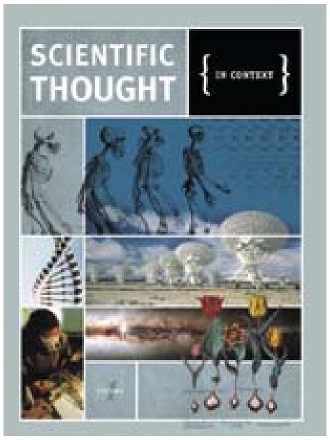
Scientific Thought in Context

Placing the most-talked-about issues in context



NEW TITLE From cloning and stem cell research to vaccination and the mapping of the human genome, the pervasive impact of science on daily life and future technology often makes complex scientific issues critical to the understanding of our modern world. *Scientific Thought in Context* was created specifically to provide a comprehensive overview of the science behind these concepts as well as exploring science's direct connection to related social issues and moral and ethical considerations.

Covers 125 major topics in science

Written by a team of international scholars and experts, *Scientific Thought in Context* covers a wide range of topics in the many subfields of science, from physics, genetics and astronomy to environmental science and evolution. This full-color set, written in language accessible to students and researchers, covers 125 major topics in science and provides a much-needed authoritative bridge between the content of the science itself and the related social issues on which it has a direct impact. Cross curricular in design, *Scientific Thought in Context* explores the enormous impact of scientific advances on the global community, including politics, law, medicine, the environment and industry.

Gale's *In Context* Series

Our new *In Context* series provides comprehensive information on such issues as climate change, environmental science and infectious diseases. Written by international experts in the field, these cross-curricular sets are specifically written for students at the high school level and above, as well as for general researchers, making complex issues easy to understand. Each full-color set includes hundreds of detailed entries; tables, photographs and illustrations; sidebars highlighting related issues; glossaries of terminology; bibliographies; and much more.

Topics in *Scientific Thought in Context* include:

- Antibiotics and Antiseptics
- Artificial Intelligence
- Black Holes and Event Horizons
- Chaos Theory
- Climate Change
- Cloning
- Concepts of Heredity and Change Prior to Evolutionary Theory
- Dissection and Vivisection
- DNA Evidence
- Ethical Principles for Medical Research Involving Human Subjects
- Evolutionary Theory
- Formulation and Impact of Naturalism
- Genetics
- Influence of Research Funding and the Grant System
- Manipulation of Genes
- Medical Imaging and Non-Invasive Medicine
- Ockham's Razor
- Origin of Life: The Miller-Urey Experiment
- Paleontology
- Plate Tectonics
- Postmodernism and the "Science Wars"
- Prions and Koch's Postulates
- Pseudoscience and Popular Misconceptions
- Sociobiology
- Standard Model, String Theory and Emerging Models Fundamental Physics
- Stem Cell Research
- Vaccines
- Wave Particle Duality
- And many others

Aligned with national and states standards

Scientific Thought in Context supports critical thinking about complex issues and the profound cultural connection between science and its impact on daily life in an interconnected, truly global world. The set aligns with national and state science and social studies standards and supports curricula across disciplines in science and the humanities. Additional features include: 60 primary source excerpts; a preface; a timeline including significant events in the history of scientific thought and the advancement of science; 300 photographs, illustrations, maps and tables, including extensively captioned historical photos; a "Words to Know" glossary; a detailed bibliography featuring books, periodicals, Web sites and multimedia materials to consult for further information; and a comprehensive index.

Scientific Thought in Context is also available in digital eBook format through the *Gale Virtual Reference Library*, allowing 24/7 access and full searchability. Contact your Gale Representative for details.

1st Ed. About 1,200 pp. in 3 vols. 2008.
ISBN 978-1-4144-0298-7.
Order #GML30809-220909.
U.S. $404.00/3-vol. set.

Now Available 2008.
eBook ISBN 978-1-4144-1085-2.
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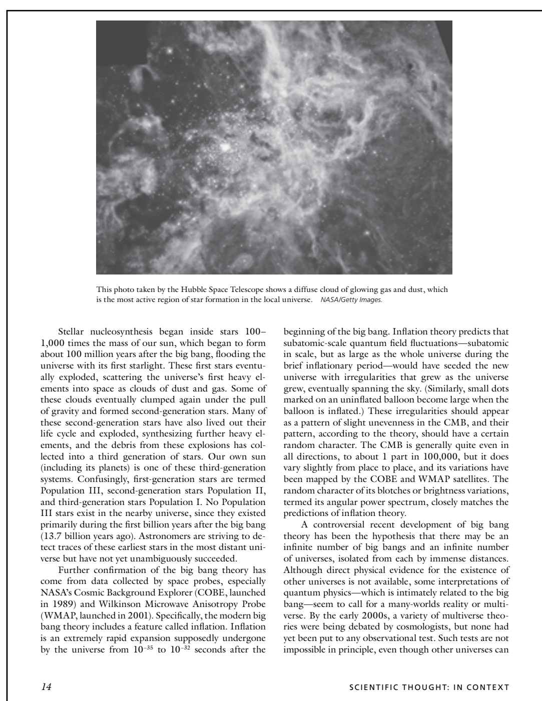

This photo taken by the Hubble Space Telescope shows a diffuse cloud of glowing gas and dust, which is the most active region of star formation in the local universe. *NASA/Getty Images.*

Stellar nucleosynthesis began inside stars 100–1,000 times the mass of our sun, which began to form about 100 million years after the big bang, flooding the universe with its first starlight. These first stars eventually exploded, scattering the universe's first heavy elements into space as clouds of dust and gas. Some of these clouds eventually clumped again under the pull of gravity and formed second-generation stars. Many of these second-generation stars have also lived out their life cycle and exploded, synthesizing further heavy elements, and the debris from these explosions has collected into a third generation of stars. Our own sun (including its planets) is one of these third-generation systems. Confusingly, first-generation stars are termed Population III, second-generation stars Population II, and third-generation stars Population I. No Population III stars exist in the nearby universe, since they existed primarily during the first billion years after the big bang (13.7 billion years ago). Astronomers are striving to detect traces of these earliest stars in the most distant universe but have not yet unambiguously succeeded.

Further confirmation of the big bang theory has come from data collected by space probes, especially NASA's Cosmic Background Explorer (COBE, launched in 1989) and Wilkinson Microwave Anisotropy Probe (WMAP, launched in 2001). Specifically, the modern big bang theory includes a feature called inflation. Inflation is an extremely rapid expansion supposedly undergone by the universe from 10^{-35} to 10^{-32} seconds after the beginning of the big bang. Inflation theory predicts that subatomic-scale quantum field fluctuations—subatomic in scale, but as large as the whole universe during the brief inflationary period—would have seeded the new universe with irregularities that grew as the universe grew, eventually spanning the sky. (Similarly, small dots marked on an uninflated balloon become large when the balloon is inflated.) These irregularities should appear as a pattern of slight unevenness in the CMB, and their pattern, according to the theory, should have a certain random character. The CMB is generally quite even in all directions, to about 1 part in 100,000, but it does vary slightly from place to place, and its variations have been mapped by the COBE and WMAP satellites. The random character of its blotches or brightness variations, termed its angular power spectrum, closely matches the predictions of inflation theory.

A controversial recent development of big bang theory has been the hypothesis that there may be an infinite number of big bangs and an infinite number of universes, isolated from each by immense distances. Although direct physical evidence for the existence of other universes is not available, some interpretations of quantum physics—which is intimately related to the big bang—seem to call for a many-worlds reality or multiverse. By the early 2000s, a variety of multiverse theories were being debated by cosmologists, but none had yet been put to any observational test. Such tests are not impossible in principle, even though other universes can

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