57. Climate change: from research to communication

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Over the last ten years, I have probably dedicated more time to science communication than to scientific research, with a presence in various media – radio, TV, newspapers, magazines – and frequent conferences for the general public or in more specialized circles including education. I have been involved in the writing of popular books dealing with both past and future climate scenarios and of numerous – currently one per month or so – forewords of books published by colleagues, or simply dealing, in some way, with climate issues. I have inspired characters of comics and of drama. More importantly, I have had opportunities to regularly exchange and interact with policy-makers, parliamentarians, ministers (environment, research) and successive presidents of my country. And since 2010, I have been a member of the Economic, Social and Environmental Council (CESE), a constitutional consultative assembly in France.

One quote I'm proud of is the citation used by the committee of the Vetlesen Prize – considered to be the earth sciences' equivalent of a Nobel – which I received in 2012 along with Susan Solomon, an American atmospheric chemist. This committee pointed out that “[i]n the longest climate reconstruction yet from ice cores, Jouzel in a 2007 study in the journal *Science* charted temperatures in Antarctica for the last 800 000 years, over eight consecutive ice ages”,¹ and added: “He has also been a leader in bringing human-caused climate change to the public's attention”.

After obtaining a degree in chemistry in 1968, I started my PhD, the aim of which was to derive information about the growth of large hailstones from the internal distribution of water isotopes,² HDO (deuterium), H₂¹⁸O (oxygen 18) and HTO (tritium). Then, I had no idea that I would one day become a specialist in major climatic shifts based on analysis of Antarctic and Greenland ice, nor that I would help raise public awareness of the potential impact of human activity on changes in the Earth's climate. Indeed, I have been lucky that Claude Lorius, a French glaciologist, was regularly visiting the laboratory bringing snow samples from Antarctica for isotopic analysis. The research I was carrying out on hailstones appeared useful for snow studies: in both

cases, the stable isotopic composition (deuterium or oxygen 18) is governed by the temperature of formation either of the ice layers in hailstones or of the snow in polar regions. For this reason, Claude Lorius encouraged me to also work on Antarctic snow, and rapidly on Antarctic ice. Under his mentorship and in strong collaboration with his Grenoble team, my research became, starting in the 1970s, largely dedicated to reconstructing past climate changes from ice cores using their isotopic composition as a paleothermometer.

In 1975, Lorius took the lead on a successful project to carry out deep drilling at the Antarctic site of Dome C³ and, thanks to personal contacts, began in the 1980s a collaboration among French and Soviet teams to study the ice extracted by Soviet drillers at Vostok, another site in the heart of the Antarctic continent. Not only, and for the first time, was an ice core covering a full glacial-interglacial cycle back to 160 000 years ago, but Grenoble colleagues Dominique Raynaud, Jean-Marc Barnola and Jérôme Chappellaz, were also then able to reveal the composition of the atmosphere through an analysis of the tiny bubbles of air trapped in the ice.⁴ This enabled us to establish a firm link between the temperature⁵ and the concentration of greenhouse gases (carbon dioxide and methane) over this last glacial-interglacial cycle⁶ and to show that their current concentration was never encountered over this entire period. This led to a series of historic publications in the journal *Nature* with, in 1987, three articles that guaranteed a very large promotion of the Vostok drilling, the results of which were called a “cornucopia”.⁷

The Vostok project gave me one of the first opportunities to have contact with the media – in fact, with one of the most famous science writers at that time. I was interviewed in our Saclay laboratory by Walter Sullivan, reporter for *The New York Times*, considered the “dean” of science writers. I was very proud of this interview, which marked the beginning of more than 30 years of interactions with the media.

The Vostok records, extended in the 1990s over the last four ice ages, not only shed light on mechanisms at play during glacial-interglacial changes but also provide information relevant to the future of our climate in response to emissions of greenhouse gases resulting from anthropogenic activities. I became rapidly interested in this issue, which, at that time, was heavily discussed at the international level, leading in 1988 to the launch of the Intergovernmental Panel on Climate Change (IPCC). I should add that, in the early 1980s, my interest in future climate change benefited from a one-year stay at the NASA Goddard Institute in New York and interactions with two prominent scientists already deeply concerned by this issue: Jim Hansen, head of this institute and best known for his 1988 congressional testimony, and Wally Broecker, who, in 1975, was the first scientist to coin the term “global warming”.⁸

In the early 1990s, I was involved, including in field work, in a European project aiming to drill an ice core in Central Greenland. The isotopic data measured on this ice⁹ and along a second core drilled by a US team 30 km apart¹⁰ further increased concerns about the future of our climate. The stability of the current climate, which has prevailed for around 10 000 years, appeared to be unusual. In this region, the last glacial period and the following transition are characterized by a series of rapid climate changes with large warmings, up to 15°C, occurring in a few decades or less. Such events are possibly linked with changes in oceanic circulation, an explanation popularized, in a too simplistic way, by modifications in the course of the Gulf Stream. This decadal time scale is relevant to future climate change, which somewhat questions the stability of our climate in a warming world, giving rise to the notion of climatic “surprises”, as quoted in the 1995 IPCC report.¹¹

Once the Greenland projects were completed, I was often solicited by the media to explain why and how these results are relevant to our future, all the more because I was a lead author of this IPCC report, selected thanks to my knowledge of past climate changes. This participation reinforced my awareness for what is central in IPCC – namely, the evolution of our climate during this century and beyond. I was also involved in the third report, again as lead author, and in the two following ones as bureau member, vice-chair of the scientific working group. As a consequence, an increasing part of media solicitations was, over all this period, associated with my involvement in the IPCC.

Quite naturally, the questions addressed by the media, initially connected with paleoclimate issues, my field of expertise, evolved towards concerns about anthropogenic climate changes, their causes and consequences and the way forward to mitigate and adapt to these changes. In turn, I have attracted media attention and acquired credibility on climate issues at large, largely thanks to the quality of the French team contributions to ice core science as fully recognized at the national level by the Gold Medal, the most prestigious scientific award in France, that we received, both Claude Lorius and myself, in 2002.

It is around that time that I started to communicate to the political world. This was not at all my decision but came from solicitations motivated by the visibility acquired thanks to my presence in the media and my scientific expertise, but also thanks to this Gold Medal award and later on, to the 2007 Nobel Peace Prize received by Al Gore and the IPCC. But I recognize that I was interested in such interactions while continuing to have media attention on scientific issues. Also I’m convinced that, as scientists, it is our role to answer questions that policy-makers are willing to raise; in this context, I am in full agreement with the IPCC’s willingness to address “policy-relevant” questions without being “policy prescriptive”.

It is with this spirit that I have contributed in 2006 to a parliamentary report dealing with the greenhouse effect. My next involvement was the process called “Grenelle de l’Environnement”, aimed at preparing decisions to be taken at the ministerial level. I have, along with Sir Nicholas Stern, an economist, co-chaired the first group dealing with climate change and energy. I have then participated in various committees dealing with adaptation to climate change in 2010 and with the preparation of the law on the energy transition in 2015. I have also had interactions with policy-makers in attending, as a scientific expert and member of the French delegation, all the COP meetings since 2001. At last, as mentioned above, I have been a member of CESE since 2010, where I have contributed as co-rapporteur to advice dealing with energy transition, climate adaptation, the relationship between science and society and climate justice. These various activities, clearly outside my own field of research, have also provided many opportunities to communicate to the general public and interact with the media.

In 2017, I published with Pierre Larroustou, now a member of the French Parliament, a book entitled *Pour éviter un chaos climatique et financier* [To Avoid Climate and Financial Chaos]¹² and, at his initiative, we launched the project of a Climate-Finance Pact with the aim of creating a treaty establishing a union for climate and biodiversity. Such a more political initiative also requires communication and this also holds true for my current involvement as chairman of the support committee of Anne Hidalgo, in view of her re-election as mayor of Paris.

To sum up, I have had over more than 30 years, and still have, the opportunity to communicate to a large variety of audiences with the aim to deliver an apparently simple message – the urgency of combating climate warming – while the climatic system and how it reacts to the increasing greenhouse effect, which is linked to our activities, is awfully complex. To deliver this message, I benefit from being a climate scientist recognized for his contributions to a better understanding of climate mechanisms at play in the past and relevant to our future, such as the role of greenhouse gases and the existence of abrupt climate changes. Still, my focus is generally on the future climate and here I spend time showing and discussing data on temperature, sea-level, extreme events, and so on – well documented and increasingly convincing – and how their evolution well corresponds to projections made by climate modellers in the 1980s, giving confidence for model projections for coming decades and beyond. I don’t hesitate, even if it is not my field of expertise, to discuss the consequences of climate warming and the solutions to mitigate, and to adapt to, this warming. Such communication is largely facilitated by the accessibility of IPCC reports that I amply use in my presentations and I would like to thank all those who contribute to the high quality of these reports.

NOTES

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