verse were filled with an unknown form of matter or energy whose gravity *repelled* rather than attracted.

That weird idea runs counter to the big bang theory, as well as the inflation theory that shores it up. The big bang theory, which holds that the universe has been expanding for about 12 billion years, assumes that matter is spread out evenly and is governed by only one force, gravity. To correct for certain shortcomings in the theory, cosmologists in the early 1980s adopted inflation theory, which, borrowing ideas from particle physics, holds that there was an early period of very rapid expansion after the big bang.

But a decade ago, notes physicist Lawrence M. Krauss, of Case Western Reserve University, Cleveland, it became clear that when the visible contents of the universe were added up, the collective gravitational force was not enough to bring the outward impulse from the big bang into eventual balance. That balance would be necessary if the universe were to avoid expanding forever or, alternatively, collapse in a fiery "big crunch." So cosmologists concluded that invisible matter ("dark matter") must exist in space, exerting sufficient gravitational force to make up the deficit.

But if, as astronomers' recent observations of exploding stars suggest, the expansion of the universe is speeding up, then even the unseen matter is not enough. A kooky form of antigravity matter or energy apparently must exist, or else the universe will keep expanding forever.

Physicists Martin A. Bucher, of the University of Cambridge, and David N. Spergel, of Princeton University, do not rule out the latter possibility, and contend that inflation theory can be modified to take an eternally expanding universe into account. Krauss, however, believes that the other alternative—that the universe is "filled with an energy of unknown origin"—is more likely. In either case, he observes, "a dramatic new understanding of physics" is now required.

Digging Up Doubt

"Why Settle Down? The Mystery of Communities" by Michael Balter, and "The Slow Birth of Agriculture" by Heather Pringle, in *Science* (Nov. 20, 1998), American Assn. for the Advancement of Science, 1200 New York Ave., N.W., Washington, D.C. 20005.

Archaeologists have long believed that the rise of farming, which occurred about 10,000 years ago, after the last Ice Age ended, led to the first human settlements. As nomads shifted away from hunting and gathering, it was thought, they needed to be near their crops and animals, and so had to stay put and form stable communities. New evidence from digs in Turkey, as well as new discoveries about ancient agriculture around the world, are casting strong doubt on the idea that agriculture and settlements emerged together in a single "Neolithic Revolution." So report *Science* contributing correspondent Balter and Pringle, a science writer based in Vancouver, British Columbia.

In recent years, an Anglo-American army of 90 excavators has descended on Çatalhöyük, a sprawling, 9,000-year-old village near the modern Turkish city of Konya, and has been slowly sifting through its multilayered remains. Discovered in 1958, Çatalhöyük was hailed initially as the world's oldest known city, with shared institutions, a division of labor (made possible by farm surpluses), and a dependence on agriculture. But today, the archaeologists, led by Ian Hodder of Cambridge University, have tentatively reached a different conclusion: that Çatalhöyük, though it may have harbored as many as 10,000 people, was not a "city" at all but a decentralized community of extended families, with very little division of labor and only limited agriculture. The occupants still heavily relied on hunting and gathering.

Excavations by a University of Istanbul team at another site, a smaller village in Central Anatolia that appears to be about 1,000 years older than Çatalhöyük, have produced even stronger evidence against the idea of a single Neolithic Revolution, Balter notes. This settlement, home to several hundred people at its height, "has a more complex arrangement of buildings than Çatalhöyük. A large collection of mud-brick houses is partly surrounded by a stone wall, and [there is] a

large cluster of public buildings that may have been a temple complex, as well as a pebbled street running through the settlement." The houses and the street are arranged exactly the same way in 10 successive layers of occupation, yet most of the vegetative remains and all of the animal remains were wild. In short, the occupants of this fairly large and highly stable settlement subsisted mostly on hunting and gathering. That "goes against every paradigm we have ever had," Guillermo Algaze of the University of California, San Diego, points out.

A further assault on the Neolithic Revolution has come from researchers using new techniques involving tiny plant fossils to study early agriculture, Pringle says. Their work has pushed back the dates of both plant domestication and animal husbandry around the world. While some villages in the Near East came into existence before agriculture, settlements in many other regions came thousands of years after crops. Either way, the strong causal link between farming and settled village life that archaeologists have long imagined seems to have snapped.

In Search of Objectivity

"Objective Visions" by Bruce Bower, in *Science News* (Dec. 5, 1998), 1719 N St., N.W., Washington, D.C. 20036.

Objectivity is a fighting word in the current "science wars." Postmodernist sociologists and philosophers claim that it's only a socially constructed idea masking scientists' shared assumptions and self-interested drives for power and prestige. Scientists themselves insist that it is a scientific lodestar. What both sides tend to ignore, maintains *Science News* writer Bower, is the history of objectivity in science.

A drawing from Bernhard Albinus's 1747 Tabulae Sceleti et Muscolorum Corporis Humani. *Albinus felt the elaborate backgrounds gave his engravings a three-dimensional effect.*

In assuming that objectivity has one fixed meaning, many on both sides of the science wars are making a mistake, historians tell him. "Objectivity has had and continues to have different meanings," says Lorraine Daston, director of the Max Planck Institute for the History of Science in Berlin. Among its modern ones: empirical reliability, procedural correctness, emotional detachment, and absolute truth.

The term *objectivity* "did not acquire its current cachet in science until the 19th century," Bower points out. Eighteenth-century scientists relied more on imagination, especially the informed imaginations of acknowledged geniuses such as Dutch anatomist Bernhard Albinus. His 1747 atlas of the human body portrayed not the skeletons he had carefully reassembled but an "improved" depiction based on his insights.

Between about 1830 and 1920,