

## Acceptance speech

20 June 2023

### Ellen Thomas, awardee in the Climate Change category (15th edition)

My co-laureate Jim Zachos and I feel deeply honored and highly appreciative that the BBVA Foundation has awarded our research, focused on events that happened 56 million years ago, in the category Climate Change, implying relevance to today's world.

For most of my career I thought that the study of microscopic fossils of organisms called foraminifera, which live in the largest but least known habitat on Earth, the deep-sea floor, was fascinating, but without any practical relevance to society, even when collaborating with colleagues such as my co-laureate in analyzing minuscule shells to derive information on the environment where they grew, such as temperature or pH or oxygen levels.

I was wrong, very wrong. Insights gained from studying these now lost worlds of the past add materially to understanding our present and future world, with its complex cycles involving lifeforms that are interacting biologically and chemically in a world that is warming due to greenhouse gas emissions. Climate models extrapolate from the recent past into the near future, but data on long-past worlds – collected by many colleagues globally – document actual integrated examples of what happened on Earth during past greenhouse warming, enabling us to see what our future could look like, more than a few decades in the future, extending into evolutionary timescales. These records show that problems for humanity – caused by fossil fuel burning – include not just “warming,” but a multitude of direct and indirect environmental consequences of greenhouse gas emission.

We humans have been emitting these gases at scales and rates that lead to ocean acidification as well as warming; such warming leads to increased activity of the hydrological cycle, droughts and floods. Polar regions warm most, and, combined with changing intensity and patterns of precipitation, polar amplification can lead to changing ocean circulation at surface and at

depth, triggering and directing poleward migration of countless organisms at different rates, affecting ecological interactions and ocean productivity, with feedbacks to climate.

It is here in Basque Country that we see the best geological sections anywhere in the world providing evidence of global warming 56 million years ago. Then, there was a 1000m deep ocean where now the beach is at Zumaia, ~75 km East of where we are. Continuing east for another 400 km to the Tremp-Graus Basin in the southern Pyrenees, these deep waters graded into shallower seas, then onto land. There, colleagues from the University of the Basque Country were the first to document a dramatic increase in the seasonality of rainfall, with autumn rainstorms and severe floods, causing erosion and landslides. At Zumaia, nominator Laia Alegret documented deep-sea extinctions, while yet others documented a decline in coralgal reefs in the shallow seas at Tremp. Here, we can compare past, present and future.

Recognition of past episodes of rapid warming due to greenhouse gas emission could lead to the question: Why worry about global warming, if Earth has cycled through climate changes from much warmer to much colder than today, over millions to billions of years of its existence? This question is not well considered. Research of past warming serves to show a global whole of consequences of greenhouse gas emissions – warming, changing precipitation patterns, changing ecosystems, extinctions, sea level rise. Climate change is no problem for Earth. There is too much hybris in saying that we must “save the Earth” – Earth will be just fine, as it has been over hundreds of millions of years, but we, people, will not be fine. It is our houses and roads and railways, our cities close to the sea, as in my native Netherlands, our patterns of agriculture that will not be sustainable.

So I will conclude by thanking you once more for this award, and saying that I can only hope that we truly learn from looking at microscopic fossils from the deep oceans, so that we learn not to save the Earth, which we cannot do, but to save ourselves.