



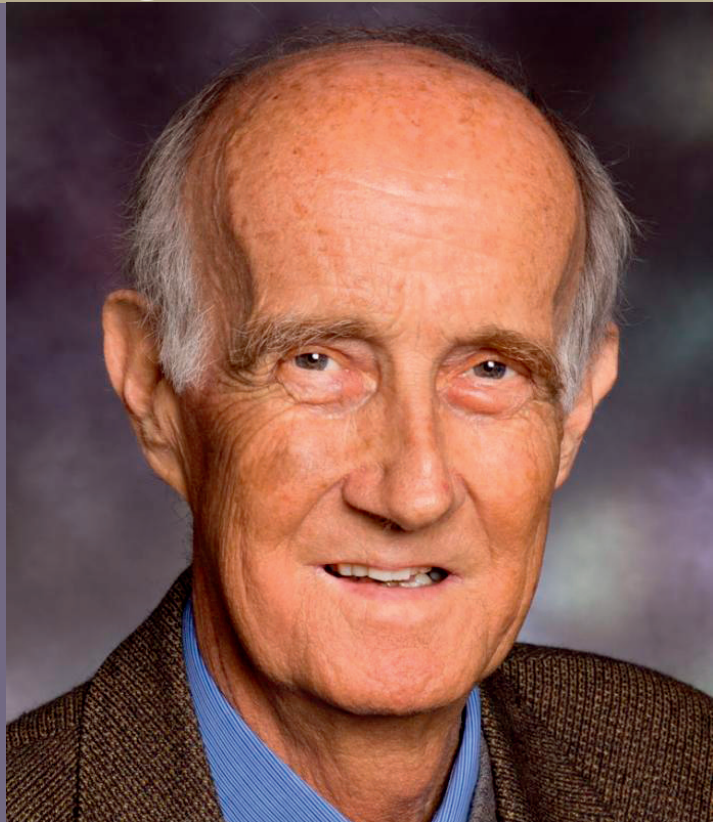
**Anthony J. McMichael**  
1942–2014

BIOGRAPHICAL

*Memiors*

*A Biographical Memoir by*  
*Kirk R. Smith*

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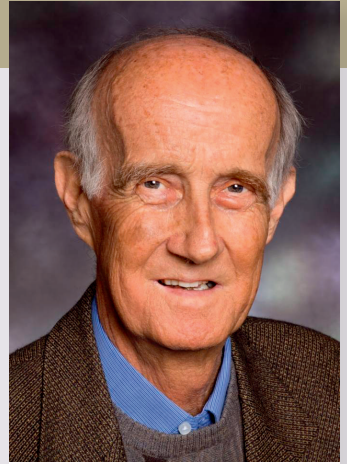
# ANTHONY JOHN M<sup>c</sup>MICHAEL

March 10, 1942–September 25, 2014

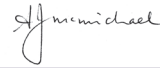
Elected to the NAS, 2011 as a Foreign Associate

One of the great epidemiologists to work across the millennia, Tony McMichael passed away three years ago—too young at 71. There were obituaries at the time in *The Lancet*, *The Guardian*, *The British Medical Journal*, among others.<sup>a</sup> Why then, another one now?

His 2012 inaugural essay after his election to the NAS was entitled “Insights contributed from past millennia into climate impacts of human health and survival” (2). This was a teaser for a book, which was nearly finished at the time of his passing. His widow, Judith Healy, and a senior colleague and former student, Alistair Woodward, and an environmental historian, Cameron Muir, have moved the book into publication just this spring, now entitled *Climate Change and the Health of Nations: Famines, Fevers, and the Fate of Populations* (3). This book is the third of Tony’s trilogy, the first two published in 1993 (4) and 2001 (5), which laid the groundwork for this last and most cogent of his lifetime achievements: What does the history of climate and health tell us about the future?



Photograph courtesy Australian National University



By Kirk R. Smith

Climate scientists often say that the most telling projections of the future impacts of climate change are not the results of modeling, sophisticated and compelling as it is becoming. Rather, it is the increasingly detailed description of what the world was like during previous swings in CO<sup>2</sup>, methane, and temperature – paleoclimate research (6). These are creating even more convincing characterizations of past worlds, ones that show what is happening to our world in the near future, except of course it now coming faster and for different reasons.

a. <https://www.theguardian.com/society/2014/oct/13/tony-mcmichael>; [http://www.thelancetnorway.com/journals/lancet/article/PIIS0140-6736\(14\)61913-9/fulltext](http://www.thelancetnorway.com/journals/lancet/article/PIIS0140-6736(14)61913-9/fulltext); <http://www.bmj.com/bmj/section-pdf/791599?path=/bmj/349/7985/Obituaries.full.pdf>; The inaugural profile for his NAS election was also relatively recent (1).

Tony's book is in this mode – what did past climate variations mean for population health on the planet over history? And what does that mean for us today, i.e., what can we learn about the past to facilitate better interventions to protect and promote population health?

As societies began to form in human history, they evolved in relation to their environments, most notably with the development of agriculture eleven thousand years ago. Indeed, Tony terms agriculture as our “Faustian bargain,” because the prosperity and relative comfort that an agrarian society provides relies on the assumption that the environment will largely remain stable. In order for agriculture to succeed, environmental conditions must not only be right, but remain so. Now, with global warming, the Faustian bill is coming due just as our population has risen to stretch resources and the availability of good farmland is shrinking due to human needs.

Climate-related upheavals are a common thread running through history, and they inevitably lead to conflict and destruction. Tony notes that the four horsemen of the apocalypse owe much to climate change: famine, pestilence, war, and conquest. Indeed, climate disruptions in the past precipitated food shortages, the spread of infectious diseases, and even civilization collapse.

Tony divides past impacts into those with long multicentury trends, such as those that led to major changes in the Nile (10,000 BCE) and Maya (9th Century CE) civilizations; those with medium multidecade trends, such as those that may have caused and certainly exacerbated the European Black Death (1330+) and led to the fall of the Ming Dynasty (1644); those with multi-year character such as the Justinian Plague (-540) of Ancient Rome and the impact of the global Post-Tambora volcanic cooling (1816-18); and those with shorter time constants such as the Philadelphia Cholera Epidemic in 1793 and the “Great Drowning” in 1362 when 100,000 were killed by storms in Scandinavia.

The bottom lines:<sup>b</sup>

Long-term climate changes contributed to the decline of civilizations, typically via aridity, food shortage, famine, and unrest.

Medium-term climatic adversity, causing hunger, infectious disease outbreaks, poverty, and unrest, led to political overthrow.

Infectious disease epidemics accompanied or followed short-term and acute episodes of temperature shifts, food shortages, and social disruption.

b. Adapted from his own words in (2).

Societies can build resilience and learn to cope with recurring shorter-term (decadal to multiyear) climatic cycles (e.g., El Niño Southern Oscillation, North Atlantic Oscillation) other than when extreme phases occur.

The combination of drought, famine, and starvation was the major serious adverse climatic impact on health over the past 12,000 years.

Cold periods, more frequent and often occurring more abruptly than warm periods, caused more apparent stress to health, survival, and social stability than did warming.

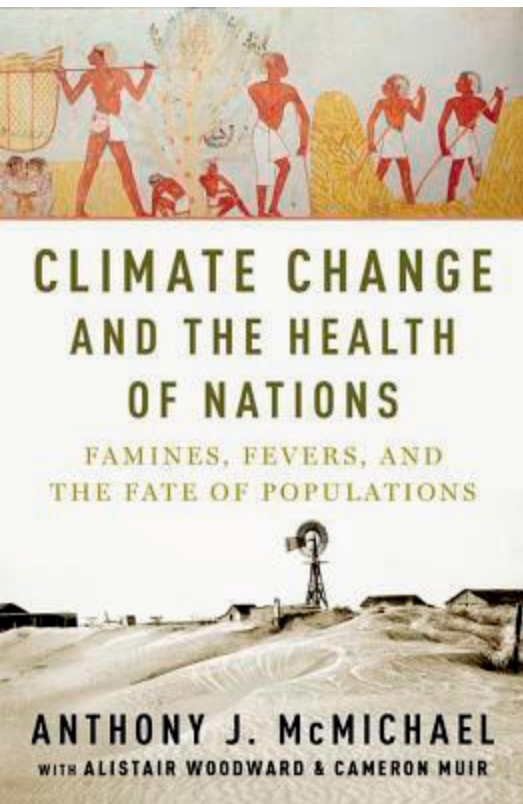
Historical experience shows that temperature changes of 1 to 2 °C (whether up or, more frequently, down) can impair food yields and influence infectious disease risks.

Hence, the health risks in a future world forecast to undergo human-induced warming of both unprecedented rapidity and magnitude (perhaps well above 2 °C) are likely to be great.

Individuals and societies can use the increased understanding of a changing climate to develop effective interventions to manage the transition.

The story of human survival in the face of an unpredictable and unstable climate and of the toll that climate change can take are important to understand as we face the realities of a warming planet. Perhaps one of the lessons from the extensive number of historical climate-related events in the book is that it is the degree and speed of climate change that is as much the problem as the shift (7). This may perhaps be partly a function of what our senses can perceive – rapid changes being much more noticeable and measurable than slow trends – and thus perhaps we do not see impacts of trends over longer periods very often, even if there.

The climate scientists tell us, however, that one characteristic of current climate change trends is an increase in climate variability. We will be seeing more ups and downs than characterized the past 100 years when many of the food and other systems on which we depend developed. Based on Tony's historical analyses, these variations are perhaps most dangerous with larger populations, with their limited ability to deploy historic adaptations including migration and the avoidance of building of infrastructure in highly vulnerable locations. Another good reason to stick with "climate change" rather than "global warming" as the primary issue, even if some believe it downplays the problem.



More often than not, climate change gives what could be called an “extra punch” that increases the impact of other forces, such as environmental degradation, inadequate safety nets for the poor, social unrest, and human displacement. What some say, however, is that society has not been static, we have developed new health-protective technologies, a global consciousness, vastly more sophisticated and rapid transport and communication, and substantially better, if still far from ideal, patterns of health across the planet. Thus, the extra punch will be operating on a decreasing field of other forces. Indeed, this is the reason that the WHO’s assessment found a decrease in health impacts in 2050 compared to 2030 in the major impacts it examined—background economic conditions and basic public health investment were considered to rise over the period (8). Thus even if climate change was continuing apace, i.e. the risks examined rose slowly, due to improvements in background health, the burden due to climate change, however, declines in this analysis.

This was a relatively good world being projected over the next decades, one in which economic growth not only proceeds but is reflected in public health and other investments to protect the poor, whose health continues to advance as it has in recent decades. Current policy shifts in the US and elsewhere, however, make one consider seriously, whether like recent stable climates, that a relatively stably growing concern for the poor and associated international collaboration will also continue. If not, then, the conditions for improvement may not exist that will keep at bay the “extra punch” added by climate change. If so, it will be worse than we hope. And perhaps even worse than we fear.

Of course, given current trends in emissions and their control, it seems we may be heading sometime after 2050 into extreme climate regimes, ones beyond current ability to predict or model effects. The health impacts of these may well extend beyond what has

been seen in the historic events described in Tony's book. Indeed, Tony was author of the section (#11.8) on extreme climates in the latest IPCC chapter on health (9), noting that only basic constraints due to physiology and ecology can be reasonably evaluated now for this future period.

We need others to continue where Tony left off, to show clearly what is needed to blunt climate changes in the next decades, including maintaining the global institutions and investment in public health to avoid the big impacts of the past, and to explore more fully where health impacts may be going in the decades beyond.

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