

The Glory of Carbon

About: Bernadette Bensaude-Vincent and Sacha Loeve, *Carbone, ses vies, ses œuvres*, Editions du Seuil

by Marc Fontecave

Although carbon dioxide is a greenhouse gas, it is also—like carbon itself—a vital partner for humanity and life. Two philosophers of science have issued a sharp yet elegant reminder.

In this tense era of increasing catastrophism fuelled by fears of the repercussions of climate change—an indisputable though extremely complex phenomenon—and the problem of defining a coherent and effective environmental policy that urgently responds to the planet's numerous environmental challenges, everyone seems to agree that one thing is to blame: carbon dioxide, which is one of the stable forms of a vital chemical element in the universe—carbon—but also and above all a greenhouse gas.

Wrongly Accused

All we need to do, therefore, is get rid of this gas, confine it to the bowels of the earth for it never to be seen again—in short, to “decarbonise” the planet, to use the watchword that now constitutes the main determinant of the energy policy of industrialised nations. This approach is both simplistic and ultimately ineffective, because it clashes with tough economic and social—not to mention scientific and technical—constraints. It also has the disadvantage of reducing carbon to mere carbon dioxide in the collective consciousness, and, in turn, of reducing carbon dioxide—whose concentration in the atmosphere continues to increase through the burning of fossil fuels—to its greenhouse effect responsible for global warming. This simplification prevents us from seeing that carbon has been a vital partner for humanity since the very beginning and in multiple forms, and that, omnipresent in its most everyday environment, it is a key mediator in the relationship between humans and nature, the product

of human breathing and the substrate of natural photosynthesis through an essential biological cycle. Everything is carbonaceous on the planet: first life, then humans, animals, plants, biodiversity—partly thanks to carbon dioxide—and the planet thankfully will never be decarbonised.

An urgent need therefore arose to remind the public, politicians and journalists of these facts, and to invite them to open their eyes to the real world in which they live in order to better deal with the problems that exist in the areas of energy and the environment without limiting themselves to ideological rhetoric and catchphrases on carbon, and, above all, by incorporating into their reflection the scientific truths that researchers have continued to uncover about this chemical element, perhaps more than any other element in the universe. This is what two philosophers of science, Bernadette Bensaude-Vincent and Sacha Loeve, have done recently.

Their book is simply entitled *Carbone* (Carbon). It is interesting to note that it bears the same title as the final chapter of Primo Levi's marvellous book, *The Periodic Table*, to which the authors in fact make reference, and which speaks of photosynthesis and carbon dioxide with infinite tenderness, concluding that if humans were capable of as much, they would solve the problem of world hunger. Published in 1975, Primo Levi's book could not conclude, as we would today, that if humans were capable of as much, they would solve the problem of solar energy storage and the use of CO₂ as a carbon source.

Carbon and Life

The great originality of this book is the angle from which the authors have chosen to describe the polymorphous nature of carbon, its permanent intervention in the achievements of nature and of humans, its industrial successes and environmental failures, its scientific awards and its political and cultural responsibilities. It is not a chemistry book, even if a certain level of chemical knowledge is required to read it. As the authors suggest in the preface, it is a biography, or rather, a curriculum vitae—and not a chronological account—of a chemical element: an entirely new literary genre.

The journey takes us from the recognition of CO₂ as an exchange gas between animals and plants, the true birth of carbon—even though it was not until 1787 that the term “carbon” featured in the Academy's lexicon of new names—up until the most modern forms of carbon that are currently fuelling the new technological revolutions in energy, the environment and healthcare: carbon nanotubes, graphene and fullerenes. It teaches us about the vastly diverse structures which this chemical chameleon can access—diamond, graphite, soot, but especially fossil fuels such as petrol, gas and coal, the waste matter of the living world accumulated over hundreds of millions of years—which are given a new life, since, while a large part of their production is fated to be burned on the spot, another part paves the way for organic chemistry, leading to drugs, synthetic polymers and plastics. Here begins the glory of carbon, the fossil fuel without which there would have been no industrial revolution or liberation of humans from

time and space—the fossil carbon that has shaken civilisations and history. And, despite the advent of renewable energies, carbon will continue, for many years and with an ever-increasing level of consumption, to ensure the development of humanity and our everyday world, particularly in the areas of transport and heating.

The account also reminds us of a basic fact: if life was made possible, indeed, very early on in the history of the Earth, it was thanks to carbon and its unique chemical properties, and more particularly thanks to what probably constituted the only source of carbon available when life began, i.e. carbon dioxide, CO₂, itself derived from carbon born in the stars. It is these properties that explain the possibility of carbon atoms associating with one another and with many other atoms, associations that have, in turn, enabled and still enable the synthesis of the building blocks of life first—amino acids, sugars, nucleic bases—followed by nucleic acids (DNA and RNA, the molecules carrying genetic information), lipids (necessary for cellular compartmentalisation), proteins and enzymes (the actors that transform biological matter). This means that the only possible life is organic and therefore carbonaceous.

Understanding Before Acting

We must thank B. Bensaude-Vincent and S. Loeve for having the courage to speak—at long last, it could be said—about carbon as something other than the demon continually presented in political discourse and the opinion columns of newspapers. Beyond the necessary exoneration, their book will undoubtedly allow its readers to participate more responsibly in developing more coherent energy and environmental policies, in which the absurd goal of radical carbon removal will be replaced with smarter carbon management, for example through energy savings or the recovery of biomass and CO₂.

While democratic choices are imperative, even on issues as complex as energy, it is obviously vital that they be based on a solid knowledge foundation, including in disciplines as difficult as chemistry. By the originality of its approach, the poetry that runs through it and the pedagogy of its authors, *Carbone* makes a successful contribution to the exacting task of informing the public.

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