

he suggested, by monitoring millions of stars with an automated telescope, a battery of computers and an automated software pipeline. A US–Australian team succeeded in detecting the objects by such a technique in 1993.

The emergence of a new generation of graduate students and postdocs who are “born wired to write code” is credited as essential to interpreting the vast data sets of modern astronomy. Astrocoders entertain us with their impressive films of stars falling into black holes, galaxies in collision and the birth and evolution of the Universe. Yet Finkbeiner does not explore the deeper question of how we should move from this information overload to physical understanding. With so many free parameters,

it is debatable how robust these computer models are, what exactly we learn from them and to what extent they are falsifiable.

The availability of vast databases also affects the nature of the research. I fear for the loss of individuality in approaches and for niche projects that would otherwise open up new areas of exploration. Every new survey sparks a rush of comparisons with existing surveys at other wavelengths; this might exponentially boost the literature but it does not benefit our understanding to the same degree. Confirmatory results abound, and networked citations between groups foster a sense of success, irrespective of scientific outcome. As a result, there is huge pressure on individual astronomers to

get involved with big projects or lose out.

Although *A Grand and Bold Thing* is more a celebration of Gunn’s extraordinary career than a definitive account of the Sloan survey, it succeeds in capturing the arcane world of the professional astronomer. To Gunn’s colleague at Princeton, Jerry Ostriker, it is almost a religious undertaking: “People will devote their lives, their time, their wits for things which have no practical importance. And there’s something rather beautiful about that.” ■

Joss Bland-Hawthorn is an ARC Federation Fellow and a professor of astrophysics at the Sydney Institute for Astronomy, School of Physics, University of Sydney, NSW 2006, Australia. e-mail: jbh@physics.usyd.edu.au

Preserving social difference

What Makes Civilization? The Ancient Near East and the Future of the West

by David Wengrow

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Every major war causes us to reflect on the meaning of the word civilization. The mayhem over the past decade in what was once Mesopotamia (now Iraq) is particularly provocative because the region is known as the historical birthplace of civilization. In *What Makes Civilization?*, archaeologist David Wengrow takes a 5,000-year perspective, comparing the first thousand years of the Mesopotamian and Egyptian civilizations to draw unsettling lessons about recent events.

The early glories of civilization developed in the third millennium BC (3000–2000 BC) in the ‘Fertile Crescent’ of the Middle East and beside the River Nile: city states such as Uruk and Ur in Mesopotamia, the pyramids at Giza and the development of sophisticated writing systems in cuneiform and hieroglyphics. Isaac Newton wrote in his *Chronology of Ancient Kingdoms Amended* (published posthumously in 1728) that ancient Mesopotamia and Egypt provided Europe with the earliest glimmers of the Enlightenment — farming, literacy, astronomy and navigation — as well as a darker heritage of sacred kingship and the dynastic cult of the dead.

Archaeologists have always debated the importance of borrowing and diffusion of ideas versus that of independent invention and national identity. There is a current fashion for exploring the interconnectedness of ancient civilizations, yet most archaeologists continue

to focus on single regions. They agree with the striking insight of French sociologist and anthropologist Marcel Mauss, who wrote in his 1920 essay ‘The Nation’, after the First World War: “Societies live by borrowing from each other, but they define themselves rather by the refusal of borrowing than by its acceptance.”

Mesopotamia and Egypt, despite their geographical proximity and similar locations in the flood plains of great rivers, provide a fascinating example of Mauss’s observation. For all the impressive scale and sophistication of these two early civilizations, they developed in very different ways. Egyptian pyramid building and

the mortuary cult of the pharaoh — with its mummies, lavishly painted tombs and ‘books of the dead’ — have no obvious equivalent in Mesopotamia. Writing was invented in the two regions at about the same time — in Mesopotamia as cuneiform around 3300 BC, and in Egypt as hieroglyphics in about 3200 BC — yet the two scripts look entirely different and seem to have arisen independently.

Astonishingly, there is no written evidence that ancient Mesopotamia and Egypt were directly aware of each other during their first 1,000 years of existence. However, both civilizations undoubtedly traded with areas farther afield well before the third millennium. For example, precious lapis lazuli, which must have come overland and by sea from its nearest source in mountainous Afghanistan, is found in Egyptian burials dating back to the fourth millennium BC.

These differences lend support to the separatist argument of Mauss, rather than to the idea of the growth of civilization as a universal and multicultural phenomenon. Although *What Makes Civilization?* does not deny the importance of mixtures and borrowings, it convincingly concludes that the parallel development of Mesopotamia and Egypt demonstrates “the deep attachment of human societies to the concepts they live by, and the inequalities they are prepared to endure in order to preserve those guiding principles”. This finding does not bode well for the current wars in Iraq and Afghanistan. ■

Andrew Robinson is a visiting fellow of Wolfson College, University of Cambridge, Cambridge CB3 9BB, UK. He is writing a biography of the French philologist Jean-François Champollion. e-mail: ar471@cam.ac.uk



Early Mesopotamian culture had little overlap with that of ancient Egypt, despite their proximity.