Astrobiology and “big history” are two relatively new intellectual disciplines, the former focused on searching for life elsewhere in the universe and the latter on integrating human history into the wider history of the cosmos (e.g. Christian 2004, 2018, Spier 2010). Despite some differences in emphasis, these two disciplines have much in common, not least their interdisciplinarity and the cosmic and evolutionary perspectives that they both engender. In order to explore these relationships, and to investigate their wider societal implications, a one-day meeting on the theme of “Expanding Worldviews: Astrobiology, Big History, and the Social and Intellectual Benefits of the Cosmic Perspective” was held on 19 July 2018 under the auspices of the Humanities Research Centre at the Australian National University (ANU).

David Christian (Macquarie University, Australia) got the meeting underway with his talk on “The challenges of extreme interdisciplinarity: building a modern origin story.” He is one of the founders of big history and was the first to coin the term in the early 1990s. Taking his cue from Erwin Schrödinger, who famously left his own comfort zone of theoretical physics to make highly productive speculations on the origin of life (Schrödinger 1944), Christian stressed the many intellectual benefits of interdisciplinary research and the unifying perspectives that can result. In particular, he noted that all human societies have felt the need of “origin stories” to orientate themselves in time and space. Summarizing the argument developed in his recent book (Christian 2018), he showed that it is now possible to provide a scientifically accurate origin story for the 21st century by integrating results from astronomy, geology, biochemistry, evolutionary biology, anthropology, history and other academic disciplines traditionally considered to be separate. It is the aim of big history to provide just such a unified view of cosmic and human history. The resulting unified perspective would help unite disparate scientific disciplines and thereby stimulate new scientific insights; it may also help heal the rift between the sciences and humanities identified by the scientist and novelist CP Snow (1959). Moreover, Christian argued that such a perspective may be necessary if humanity is to find unified responses to urgent global challenges, not least those associated with human dominance of the Earth’s environment in the Anthropocene epoch. Realizing these benefits, however, will require specialists in different fields to follow Schrödinger’s example and be prepared to work across disciplines. As he put it during his talk: “It’s worth taking the risk of interdisciplinary research because the payoff could be colossal.” During the ensuing discussion, Christian also drew attention to the deleterious consequences of teaching narrow national histories in schools, serving to reinforce nationalism, and argued that teaching world history, and indeed big history, could help counter nationalistic trends.

Evolution and ethics
The second talk was given by Marnie Hughes-Warrington (ANU) on “Does big history imply the need to rescale ethics?” She began by explaining that, as a historian, the opportunity to study the
appearance of a new field like big history is of interest in itself. However, she pointed out that big history actually forms part of a long tradition of universal histories dating back to the ancient world; she drew particular attention to Diodorus Siculus’s Library of History, which dates from the first century BCE. Hughes-Warrington pointed out that this type of history fell out of favour in the 19th century, but that it is now making a comeback in the form of big history. She then noted that there is no standard scale for histories, and that this arises from the interest of historians in describing how the world ought to be, and not just how it has been. As big historians have expanded both the range of phenomena described and the disciplines that might contribute to the description of those phenomena, an opportunity to rescale ethics has opened up. Christian used the example of the Nazca lines to highlight how we might have two scale views of the same phenomena: we can see rocks on the ground, and we can see a picture from space. So, too, different histories can highlight whether the actions of humans towards one another are good, fair or right, or whether the rise of cyanobacteria should be seen as an evolutionary leap forward or an “oxygen holocaust” (Margulis & Sagan 1997), or whether the big history description of humans as “planetary managers” suggests responsibility for environmental change. These various views of phenomena may be different in degree or kind, and that might suggest ethical scales that are also different in degree and kind. Hughes-Warrington suggested that metaphysical analysis would seem to indicate that they were differences in degree, and that the scales of ethics implied in big histories might be extensions of existing ethical theories, rather than entirely new ones.

Elise Bohan (Macquarie University) concluded the first session, dedicated specifically to big history, with her talk on “Why big history matters”. She argued that big history does a tremendous job of orienting modern humans existentially and tribally, at a time when national and traditional narratives are increasingly being challenged and rewritten. In a globalized world, she argued that big history shows us that family and community are still as important as ever, but that our tribe is actually much bigger than we used to imagine. For these reasons, and based on her own experience teaching big history to university students, Bohan concluded that the big history story has significant power to change the world for the better.

Fake universes

After the coffee break, the discussion moved towards more theoretical considerations. Paul Davies (Arizona State University, USA) asked the intriguing question “Is the universe a fake?” He began by noting that the question of “truth” bedevils all studies of history, including big history – is what we believe to be historical fact really an accurate description, or just a mass of competing narratives and interpretations? This uncertainty is greatly magnified if, following Descartes, we allow for the possibility that what we think of as reality might itself be an illusion.

Davies noted that some computer scientists claim to be on the verge of simulating consciousness, raising the possibility that we might ourselves soon be able to create simulated realities for simulated consciousnesses. How can we be sure that the same isn’t being done to us (e.g. Bostrom 2003)? As “fake” universes are presumably easier to create than “real” ones, any given observer is more likely to exist in one of the former, and the advent of quantum computing is only likely to make the generation of simulated realities easier. Moreover, many scientists now favour some version of the so-called multiverse theory, which posits a vast number of parallel universes having different physical laws. This may account for why our universe is apparently fine-tuned for life because, by definition, life could only arise in that subset of universes where the physical laws permit it (e.g. Davies 2006). However, if multiple universes exist then it seems inevitable that simulated universes will have been created somewhere, so the problem of distinguishing real from simulated universes remains.
Davies argued that the only way to tell
whether we live in a real or a fake universe
would be to observe apparent inconsistenci-

cies in Nature owing to an imperfect simu-
lation – e.g. “can we observe the scenery
wobbling?” He then noted that the technol-
ogy required for the simulation of reality
might also explain the lack of evidence for
intelligent life elsewhere in our universe,
summarized in the Fermi paradox: any
sufficiently advanced life may prefer to
retreat into post-biological existences in
simulated worlds. However, Davies con-
cluded with a warning from a big historical perspective: societies have tended to think
about the universe in terms of the domi-
ant technology of their time, successively
as a musical instrument, a clockwork
mechanism, a giant steam engine and now
a sophisticated computer simulation. As

technology moves on, our current fascina-
tion with computationally created realities
may come to seem naïve.

**Entropy as hero**

Davies was followed by Charley
Lineweaver (ANU) who spoke on “Use-
ful lies and cosmic perspectives.” In this
wide-ranging talk, he made the important
point that brains (like livers and lungs)
are organs that have been selected to keep
us alive and reproduce. Brains have been
selected to support useful cosmic perspec-
tives, not necessarily truthful ones. If true
ideas are useful, selection will favour
brains that harbour them. If false ideas
are useful, brains that harbour them will also
be selected for. In this Darwinian view, our
cosmic perspectives answering such ques-
tions as “who are we?” and “what is our
place in the universe?” should be useful,
but not necessarily truthful.

Fortunately, there is an overlap between
“useful” and “true” perspectives, and
the scientific method falls within this
category. Lineweaver quoted EO Wilson
(2013): “The scientific method has been
consistently better than religious beliefs
in explaining the origin and meaning of
humanity,” but challenged the view that
science is a search for truth. He suggested
rather that science, like any worldview,
is constrained by the need to be useful.
Lineweaver argued that some commonly
held aspects of the scientific worldview,
such as imagined trends towards increas-
ing complexity and suggestions that the
human brain is the most complicated
structure in the universe, are not supported
by objective assessments of the data.

Moreover, contrary to some popular
representations of big history, Lineweaver
argued that if we have to anthropomor-
phize the increase of entropy, it should be as
“hero”, not “villain”, because all life forms
and all far-from-equilibrium dissipative
structures have been produced to increase
entropy production. He proposed a para-
digm shift from “We eat food?” to “Food
has produced us to eat it”. Following these
theoretical observations, Lineweaver drew
attention to some negative consequences
of human tribalism, for example the recent
controversies regarding dual nationality in
the Australian parliament, and pointed out
that cultural diversity should be celebrated,
not denigrated. A big historical perspective
would promote, not stigmatize, dual citizenship in
governments.

After lunch, Naomi
McClure-Griffiths (ANU) spoke on “The cosmic
perspective of a galactic astronaut”,
providing an astronomical overview of our
location in the universe. She pointed out
that for centuries humans have struggled
to reconcile the Moon, stars and planets as
external to the Earth, and that this grow-
ing realization pushed the human-centric
worldview into a new realm where we had
to accept that we are not the centre of
the universe. The past century has shaken
our worldview even more. Not only have we
realized that our Milky Way galaxy is
one of many, but that our place within the
Milky Way is not special either. One might
even go so far as to describe our location as
boring: a bog-standard star in the suburban
wastelands of a bog-standard galaxy. Per-
haps even more significantly, the discovery
within the last 20 years that planets are
common companions of stars has shown us
that even planet Earth may not be special
in a cosmic context. All this has resulted in
a “lost sense of specialness” for humanity.
However, while on one level this might tend
to make us despondent, McClure-Griffiths
argued that there is a deeper ethical, or
even practical, implication: the universe is
so large, and we are such tiny components
of it, that the only things that really matter
are our interactions with each other. It will
not matter to the universe if we destroy
ourselves, or even if we render the Earth
uninhabitable, but it matters to us, and this
perspective may help guide our actions.

**The truth is not enough**

McClure-Griffiths was followed by Mark
Lupisella (The Horizons Project, http://
horizonsproject.org) who asked “Is the
universe enough? Can it suffice as a basis
for satisfactory worldviews?” He argued
that worldviews are important because
they drive how people believe, think
and act, but also that they can be dangerously
misguided. Modern science can inform
more truthful worldviews, but although
the scientific perspective is unique and
compelling, we need to recognize that it
may not be enough for everyone. Contem-
plating the modern scientific universe can
be humbling and awe-inspiring, even moti-
ivating, but it can also be unsettling and
uncertain, even scary. The extent to which
the universe we know today can form the
basis of satisfying worldviews rests in large
part on human psychology, preferences
and needs. Many of these human predisposi-
tions may have deep evolutionary roots
that we need to be aware of. For example,
a predisposition to believe in a personal
deity may have arisen as a result of natural
selection during human evolution; certain
scientific cosmic perspectives, even if
“true”, may have difficulty in satisfying this
and other important psychological needs,
such as guiding human behaviour, coping
with death, etc. In short, Lupisella argued
that scientifically informed cosmic perspec-
tives might be sufficient “for some people
some of the time, but probably not for most
people most of the time”. Although he
added the caveat that future humans or our
artificial intelligence descendants, as well
as other forms of intelligence that may exist
in the universe, might be more receptive to
“cosmic worldviews”.

Lupisella argued that if we are not satis-
fied with worldviews we have today, then
we should keep working to develop new
ones that could have the potential to be use-
ful and satisfying. One possible direction
might be to explore relationships between
cosmic evolution and cultural evolution.
One attractive aspect of such cosmic-
cultural worldviews is the insight that,
through biological and cultural evolution,
the universe has seemingly “bootstrapped”
itself into the realm of values, meaning and
purpose, even if these did not exist from the
beginning (Lupisella 2009). These ideas are
developed further in a forthcoming book
(Lupisella 2018).

The evolutionary theme was contin-
ued by John Stewart (Free University of
Brussels, Belgium) who discussed “How
the future trajectory of evolution reveals a
meaningful role for humanity”. He argued
that an understanding of the large-scale
evolutionary processes that have formed
humanity, and that will shape our future,
is capable of providing meaning and purpose
for human existence. This follows from the
realization that the evolution of life on Earth
has a trajectory: evolution has moved in the
direction of producing cooperative organi-
izations of increasing scale and evolvability
(Stewart 2000, 2014). Stewart argued that the
benefits of cooperation and evolvability that
have driven this trajectory will continue
to operate into the future on yet larger
scales, and that they favour the emergence of
a cooperative organization on the scale
of the planet that will eventually expand

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**Meeting Report**

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into space. Indeed, he maintained that this trajectory will manifest on any planet on which life emerges, with the resultant planetary organizations linking cooperatively at larger and larger astronomical scales.

Crucially, while this trajectory towards increasing cooperation is initially driven by natural selection, after a certain point it will continue only if it is driven intentionally by a sentient organism such as humanity. Such an organism will face a fundamentally existential choice once it becomes aware of its potential role in advancing the trajectory of evolution: either it commits to intentionally driving the process forward and participating positively in the future evolution of life in the cosmos, or it turns its back on life and continues to squat on the planet on which it arose, satisfying Stone Age desires until its inevitable demise.

**Better together**

Following the tea break, the discussion moved on towards societal and political implications, and to this end Chris Hamer (University of New South Wales, Australia) discussed “The evolution of Earth federation from a cosmic perspective”. The cosmic perspective makes it abundantly clear we are all citizens of the one small planet and that we all face some major global challenges. Some of these, such as climate change and nuclear weapons, may even threaten the future of our civilization. These global problems need global solutions and Hamer argued that a system of democratic global governance, empowered to make binding laws and regulations to deal with these global issues, would be the most sensible way to deal with these problems. World federation would be one possible solution and he reviewed some of the history of world federalist concepts (Hamer 1998, see also Leinen & Bummel 2018). Hamer noted that, historically, the concept of world federalism has often gone hand-in-hand with cosmic and big historical worldviews. For example, HG Wells, plausibly “the godfather of big history”, was also a leading proponent of world government, observing in his *Outline of History* that “there can be little question that the attainment of a federation of all humanity … would mean such a release and increase of human energy as to open a new phase in human history” (Wells 1920). The same connection has also been made in fiction: in the popular science fiction series *Star Trek*, for example, world federation occurs in the 22nd century, before being extended to other planetary civilizations, possibly prefiguring the increasing scale of societal evolution predicted by Stewart.

Despite the anticipated benefits, realizing world federation will of course be very difficult from the point of view of practical politics and, after reviewing some options, Hamer argued that Europe has shown the way, with the stage-by-stage evolution of the European Union, and has developed the basic principles upon which an Earth Federation could be based. He suggested, following Clarence Streit (1939), that the next most practical step would be a world security community of democratic nations.

The final talk was given by Ian Crawford (Birkbeck College/ANU) who attempted to connect a number of strands with his talk on “Widening perspectives: the intellectual and social benefits of astrobiology, big history, and the exploration of space”. He began by making the link between big history and the still relatively new discipline of astrobiology. Astrobiology is usually defined as the study of the origin, evolution, distribution and future of life in the universe. As such it is inherently interdisciplinary and cannot help but engender a worldview infused by cosmic and evolutionary perspectives similar to those implicit in big history. Crawford demonstrated this link through a personal anecdote: a large part of the astrobiology module that he teaches at Birkbeck College is based on an earlier course entitled “Cosmic perspectives for world history” that he devised for the City University’s extramural programme in 1994. In agreement with other speakers, Crawford argued that big history and astrobiology are both acting to widen human perspectives in beneficial directions (see Crawford 2018). These include stimulating the (partial) reintegration of scientific disciplines after a period of extreme specialization, breaking down some of the barriers between the sciences and the humanities identified by Snow (1959), and enhancing public awareness of cosmic and evolutionary perspectives which comprise a strong, if implicit, argument for the political unification of humanity. He agreed with Hamer that a world federation would be an appropriate political means of implementing the latter. Crawford concluded by noting that astrobiology and big history are also concerned with the future of humanity, and he argued that space exploration will enable a richer future than will be attainable if humanity remains Earth-bound. In addition to the scientific benefits of space exploration (including a central role for astrobiology), he argued that two important societal benefits will also follow: (i) a visceral reinforcing of the cosmic perspective that astrobiology and big history can only provide intellectually (see also White 2014); and (ii) a vast expansion of the horizons of human experience and correspondingly increased exposure to a wide range of intellectual and cultural stimuli not otherwise attainable (e.g. Crawford 2014).

Overall, the meeting successfully demonstrated the interconnections between the eclectic set of topics discussed and, albeit in a small way, was helpful in forging links between disparate disciplines as advocated by Snow (1959). From the perspective of the hard sciences, here represented by astronomy, astrobiology and cosmology, perhaps the major take-home message was that these sciences, working with the humanities, have the potential to yield significant societal benefits by informing cosmopolitan worldviews among the global public. Based on this experience, the organization of similar interdisciplinary meetings in the future would be desirable.

**REFERENCES**

Bostrom N 2003 *Philosophical Quarterly* 53 243


Crawford IA 2014 *J. Brit. Interplanetary Soc.* 67 253

Crawford IA 2018 *J. Hist. Astrolab. 17* 52


Lineweaver CH & Chopra A 2012 *Ann. Rev. Earth Planet. Sci.* 40 597


Lupisella ML 2018 *Cosmological Theories of Value: Science, Philosophy, and Meaning in Cosmic Evolution* (Springer) in press


Schrödinger E 1944 *What is Life?* (Cambridge University Press, Cambridge)

Snow CP 1959 *The Two Cultures* (Cambridge University Press, Cambridge)

Spier F 2010 *Big History and the Future of Humanity* (Wiley-Blackwell, Hoboken)


Stewart J 2014 *Biosteams* 123 27


Wells HG 1930 *The Outline of History* (George Newnes, London)

White F 2014 *The Overview Effect: Space Exploration and Human Evolution* (Library of Flight, American Institute of Aeronautics and Astronautics, Reston)

Wilson EO 2013 *Letters to a Young Scientist* (Liveright, New York)