的人口负担真正转化为无可比拟的创新人力资源。

在中国这样一个大国传播普及科技知识、科学精神是一个宏大的系统工程，需要政府组织倡导和社会各界的积极努力。中国科学院也承担着光荣而艰巨的任务，我们有义务整合全院资源努力把科普工作做大、做好，为国家和社会发挥更大的作用。科学出版社是科普图书出版的一支战略方面军，应该大有作为。《20 世纪科普经典特藏》把原汁原味的经典科普大餐奉献给新时代读者，辅之以中文点评是一个很好的尝试。希望这些经典著作能给读者以启发，开拓读者的科学视野，更希望这些经典著作能起到示范的作用，推进我们自己的原创科普和科学文化作品的创作和出版。

姚期智

2006 年 2 月 17 日

点 评 者 序

伽莫夫与斯坦纳德所著的《汤普金斯先生的新世界》一书，可以说是一本科普名著。而且，这本名著本身的演变还有一段很曲折的历史。

先应该简要地介绍一下伽莫夫其人。

伽莫夫(1904~1968)，系天才的俄裔美籍科学家，在原子核物理学和宇宙学方面成就斐然，如今在宇宙学中影响最为巨大的大爆炸理论，就有他的重要贡献，甚至于在生物遗传密码概念的提出上，他也是先驱者之一。

除了科学研究之外，科普也是伽莫夫的重要并且极有成就的领域。早年在哥本哈根随量子物理学的一代领袖人物玻尔学习时，他就在玻尔的弟子当中以幽默机智著称。从他的著作中，我们也可以看出其深厚的科学修养和人文修养。他的科普作品数量虽然远远没有像阿西莫夫那样的科普作家那么多，但却本本都有其自身的特色，并且长年拥有大量的读者。从1938年起，他就发表了一系列科学故事，其中成功地塑造了一位名叫汤普金斯的主人公，通过这位主人公的各种经历来传播物理学知识。1940年，他将第一批故事汇集成他的第一部科普著作《汤普金斯先生身历奇境》，1944年，他又将后续故事汇集成《汤普金斯先生探索原子世界》一书。因受读者欢迎，1965年，伽莫夫重新补充新内容，将两本合编为《平装本中的汤普金斯先生》。1968年，伽莫夫去世，在身后这部著作依然是广受欢迎的科普名著，但此后物理学和宇宙学等却在迅速发展，使得书中的内容略显陈旧。在此情况下，剑桥大学出版社大胆邀请了英国著名科普作家斯坦纳德对该书进行全面更新和补写，于是，就成了眼下的这部著作。

伽莫夫在60年代的版本，以及经斯坦纳德修订补充的新版本，都曾有过中译本，均名为《物理世界奇遇记》，分别由科学出版社和湖南教育出版社出版。有人

曾说过，上个世纪 70 年代末科学出版社的中译本，几乎影响了当时国内一代人对物理学的理解和兴趣。不过，后来由湖南教育出版社出版，收入“世界科普名著精选”丛书中的中译本《物理世界奇遇记》(最新版)，与这里的英文版在内容结构上又略有不同。

伽莫夫的这本书，可以说是既好读，读起来又有些困难。说好读，是因为伽莫夫的特殊杰出的学识、修养、幽默感和想像力。如果不谈他那些重要的科学贡献，仅就科普著作而言，也足以作为一位兴趣广泛的天才而让人们记住。与其他常见的按主题分类来写作的科普著作不同，伽莫夫完全是以一种大家的写作风格，把数学、物理学的许多内容有机地融合在一起，仿佛作者是想到哪说到哪，将叙述的内容信手拈来，其实，仔细思考，就会感觉到其中各部分内容之间内在的紧密关系。说困难，则是因为按照某种分类，这本书或许可以算作“高级科普”，也就是说，要完全读懂它并不那么容易，需要读者具有某种程度的知识准备，还需要在阅读时随着作者的叙述自己动很多的脑筋来进行思考。

但是，至少有一点可以指出的是，我们也许需要改变一点观念，即读科普书，通常也并不一定非要把书中一切细节都一一彻底搞懂，体会科学家写作的风格和思路、感受科学的思维与美，甚至从中学会一些科学家说话的方式，都可以说是重要的收获。

如今，此书英文(附中文点评)版在国内的出版，可以为学习物理学的学生和物理学爱好者提供一份原汁原味的作品，也可以为英语学习者提供一部很有可读性的优秀科学普及类著作。至于本人在书中的点评，以非常随意的形式写成，有些地方像读书笔记，有些地方像简评，有些地方是感叹，也有些地方则是简要的提示。当然，如果读者略去点评，直接阅读原文，也是可行的阅读方式。

希望读者能够喜欢这本书，并在阅读中有所获益。

刘 兵

2005年10月9日

于清华大学荷清苑

Reviser's Foreword



There cannot be many physicists who have not at one time or other read the Mr Tompkins adventures. Although originally intended for the layperson, Gamow's classic introduction to modern physics has had enduring, universal appeal. I myself have always regarded Mr Tompkins with the greatest affection. I was therefore delighted to be asked to update the book.

A new version was clearly long overdue, so much having happened in the 30 years since the last revision, especially in the fields of cosmology and high energy nuclear physics. But on re-reading the book, it struck me that it was not only the physics that needed attention.

For example, the current output from Hollywood could hardly be regarded as 'infinite romances between popular stars'. Again, ought one to be introducing quantum theory by reference to a tiger shoot, given our modern-day concern for endangered species? And what of 'pouting' Maud, the professor's daughter, 'engulfed in *Vogue*', wanting 'a darling mink coat', and told to 'run along, girlie' at the mere mention of physics. This hardly strikes the right note at a time when strenuous efforts are being made to persuade girls to study physics.

Then there are problems with the plot. While Gamow deserves credit for the innovative way he introduced the physics through a story, the actual storyline has always had its weaknesses. For instance, Mr Tompkins repeatedly learns new physics from his dreams before he has had any chance of being exposed to such ideas (even subliminally) through real life situations involving the professor's lectures or conversations. Or take the case of

如此说来，伽莫夫的这本经典之作可谓“雅俗共赏”。这岂不是有些像金庸小说？

在这里，修订者已经在科普作品中表现出了很好的环保意识和性别意识，可谓是科普观念的与时俱进。

his holiday at the seaside. He falls asleep in the train and dreams that the professor is accompanying him on his journey. It later turns out that the professor actually is on holiday with him and Mr Tompkins is fearful that he will remember what a fool he made of himself on the train—in his dream?!

At times the physics explanations are not as clear as they might have been. For instance, in dealing with the relativistic loss of simultaneity for events occurring in different locations, a situation is described where observers in two spacecraft are to compare results. But instead of adopting the viewpoint of one of these two frames of reference's, the problem is addressed from a third, and unacknowledged, frame in which both craft are moving. Likewise, the account given of the shooting of the station master, while the porter was apparently reading a paper's at the other end of the platform, does not in fact establish the porter innocence—as is claimed. (The description would need to rule out the possibility of the porter firing the gun before sitting down to read the paper.)

There is the question of what to do with the 'cosmic opera'. The idea of such a work ever being staged at Covent Garden, was, of course, always farfetched. But now we are faced with the added problem that the subject of the opera—the rivalry between the Big Bang theory and the Steady State theory—can hardly be regarded as a live issue today, the experimental evidence having come down heavily in favour of the former. And yet the exclusion of this ingenious, joyful interlude would be a great loss.

Another problem concerns the illustrations. *Mr Tompkins in Paperback* was partly illustrated by John Hookham, and partly by Gamow himself. In order to describe the latest developments in physics, further illustrations would be required, so necessitating yet a third artist. Should one settle for the resulting unsatisfactory clash of styles, or adopt a completely fresh approach?

这是一个两难的问题。实际上，伽莫夫的多才多艺，也体现在他的绘画上，他的漫画极有个人风格，有一种质朴但却传神的特征，此书新版中缺少了伽莫夫本人的绘画，实在是一大遗憾！

In the light of these various considerations, a decision had to be made: I could content myself with a minimal rewrite in which I simply patched up the physics and turned a blind eye to all the other weaknesses. Alternatively, I could grasp the nettle and go for a thorough reworking.

I decided on the latter. All the chapters needed work doing on them. Chapters 7, 15, 16 and 17 are entirely new. I decided it would also be helpful to add a glossary. The detailed changes I proposed met with the approval of the Gamow family, the publishers and their panel of advisors—with the notable exception of one consultant who was of the opinion that the text should not in any way be touched. This dissenting view was a signal that I was not going to be able to please everyone! Clearly there will always be those who would rather stay with the original—which is fair enough.

But as far as this version is concerned, it is primarily aimed at those who have yet to make the acquaintance of Mr Tompkins. While trying to remain true to the spirit and approach of Gamow's original, it aims to inspire and meet the needs of the next generation of readers. As such, I would like to think that it is a version George Gamow himself might have written—had he been at work today.

每个时代，科普作品的读者都不相同，但伽莫夫的那种个人魅力，则有着某种超越时代的特征。

Acknowledgements

Thanks are due to Michael Edwards for enlivening the text with his refreshing illustrations. I am grateful to Matt Lilley for his helpful and constructive comments on an early draft. The encouragement and support I received from the Gamow family was much appreciated.

R. STANNARD

Gamow's Preface to *Mr Tompkins in Paperback*

In the winter of 1938 I wrote a short, scientifically fantastic story (not a science fiction story) in which I tried to explain to the layman the basic ideas of the theory of curvature of space and the expanding universe. I decided to do this by exaggerating the actually existing relativistic phenomena to such an extent that they could easily be observed by the hero of the story, C. G. H.* Tompkins, a bank clerk interested in modern science.

I sent the manuscript to *Harper's Magazine* and, like all beginning authors, got it back with a rejection slip. The other half-a-dozen magazines which I tried followed suit. So I put the manuscript in a drawer of my desk and forgot about it. During the summer of the same year, I attended the International Conference of Theoretical Physics, organized by the League of Nations in Warsaw. I was chatting over a glass of excellent Polish *miod* with my old friend Sir Charles Darwin, the grandson of Charles (*The Origin of Species*) Darwin, and the conversation turned to the popularization of science. I told Darwin about the bad luck I had had along this line, and he said: 'Look, Gamow, when you get back to the United States dig up your manuscript and send it to Dr C. P. Snow, who is the editor of a popular scientific magazine *Discovery* published by the Cambridge University Press.'

So I did just this, and a week later came a telegram from Snow saying: 'Your article will be published in the next

斯诺这位“两种文化”问题的提出者，其工作并不仅限于抽象的理论，从这里看，他对“科普作家”伽莫夫的发现亦是大功一件。

* The initials of Mr Tompkins originated from three fundamental physical constants: the velocity of light c , the gravitational constant G , and the quantum constant h , which have to be changed by immensely large factors in order to make their effect easily noticeable by the man on the street.

issue. Please send more.' Thus a number of stories on Mr Tompkins, which popularised the theory of relativity and the quantum theory, appeared in subsequent issues of *Discovery*. Soon there after I received a letter from the Cambridge University Press, suggesting that these articles, with a few additional stories to increase the number of pages, should be published in book form. The book, called *Mr Tompkins in Wonderland*, was published by Cambridge University Press in 1940 and since that time has been reprinted sixteen times. This book was followed by the sequel, *Mr Tompkins Explores the Atom*, published in 1944 and by now reprinted nine times. In addition, both books have been translated into practically all European languages (except Russian), and also into Chinese and Hindi.

Recently the Cambridge University Press decided to unite the two original volumes into a single paperback edition, asking me to update the old material and add some more stories treating the advances in physics and related fields which took place after these books were originally published. Thus I had to add the stories on fission and fusion, the steady state universe, and exciting problems concerning elementary particles. This material forms the present book.

A few words must be said about the illustrations. The original articles in *Discovery* and the first original volume were illustrated by Mr John Hookham, who created the facial features of Mr Tompkins. When I wrote the second volume Mr Hookham had retired from work as an illustrator, and I decided to illustrate the book myself, faithfully following Hookham's style. The new illustrations in the present volume are also mine. The verses and songs appearing in this volume are written by my wife Barbara.

G. GAMOW

University of Colorado, Boulder, Colorado, USA

Contents 目录

序.....	路甬祥
点评者序.....	刘兵
Reviser's Foreword.....	7
Gamow's Preface to <i>Mr Tompkins in Paperback</i>	11
1 City Speed Limit	1
城市速度极限	
2 The Professor's Lecture on Relativity which Caused Mr Tompkins's Dream	10
教授那篇使汤普金斯先生进入梦境的相对论 演讲	
3 Mr Tompkins Takes a Holiday	25
汤普金斯先生请了个疗养假	
4 The Notes of the Professor's Lecture on Curved Space	47
教授那篇关于弯曲空间的演讲稿	
5 Mr Tompkins Visits a Closed Universe	62
汤普金斯先生访问一个封闭宇宙	
6 Cosmic Opera	73
宇宙之歌	
7 Black Holes, Heat Death, and Blow Torch	84
黑洞、热寂和喷灯	
8 Quantum Snooker	95
量子台球	
9 The Quantum Safari	118
量子丛林	

10	Maxwell's Demon	128
	麦克斯韦妖	
11	The Merry Tribe of Electrons	146
	快乐的电子部落	
11½	The Remainder of the Previous Lecture through which Mr Tompkins Dozed	163
	上一次演讲中汤普金斯先生因为睡着而没有听 到的那部分	
12	Inside the Nucleus	173
	原子核内部	
13	The Woodcarver	184
	老木雕匠	
14	Holes in Nothing	196
	虚空中的空穴	
15	Visiting the 'Atom Smasher'	205
	参观“原子粉碎机”	
16	The Professor's Last Lecture	239
	教授的最后一篇演讲	
17	Epilogue	256
	尾声	

1 City Speed Limit

城市速度极限



It was a public holiday, and Mr Tompkins, a little clerk of a big city bank, slept late and had a leisurely breakfast. Trying to plan his day, he first thought about going to an afternoon movie. Opening the local newspaper, he turned to the entertainment page. But none of the films appealed to him. He detested the current obsession with sex and violence. As for the rest, it was the usual holiday fare aimed at children. If only there were at least one film with some real adventure, with something unusual and maybe challenging about it. But there was none.

Unexpectedly, his eye fell on a little notice in the corner of the page. The town's university was announcing a series of lectures on the problems of modern physics. This afternoon's lecture was to be about Einstein's Theory of Relativity. Well, that might be something! He had often heard the statement that only a dozen people in the world really understood Einstein's theory. Maybe he could become the thirteenth! He decided to go to the lecture; it might be just what he needed.

Arriving at the big university auditorium, he found the lecture had already begun. The room was full of young students. But there was a sprinkling of older people there as well, presumably members of the public like himself. They were listening with keen attention to a tall, white-bearded man standing alongside an overhead projector. He was explaining to his audience the basic ideas of the Theory of Relativity.

Mr Tompkins got as far as understanding that the

作为科普作品，这是一个独特的开场。看来，在伽莫夫通过汤普金斯来表述的审美趣味中，能看得上眼的影片实在是太少了。

在今天，我们的科普讲座还会这么吸引人，特别是这么吸引年轻人吗？

科学的理论，与普通人基于日常经验的感受，经常是不一致的！

就像电影中常用的切换手法一样，汤普金斯先生已经入梦了！

以下作者描述的场景，在现实生活中是无法看到的，但它们确实又是对相对论有关速度等理论的形象表达，因此，将这些场景放入主人公的梦境里，便显得合情合理了。

whole point of Einstein's theory is that there is a maximum velocity, the velocity of light, which cannot be exceeded by any moving material object. This fact leads to very strange and unusual consequences. For example, when moving close to the velocity of light, measuring rulers contract and clocks slow down. The professor stated, however, that as the velocity of light is 300,000 kilometres per second (i. e. 186,000 miles per second), these relativistic effects could hardly be observed for events of ordinary life.

It seemed to Mr Tompkins that this was all contradictory to common sense. He was trying to imagine what these effects would look like, when his head slowly dropped on his chest ...

When he opened his eyes again, he found himself sitting, not on a lecture room bench, but on one of the benches provided by the city for the convenience of passengers waiting for a bus. It was a beautiful old city with medieval college buildings lining the street. He suspected that he must be dreaming, but there was nothing unusual about the scene. The hands of the big clock on the college tower opposite were pointing to five o'clock.

The street was nearly empty—except for a single cyclist coming slowly towards him. As he approached, Mr Tompkins's eyes opened wide with astonishment. The bicycle and the young man on it were unbelievably shortened in the direction of their motion, as if seen through a cylindrical lens. The clock on the tower struck five, and the cyclist, evidently in a hurry, stepped harder on the pedals. Mr Tompkins did not notice that he gained much in speed, but, as a result of his effort, he shortened still further and went down the street looking rather like a flat picture cut out of cardboard. Immediately Mr Tompkins understood what was happening to the cyclist—it was the contraction of moving bodies, about which he had just heard. He felt very pleased with himself. 'Nature's speed limit must be lower here,' he concluded. 'I reckon it can't be much more than 20 m. p. h. They'll not be needing speed cameras in this town.' In fact, a

