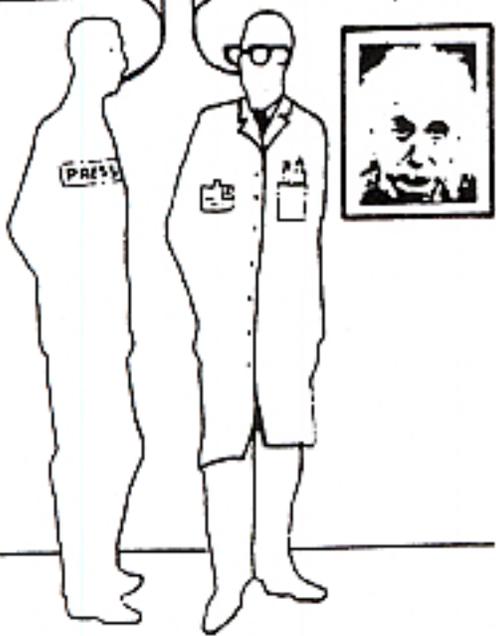


Thank You
For Granting
This interview.

$\log_{10}x[(-6\dots)]$
 $X \leftrightarrow Y.M$
 $\frac{2X}{Y} = A^2$



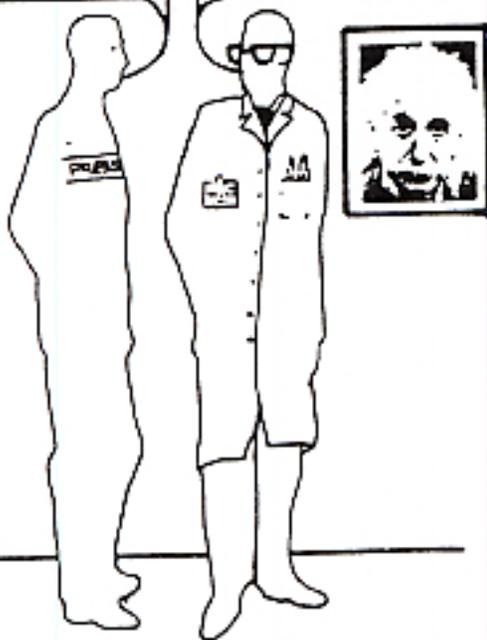
Do You Feel
Science is working
in the interests
of mankind or
its own?

$\cos^{-1} \div 1/X$
GRA 18344.41-06
 $X \leftrightarrow Y.M$ EXP
INV D.R.G



Is There a Future
Possible
In light of 3 mile
Island + Chernobyl?

$E = MC^2$



Jerk!

Imbecile!



Getsky/86

“Most of the fundamental ideas of science are essentially simple, and may, as a rule, be expressed in a language comprehensible to anyone.”

Albert Einstein

“If you cannot—in the long run—tell everyone what you have been doing, your doing has been worthless.”

Erwin Schroedinger

The Rules

Lie

Cheat

Steal

Dare to be Stupid

Don't trust your sources (or your editors)

Waste Peoples' Time

Quote Out of Context

Make Arbitrary Calls

Don't expect anyone to understand you

Don't expect anyone to believe you

Prepare to make mistakes

Avoid "hardening of the categories"

Debase yourself, but never your readers

Eschew Objectivity

Emote

“You always have to lie a little to tell the
truth.”

Victor Weisskopf

A True-Life Story: Why Science Writers Lie

By K.C. COLE
TIMES SCIENCE WRITER

You always have to lie a little to tell the truth." A first-rate popularizer of science, MIT physicist Victor Weisskopf, once told me that was the secret to explaining science in nontechnical terms. He should know. His enchanting book "Knowledge and Wonder" has been seducing laypeople into the world of science for decades.

And so I confess: Week after week, I tell what I hope are well-considered lies. I write about electric currents that "flow" through wires like rivers—even though I know they do no such thing. I talk about elementary "particles" and "forces" even though physicists have only the foggiest notion what those terms mean. I toss off words such as "time" and "gravity," knowing that to some extent, their very existence is illusory.

The lies are simplifications that ease the way to the central point. The art is knowing the difference between acceptable—even necessary—lies and oversimplifications that slide into mistakes. Sometimes, it's hard to tell which is which, and even scientists frequently don't agree.

I vividly remember the first deliberate lie I told in a science essay. I was writing in *Time Inc.'s* *Discover* magazine about the ways seemingly small differences can sometimes produce enormous effects.

The elements neon and sodium, for example, have starkly contrasting characters. Neon is what chemists call a noble gas. It is so self-contained and standoffish that it won't react with anything. Sodium, on the other hand, is a highly reactive metal.

And yet, the only difference between the two, I

wrote, is one lousy extra electron in sodium's outer shell. Neon has 10 electrons to sodium's 11.

To be honest, I stole the example from Weisskopf (who also told me that the only sin is if you hear a good idea and you don't steal it). And strictly speaking, it is wrong. There's something else different about neon and sodium: Sodium also has an extra proton in its nucleus. However, atomic nuclei don't affect an element's chemical character. And as the mathematicians like to say, a difference is a difference.

Honest descriptions of scientific ideas will always remain elusive, mainly because an accurate depiction lies somewhere between the crisp clarity of equations and the fuzzy familiarity of metaphor.

only if it makes a difference.

Was pushing that proton under the rug an acceptable lie? Or a misleading representation? Recently, I wrote a column about water that contained both an acceptable lie and a misleading misrepresentation—and received a dozen letters from chemistry teachers in response.

In describing the marvelous and mysterious chemical properties of water, I said it was the only substance that can exist in solid, liquid and gaseous states at the same temperature. That sentence should have read: Water is the only substance that is solid,

liquid and gas at temperatures and pressures normal on the surface of the Earth.

Actually, all substances have a so-called triple point, some combination of pressure and temperature at which they can exist in all three states at once. But it would take extreme temperatures and/or pressures to reach most triple points.

Because the essay's focus was water's relevance to life, I omitted the second half of the thought. In retrospect, that was a misleading misrepresentation.

The lie (or one of the lies) was the statement that water is the only substance that expands when it freezes into a solid. Actually, the metal alloy used to set type also expands. That embellishment seemed to distract from the central point, however, so I chose to leave it (like sodium's proton) out. In a case like this, less seemed more. There's a limit to the number of qualifications you can pile on a point without burying its impact.

Honest descriptions of scientific ideas will always remain elusive, mainly because an accurate depiction lies somewhere between the crisp clarity of equations and the fuzzy familiarity of metaphor. Even equations, when you get right down to it, don't describe the "whole" truth very well, because truth has many facets. Only a limited slice of reality can be accurately described by any given set of natural laws.

Or as the founder of quantum mechanics, Niels Bohr, reportedly put it: "There is an uncertainty relationship between truth and clarity." In physics jargon, that means the closer you get to pinning down truth, the more elusive clarity becomes, and vice versa.

At times, being clear and telling the whole truth may be mutually exclusive.

$$E = mc^2$$

The Weight of Energy

A windup toy unwinds and lightens by one billionths the weight of the dot of an i.

A car burns a tankful of gas and plenty of air; the total weight lightens by 10 dots' weight.

A thermonuclear bomb explodes and the total weight is reduced by a quarter of an ounce.

The sun shines for 1 second and loses the weight of 2 dozen ocean liners.

“There is an uncertainty relationship
between truth and clarity.”

Niels Bohr

“Words can easily turn into a dangerous
source of error and deception.”

Albert Einstein

“Heat is a motion of expansion.....

So that the body acquires a motion alternative, perpetually quivering, striving, and irritated by repercussion, whence spring the fury and fire of heat.”

Francis Bacon

“And now we might add something concerning a most subtle spirit which pervades and lies hid in all gross bodies, by the force and action of which spirit the particles of bodies attraction one another at near distances and cohere....”

Isaac Newton

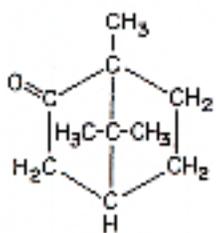
16. **GRACEFUL EXIT AND ENERGY CONDITIONS IN STRING COSMOLOGY**
R. Brustein and R. Madden, Phys. Lett. B410, 110 (1997).
 - E-Print archives: hep-th/9702043
17. **INSTANTON EFFECTS IN STRING COSMOLOGY**
K. Behrndt, S. Forste and S. Schwager, Nucl. Phys. B508, 391 (1997).
 - E-Print archives: hep-th/9704013
18. **A MODEL OF GRACEFUL EXIT IN STRING COSMOLOGY**
R. Brustein and R. Madden, Phys. Rev. D57, 712 (1998).
 - E-Print archives: hep-th/9708046
19. **SINGULARITIES IN SCALAR-TENSOR COSMOLOGIES**
N. Kaloper and K. A. Olive Phys. Rev. D57, 811 (1998).
 - E-Print archives: hep-th/9708008
20. **MASSIVE STRING MODES AND NON-SINGULAR PRE-BIG BANG COSMOLOGY**
M. Maggiore, Nucl. Phys. B 525, 413 (1998).
 - E-Print archives: gr-qc/9709004
21. **REPULSIVE GRAVITY IN THE VERY EARLY UNIVERSE**
M. Gasperini, Gen. Rel. Grav. 30, 1703 (1998)

Awarded the "Fourth Prize" in the 1998 Awards for Essays on Gravitation (Gravity Research Foundation, Wellesley Hills, Ma).
 - Preprint: latex file [DFTT-23/98](#), postscript file (including figures) [DFTT2398.ps](#).
 - Figures (in postscript): [Fig. 1](#).
 - E-Print archives: gr-qc/9805060
22. **NONSINGULAR DILATON COSMOLOGY**
R. Brandenberger, R. Easther and J. Maia, JHEP 9808, 007 (1998).
 - E-Print archives: gr-qc/9806111
23. **D-BRANES AND COSMOLOGY**
M. Maggiore and A. Riotto, Nucl. Phys. B 548, 427 (1999)
 - E-Print archives: hep-th/9811089
24. **DUALITIES VERSUS SINGULARITIES**
T. Banks, W. Fischler and L. Motl, JHEP 9901, 019 (1999).
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25. **LOOP CORRECTIONS AND GRACEFUL EXIT IN STRING COSMOLOGY**
S. Foffa, M. Maggiore and R. Sturani, Nucl. Phys. B 552, 395 (1999).
 - E-Print archives: hep-th/9903008

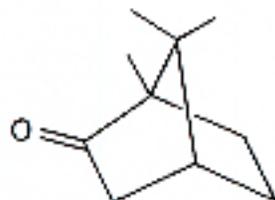
e

“When it comes to atoms, language can be used only as in poetry. The poet, too, is not nearly so concerned with describing facts as with creating images.”

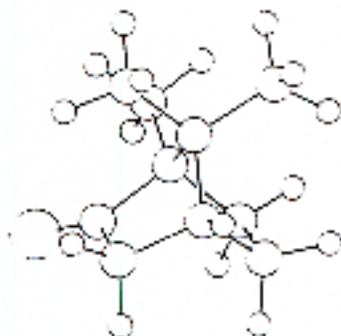
Niels Bohr



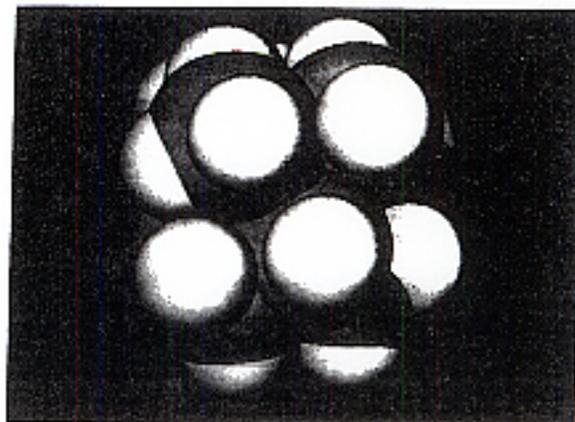
15.3 Camphor, with all the atoms specified.



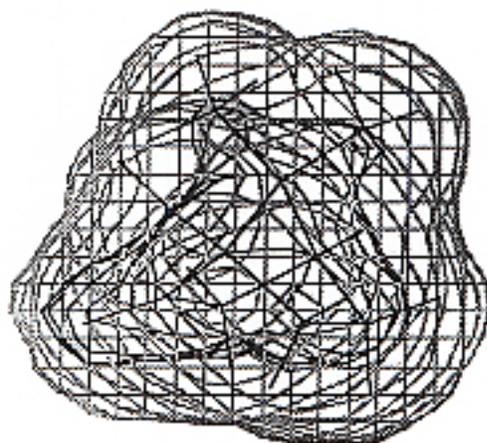
15.4 Camphor, a three-dimensional representation.



15.5 A ball-and-stick model of camphor.



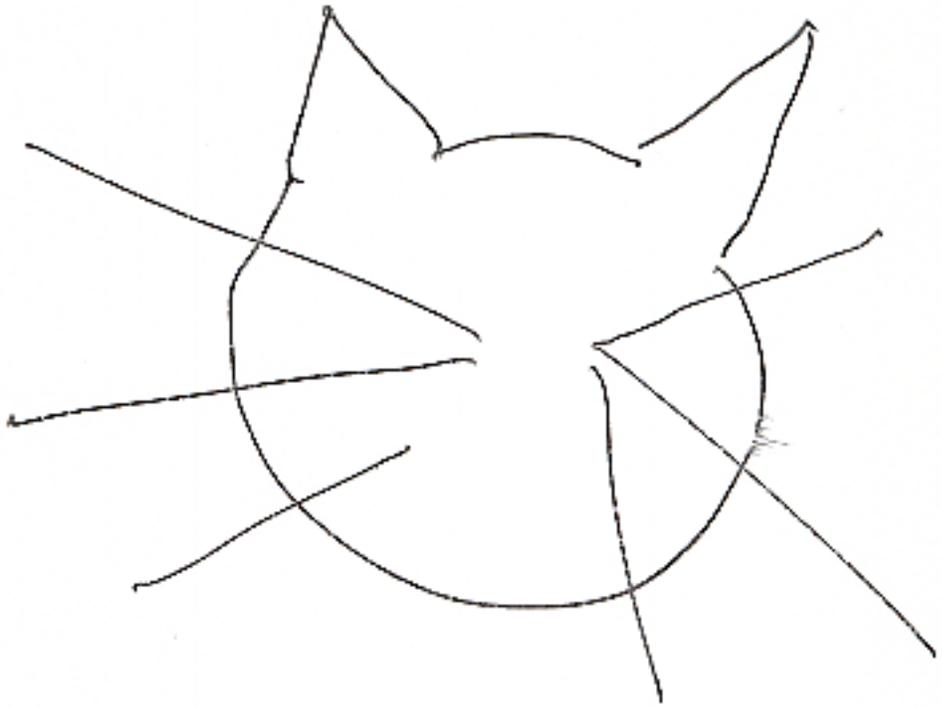
15.6 A space-filling model of camphor.



15.7 Two views of the distribution of the electrons in the camphor molecule.

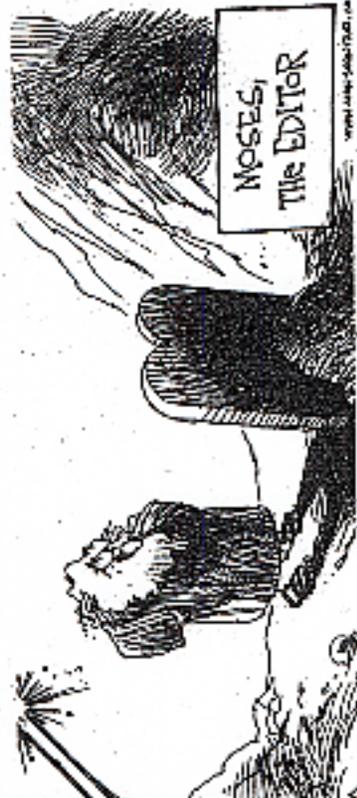
“The real sin is if you hear a good idea
and you *don't* steal it.”

Viki Weisskopf



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NO,
I CAN'T
DUMB IT
DOWN ANY
FURTHER!



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“Either we have failed to see ninety-nine percent of the Universe or we are wrong about how the Universe began.”

--Stephen Hawking

QUINTESSENCE

The Mystery of Missing Mass in the Universe

Lawrence Krauss

Will the universe continue to expand forever, reverse its expansion and begin to contract, or reach a delicately poised state where it simply persists forever? The answer depends on the amount of properties of matter in the universe, and that has risen to the rise to one of the great paradoxes of modern cosmology: there is too little visible matter to account for the behavior we can see. Over 90% of the universe consist of “missing mass” or “dark matter”—what Lawrence Krauss, in his classic book, termed “the fifth essence.”

In his new edition of *The Fifth Essence*, re-titled *Quintessence* after the now widely accepted term for dark matter, Krauss shows how the dark matter problem is now connected with two of the hottest areas in recent cosmology: the fate of the universe and the “cosmological constant.” With a new introduction, epilogue, and chapter updates, Krauss updates his classic for 2000 and shares one of the most stunning discoveries in recent years: an antigravity force that explains recent observations of a permanently expanding universe.

Lawrence Krauss is the Chairman of Physics at Case Western Reserve University, in Cleveland, Ohio.

Book Information, Release Date: 2/1/2000, ISBN: 0-465-03740-2, Price: \$25.00,

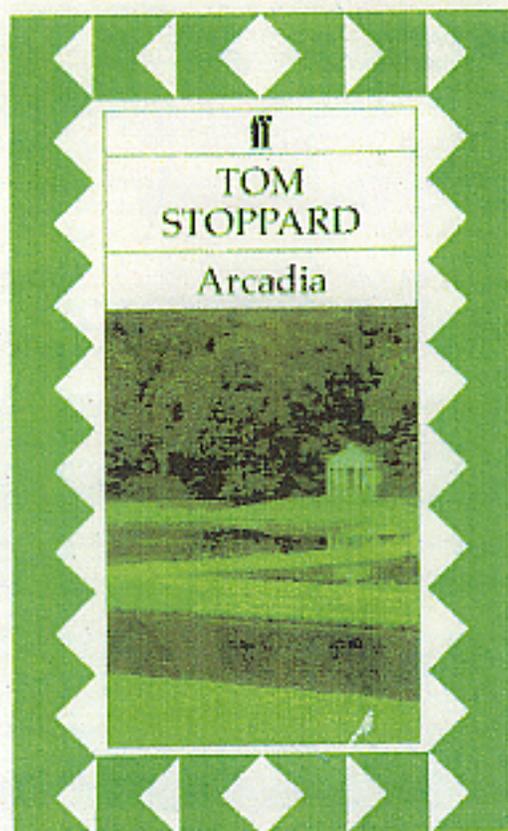
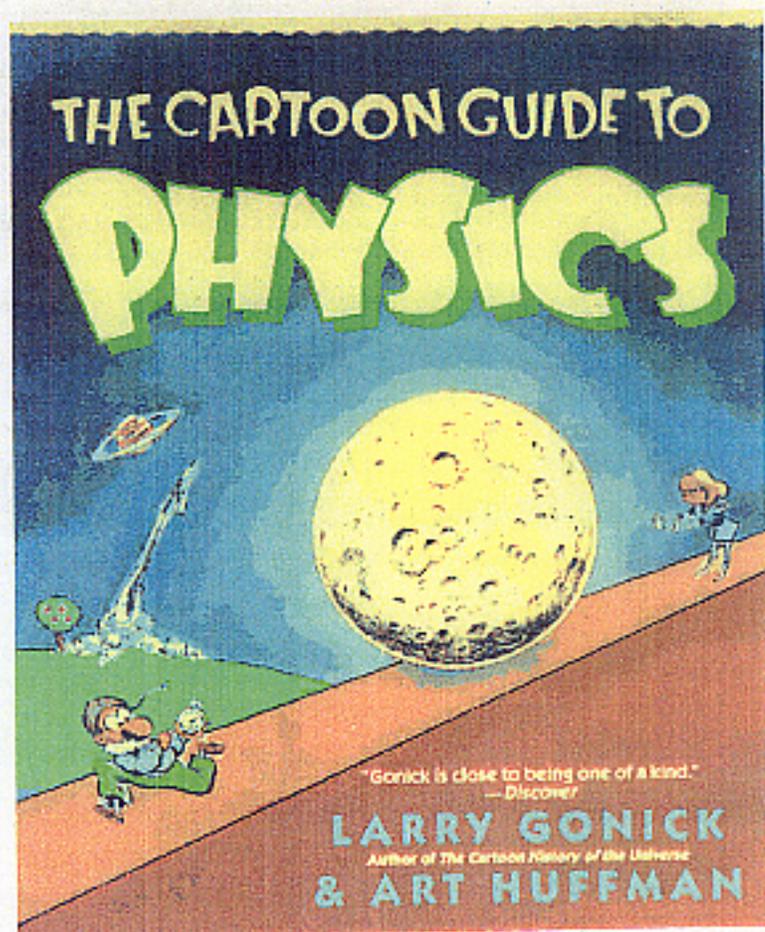
“I’m starting to wonder whether the physicists are pulling some kind of elaborate scam here. I’m starting to wonder if they don’t sit around their \$23 million atomic accelerators all day, drinking frozen daiquiris, and shrieking, ‘there goes one now!’ and then laughing themselves sick.”

Dave Barry

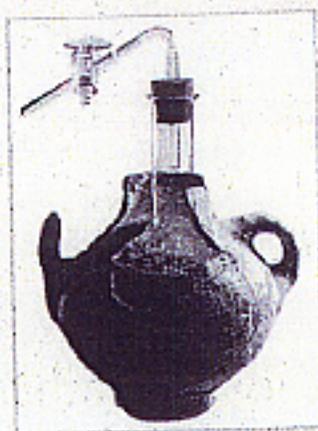
The Most Dangerous Disease
Afflicting Humankind:

Hardening of the Categories

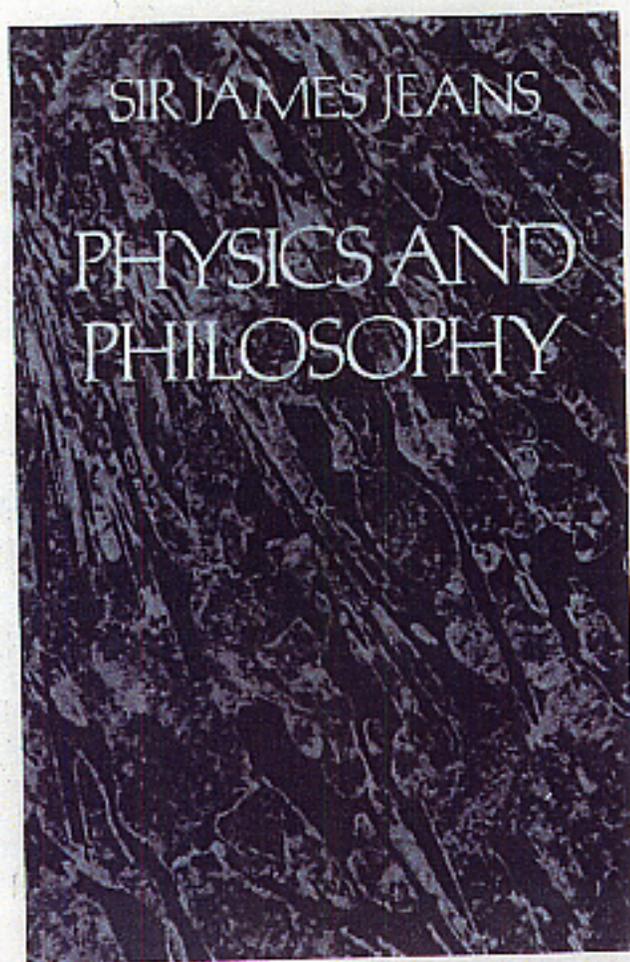
Bob Miller



Roald Hoffmann
Shira Leibowitz Schmidt



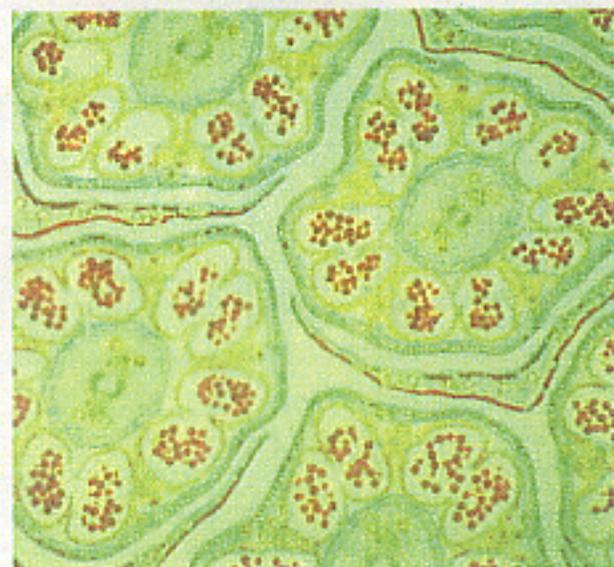
OLD WINE
Reflections on Science
and Jewish Tradition
NEW FLASKS



WHAT IS LIFE?

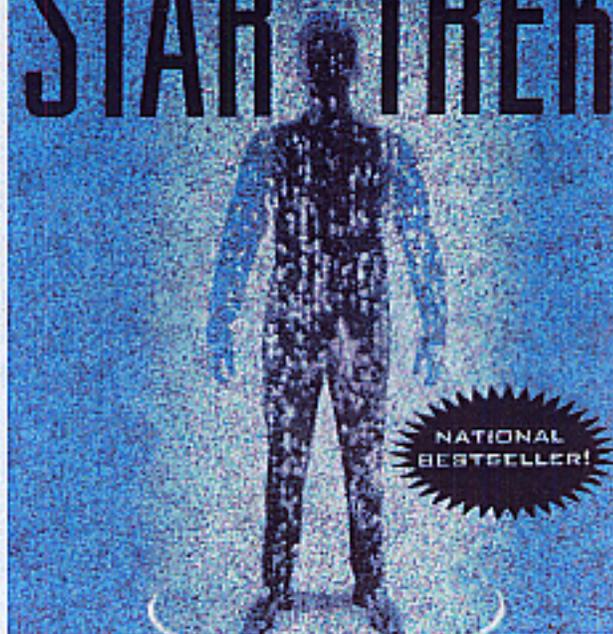
with Mind and Matter and
Autobiographical Sketches

ERWIN SCHRÖDINGER



Canto

THE PHYSICS OF STAR TREK



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WITH A FOREWORD BY STEPHEN HAWKING

"The essential tubside companion for the fans of the venerable Star Trek series."—*Washington Post*



Honey, Mud,
Maggots, and
Other Medical Marvels
The Science Behind Folk
Remedies and Old Wives' Tales
Robert and Michèle Root-Bernstein

THE UNIVERSE AND THE TEACUP



THE
MATHEMATICS
OF TRUTH
AND BEAUTY

K. C. COLE

“What a strange misconception has been taught to people! They have been taught that one cannot be disciplined enough to discover the truth unless one is indifferent to it. Actually, there is no point in looking for the truth unless what it is makes a difference.”

Frank Oppenheimer

“Poets say science takes away from the beauty of the stars—mere globs of gas atoms. Nothing is “mere.” I too can see the stars on a desert night, and feel them. But do I see less or more? The vastness of the heavens stretches my imagination—stuck on this carousel my little eye can catch one-million-year-old light. A vast pattern—of which I am a part—perhaps my stuff was belched from some forgotten star, as one is belching there. Or see them with the greater eye of Palomar, rushing all apart from some common starting point when they were perhaps all together. What is the pattern, or the meaning, or the why? It does not do harm to the mystery to know a little about it. For far more marvelous is the truth than any artists of the past imagined! Why do the poets of the present not speak of it? What men are poets who can speak of Jupiter if he were like a man, but if he is an immense spinning sphere of methane and ammonia must be silent?

Physics Richard Feynman,

Lectures in Physics

What, then, impels us to devise theory after theory? Why do we devise theories at all? The answer is simply: because we enjoy “comprehending.”

... There exists a passion for comprehending, just as there exists a passion for music.”

Albert Einstein

“Understanding is a lot like sex. It’s got a practical purpose, but that’s not why people do it normally.”

Frank Oppenheimer