



Science in a changing world

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Science aims not only to describe the universe but also to make predictions, allowing us to react accordingly and improve our quality of life. Over recent decades, scientists have meticulously recorded and described climate patterns and processes worldwide. Predictions regarding climate change in response to anthropogenic factors, such as atmospheric greenhouse-gas emissions, were initially made long ago (*Q J Roy Meteor Soc* 1938; *Nature* 1972; *Science* 1975) and have been continually refined through successive studies and reports from the Intergovernmental Panel on Climate Change. Presented in a plethora of international conferences, these predictions were reasonably close to current observations. However, humanity has largely disregarded these predictions, and as a result, science has not fully served one of its purposes. Thus, the current widespread occurrence of droughts, heat-waves, and intense wildfires should come as no surprise—in fact, it can be argued that these are outcomes that humanity has collectively chosen. Despite some uncertainties, including local-scale processes and societal reactions, the climate will continue to change in the short term.

For different parts of the world and for different branches of the tree of life, scientists have also been predicting the ecological consequences of ignoring those climate predictions. Given that humans have changed the climate, the distribution and structure of biota must also change, and given the rate of change, this implies a loss of biodiversity. Aiming to preserve 20th-century ecosystems within a 21st-century climate is naive. Examples of shifts in ecosystem structure, function, and biodiversity caused by droughts, warming temperatures, and changes in fire regimes are accumulating, and many more shifts are yet to come; indeed, studies of such phenomena are likely to overwhelm ecological research in the coming years. Relentless climate change, together with other anthropogenic impacts such as pollution, land-use change, and non-native invasive species, is shifting the biodiversity baseline to a new normal. Ecological restoration no longer requires looking at the past (reference ecosystems) but rather focusing on sustainability under the predicted future (novel ecosystems and no-analog communities).

Self-interest and social inertia across the entire human population, along with purposeful misinformation by major social actors like fossil-fuel companies (*Science* 2023), have led to the so-called “tragedy of the commons” prevailing over scientific evidence. Improving our predictive ability (one of the objectives of science) does not seem to be a priority anymore as it is not a limiting factor. Ecologists continue to monitor the changes (for example, scientists as “insectometers”; *P Natl Acad Sci USA* 2021). In so doing, we certainly learn about how the biosphere and biodiversity are functioning, but we are witnessing a vanishing world that has—up to now—accommodated humanity quite well. This scenario is reminiscent of the case of Leoncio Badia (the undertaker of Paterna, Valencia, Spain, between 1939 and 1945) who witnessed the brutal reality of the executions of his colleagues by the Franco dictatorship and secretly buried the bodies with care, meticulously recording all details and labeling them so they could be recognized in the future (which indeed has happened). Similarly, scientists today are witnessing the natural world disappear and are quietly and carefully documenting the details for the benefit of future generations, with the feeling that this process is unstoppable given its strength (the Badia effect). This is an odd, and also uncomfortable, sensation for those interested in biodiversity and natural history. Humans may develop technologies to facilitate their continuous adaptation to new climates, but biodiversity is likely to be left behind.

Collective global actions and sustained efforts across all sectors of society are needed to effectively stabilize the climate as soon as possible. It is important to be aware that climate is a common good, one that requires global conservation efforts for the benefit of the coming generations. While pressing for substantial policy changes, it is essential to recognize that collectively we—the people—are numerous. Small changes in our individual and community behavior may seem trivial, but can accumulate and spread through a contagion-like (non-linear) process, ultimately causing an abrupt shift in the current trends. Consequently, the old slogan “think globally, act locally” is more relevant than ever, and so is “think ahead, act now”.