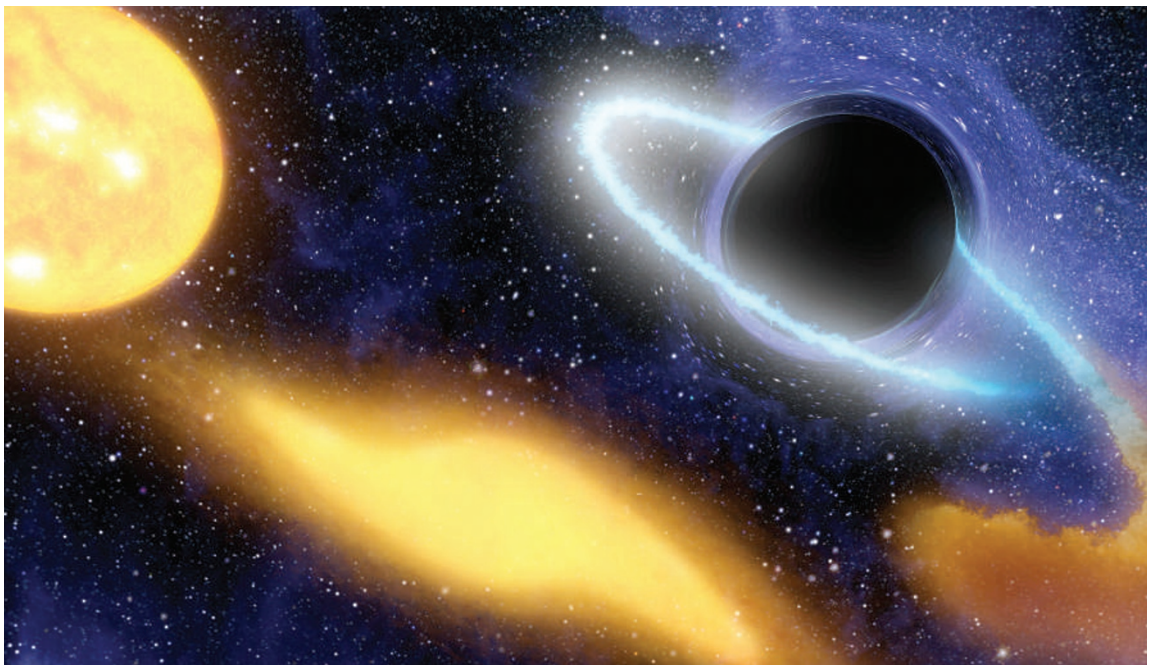
BOOKS & ARTS



Einstein's general theory of relativity sparked research that led to the understanding of black holes.

NASA-JPL

Relative confusion

The implications of Einstein's special and general theories of relativity were not immediately apparent.

The Curious History of Relativity: How Einstein's Theory of Gravity was Lost and Found Again
by Jean Eisenstaedt
Princeton University Press: 2006. 384 pp. $29.95, £18.95

William Unruh

Einstein created two surprising theories between 1905 and 1915. His special theory of relativity in 1905 altered our understanding of space and time such that, rather than being viewed as aspects of the physical world that could be used to describe and explain other features, both came to depend on the observer. By 1915, his general theory of relativity meant that space and time were now even more fluid, also depending on the state of matter in the surrounding Universe. Gravity was now seen as an aspect of time and space.

The Curious History of Relativity by Jean Eisenstaedt, originally published in French as *Einstein et la Relativité Générale*, traces Einstein's development of his special and general theories of relativity. It also describes the confused state of the experiments in the following years that were designed to test the general theory. The final third of the book describes and explains one of the consequences of the theory: the idea of black holes. As a historian of physics who has studied the development of general relativity, Eisenstaedt presents a wealth of intellectual, social and philosophical material regarding the theory and the reactions it engendered in the community.

I found many parts of this book absorbing, but some were not without irritation. Let me start with the positives. Eisenstaedt's mastery of Einstein's intellectual and personal development between 1905 and 1920, a period that spanned his greatest creativity and contribution, is evident, and he tells the stories well. It is fascinating to read his descriptions of Einstein's struggles with the concepts, his tenacious grip on the principles that helped him escape from numerous dead ends, and his temporary falling out with David Hilbert over what he regarded (justifiably) as an attempt by Hilbert at intellectual theft. The author's interesting digressions on the nature of scientific research and on the way scientific theories are invented are appropriate, even if I did not always agree with his position. His emphasis that both special and general relativity are theories of what is invariant, rather than what is relative, is spot on.

However, parts of the book annoyed me. Before describing the problems, I must declare a conflict: Eisenstaedt implies that relativists, and I consider myself one, are confused, incompetent and studying the subject just because they are paid to. Nevertheless, I will outline aspects of this book that bothered me. First, Eisenstaedt masterfully recounts the conventional story about the puzzles concerning the behaviour of light that arose in the nineteenth century. His treatment of these is fascinating in its historical detail, but he implies that half a century of trouble could have been avoided if only the physicists of the time had realized that velocities should not be added together. In contrast, even with the special theory of relativity, relative velocities as seen by any one observer should be added. The key to special relativity is that observers disagree on what those velocities are because they differ on what distances and time mean. This point is subtle, and escaped even Henri Poincaré and Hendrik Lorentz shortly before 1905.

Eisenstaedt fails to convey an intuitive understanding of general relativity. He resorts to a statement that gravity is the curvature of space-time — an explanation guaranteed to shut off any reader's imagination — and his attempts to describe tensor calculus do not help. The primary image he uses is that of the deflections experienced by a ball rolling across a rumpled landscape. But the primary cause of those deflections is the effect of Earth's gravity, so his description is circular as it uses gravity to explain gravity. He describes the Einstein

effect, whereby clocks run at different rates according to their position in a gravitational field, but gravity does not cause this effect. Rather, general relativity says that this inequable flow of time from place to place is gravity, in most of our normal experiences with it.

My biggest gripe about the book, however, is the conceit in the title that the theory was almost lost in the 1930s and 1940s, and was only found again in the early 1960s with the discovery of black holes. It is true that during the Second World War everyone's attention was concentrated on more practical areas of science, but it was precisely during that period that general relativity completely revised our image of the Universe. In conflict with even Einstein's prejudices, the Universe as a whole was found to be dynamic. It was also during this period that Subrahmanyan Chandrasekhar, and later Robert Oppenheimer and his students, used the theory to show that large stars at the end of their lives must become what we now know as black holes. Immediately after the war, groups across the world started studying the physical and mathematical consequences of the theory. Black holes did not cause that revival; understanding them was its result. Eisenstaedt's sensationalization is unnecessary in a book about what is one of the most sensational intellectual stories of the twentieth century.

Despite these grumbles, I would recommend the book for its account of those ten incredible years and the impact that was generated. ■

William Unruh is in the Department of Physics and Astronomy, University of British Columbia, Vancouver, British Columbia V6T 1Z1, Canada.

A hunger for company

Feast: Why Humans Share Food
by Martin Jones
Oxford University Press: 2007. 364 pp.
$35, £20

Gary Paul Nabhan

Engaging storytelling is not the forte of many technical scholars. So when an intelligent book comes along that is also truly charming, it deserves celebration. *Feast* by Martin Jones, a bio-archaeologist at the University of Cambridge, will delight most anthropologists and evolutionary biologists, as well as broadly educated laypersons interested in the evolution of diet and the social organization of eating.

The book is a pertinent example of what can be gained by 'consilience' among the natural sciences, social sciences and humanities. The term 'consilience' took on an extra layer of meaning when Edward O. Wilson attempted what might be perceived as a hostile take-over of all such disciplines by subsuming them under the unifying principles of evolutionary biology. In contrast, Jones takes a more balanced approach, setting up a productive tension between the evolutionary theories of Charles Darwin and Marvin Harris on the one hand, and the social and metaphorical insights of Mary Douglas and Claude Lévi-Strauss on the other. Include the biomolecular toolkit that Jones has used to look at remnant foodstuffs found on ancient grinding stones, clay pots and teeth, and you have an entirely fresh, integrated view of the social dynamics of food harvesting, food preparation and eating.

One of the most satisfying aspects of this treatise on the evolution of socialized food preparation and consumption is the manner in which Jones demonstrates the utility of new instruments, techniques and methodologies for investigating fragmentary archaeological remains associated with sites of human food procurement. Rather than assuming that these technologies render other, earlier approaches to human dietary evolution obsolete, Jones realizes that they build on the work of earlier investigators. Tool-driven science can go astray if it is not grounded in the well-articulated theories that it not only tests, but also refines. Jones therefore offers a narrative that is simultaneously humble and excited by new opportunities to shed light on why humans eat in the ways they do.

The journey makes stopovers at ancient archaeological sites; at the African field camps where Jane Goodall and other ethologists observed the eating behaviours of different primates; and even at the Fresh Kills landfill site near New York City, where garbologist William Rathje analyses contemporary human behaviour by sifting through masses of kitchen waste. Some of these stopovers have also been visited by other scholars on their quest to understand the social behaviour of human food consumers, and Jones uses each of their parables to illustrate his cogent points.

Jones even records field notes on his own ritualized behaviour and dress at a banquet at the University of Cambridge in the framework of their social acceptability in this formal setting. By juxtaposing this with primate behaviour at Goodall's camp, he offers a compelling answer to the question of whether humans are really that different from other primates in the social structure of our food sharing. The short answer is no, we are not, but the richer answer is that it is a matter of degree, and Jones guides us through these nuances.

By concerning himself with both evolutionary theory and the social constructions that give meaning to human eating behaviour, Jones arrives at a robust, integrative theory of why we share food the way we do. Testing this theory is likely to keep interdisciplinary scholars engaged for several decades to come. In a model of accessible scientific writing, Jones' captivating narrative is based on cutting-edge technology and on his personal indebtedness to early pioneers in this field. ■

Gary Paul Nabhan directs the Renewing America's Food Traditions consortium at the Center for Sustainable Environments, Northern Arizona University, Flagstaff, Arizona 86011, USA.

L. PSIHOYOS/SCIENCE FACTION

Your lab's a tip: garbologist William Rathje finds clues to human behaviour in piles of rubbish.