Blue
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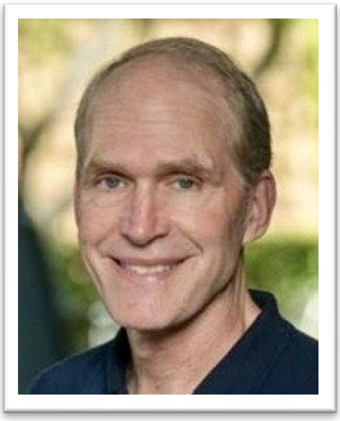
Professor Robert B. Jackson

Interview Summary

THE ASAHI GLASS FOUNDATION

Professor Robert B. Jackson (U.S.A.)



Ecologist / Earth System Scientist

Born: September 26, 1961, London, U.K.

Professor, Department of Earth System Science, Stanford University

＜Early Childhood ~ University＞

Robert Jackson was born in London, England, in September 1961. His father worked as an engineer in the petrochemical industry, specializing in water treatment, and the family was in the UK for his job. When Robert was seven, they relocated to the United States. The middle of three boys, he spent most of his childhood in Houston, Texas. He loved sports—especially baseball. During family trips to Canada and Colorado, he enjoyed outdoor activities such as camping, hiking, and fishing. Because of his father's job, the family moved frequently, and he often found it difficult to say goodbye to his friends. Even so, Professor Jackson looks back on his childhood fondly, grateful for the love and support of his family.

Growing up in the suburbs of Houston and later Chicago—rather than in a major metropolitan center— Jackson experienced a typical American middle-class upbringing. He attended a public high school, where his grades were briefly excellent, and lived what he describes as a "typically prodigal high-school life." His strength in science and mathematics inspired him to consider a career in chemical engineering. With that goal in mind, he enrolled in the Chemical Engineering Department at Rice University in Houston, known for its strong program in the field. He chose Rice partly because it was a relatively small university and because he already had friends nearby.

Photo 1 A young Rob playing baseball

Jackson admits he was not an outstanding student, but he was fortunate to have supportive friends and thoroughly enjoyed his college years.

＜From the Corporate World to Academia＞

In 1983, after graduating from Rice University, Jackson joined one of the world's largest chemical manufacturers, the Dow Chemical Company, and began working as a chemical engineer. His first assignment took him to Los Angeles. Though he recalls genuinely enjoying his work at Dow, around that time, he began to develop a new ambition: to pursue environmental research and eventually become a university professor. To explore this emerging interest, he started taking night classes in botany at California State University, Fullerton. During the week he worked full-time at Dow and attended classes in the evenings, while on weekends, he headed into the mountains, deserts, and coastlines of California for field study. A major influence during this period was Professor Jack Burk, whose enthusiastic and field-based teaching further encouraged Jackson's desire to return to university and study the environment more seriously. In addition to meeting Professor Burk, a piece of sound advice from his father also set Jackson firmly on a path toward being a researcher. One day, Professor Jackson confided in his father that he wanted to quit his job and return to university, but felt anxious because he would be over 30 by the time he graduated. His father answered that he would turn 30 someday anyway, so he might as well be doing something that he loves. Professor Jackson was surprised by his father's unexpected response, but it strongly encouraged him to pursue his new path. After four years of working, he resigned from The Dow Chemical Company and entered the world of academia.

Photo 2 Rob fishing in the Boundary Waters, Canada

＜University Research＞

After leaving his corporate job, Jackson entered the graduate program in ecology at Utah State University to work with Dr. Martyn Caldwell. He believed that ecology offered the essential foundation for environmental science, and that earning a Ph.D. in the field was necessary for the career he hoped to build. He chose Utah State for two main reasons. First, its location provided access to diverse natural environments ideal for ecological research, backpacking, fishing, and skiing. Second, his future wife, Sally, was working as an ornithological researcher and held a fellowship at Yellowstone National Park, and attending Utah State allowed him to live in the same region. His research there laid the groundwork for his emergence as a leading expert in root biology and root ecology—fields that would profoundly shape his academic career. Among the many papers he has published, those in root ecology remain the most frequently cited, underscoring the depth and influence of his work in this area.

After completing his master's degrees in ecology and statistics at Utah State University, Jackson earned his Ph.D. in ecology in 1992. That same year, he received a postdoctoral fellowship from the U.S. Department of Energy, which enabled him to spend two years at Stanford University conducting research on global environmental change. His work focused on experiments in Stanford's biological preserve, where he investigated how rising atmospheric carbon dioxide levels affect grasslands. The research aimed to simulate the future environmental conditions that might result from the continued release of greenhouse gases such as carbon dioxide into the atmosphere. The project was led by Professor Harold Mooney of Stanford University, a distinguished biologist who later received the Blue Planet Prize in 2002. Participating in this experiment proved to be a critical step that ultimately guided Jackson toward the study of climate change and greenhouse gases. Meeting Professor Mooney was another pivotal moment in his career, as Mooney became one of the most influential figures in Jackson's development as a researcher.

Photo 3 Rob journeying to a field site in the Amazon

Upon finishing his two-year fellowship, Jackson became an assistant professor in the Department of Botany at the University of Texas at Austin. In 1999, he moved to the Nicholas School of the Environment at Duke University in North Carolina, where he began conducting experiments, field investigations, and research that would later form the foundation of his current specialties—carbon-cycle research, including methane studies. At Duke, Jackson expanded the scope of his work through multiple research projects. In one collaborative study that examined how changes in atmospheric carbon dioxide affect the growth of a pine forest, he discovered that the trees did not grow as quickly as expected under elevated CO_2 levels— an outcome that contradicted predictions that higher concentrations would stimulate growth. This limited growth was attributed to the trees' inability to absorb sufficient nitrogen and phosphorus from the soil, a surprising finding that highlighted the fundamental role of belowground interactions (with details discussed later).

In another project, he began studying water contamination and greenhouse gas emissions in oil and gas fields, where he measured methane for the first time and reported that methane was sometimes migrating from oil and gas production sites into people's drinking water. As he continued measuring methane concentrations in the environment, he came to recognize that reducing methane emissions is one of the most effective tools that we have to slow climate change.


Photo 4 Rob studying Amazon trees

As his investigations progressed, Jackson broadened his focus beyond natural ecosystems to emphasize the built environment more, from oil and gas fields to cities and homes and buildings. This shift led him to recognize the importance of studying the energy sector as an integral part of environmental science. Today, Jackson continues to pursue both lines of research: long-term studies of natural environments such as Amazon forests, and similarly sustained investigations of human-constructed systems like oil and gas pipelines. His work has consistently served as a bridge between these two worlds.

In 2003, Jackson was promoted from associate professor to full professor. Looking back, he recalls that although his research life at Duke University was busy, he still enjoyed a fulfilling private life. Living in a fairly rural area surrounded by nature—an ideal environment for research—allowed his family to raise pheasants and quail in homemade bird aviaries, keep dairy goats and make cheese, and create a wonderful setting in which to raise their young sons. After about fifteen years at Duke, Jackson moved in 2014 to Stanford University, where he continues his academic career today as a professor in the Department of Earth System Science.

＜On the Carbon Cycle＞

Among Jackson's most influential contributions to climate change research—particularly in the studies of greenhouse gas emissions—is his work on the carbon cycle. This research, which he began during his postdoctoral studies, grew out of extensive investigations into soils and soil health in grasslands and forests. Through these studies, he and his colleagues helped clarify the following mechanism:

Carbon dioxide is a food for plants. Plants absorb CO_2 through tiny pores on their leaves, convert it into sugars through photosynthesis, and use those sugars to grow. As they grow, plants provide us with nutrients, fiber, fuel, and other resources essential to human life. In addition, the billions of tons of carbon dioxide absorbed by plants worldwide are stored not only within plant tissues but also in the soil through their root systems. For many years, scientists believed that this natural, planetary-scale carbon cycle—the largest such cycle on Earth—worked simply: if atmospheric CO_2 increased, plants would absorb more of it, resulting in greater carbon storage in the soil. However, Jackson and his postdoctoral scientist César Terrer uncovered a surprising trade-off: when plant growth accelerates in high CO_2, soil carbon storage often decreases. Why does this happen?

When atmospheric CO_2 levels rise, plant growth typically increases. To support this additional growth, plants must take up more nutrients, minerals, and water from the soil. But the organisms living in the soil also accelerate their growth, leading to greater decomposition of soil organic matter. As these soil microbes take up greater amounts of nitrogen, phosphorus, and other elements, they also break down more organic material—including soil carbon. Consequently, carbon that would ordinarily be stored in the soil is instead released into the atmosphere. As soil carbon declines, the soil's ability to retain water and nutrients diminishes, lowering soil fertility. Over time, this reduced fertility slows plant growth.

Although the relationship between plant growth and soil quality had been explored before, Jackson and his colleagues made a major contribution by documenting this mechanism, using data collected from around the world. Their large-scale synthesis substantially advanced scientific understanding of the carbon cycle.

＜Research on Methane＞

Among Jackson's many areas of research, one to which he has devoted exceptional effort is the measurement and reduction of methane emissions. Methane is a highly potent greenhouse gas—80 to 90 times more powerful than carbon dioxide at warming the Earth over a 20-year period. Jackson warns that atmospheric methane concentrations have been rising sharply since measurements began and at a pace far faster than for CO_2.

He suggests that despite its extraordinary warming potential, methane has long been overlooked in part because a substantial portion of emissions comes from agriculture rather than from energy systems. Its release is closely tied to food production, particularly cows raised for beef and dairy production. Discussions of greenhouse gases and food security are complex, and methane has also received less attention because only recently have people recognized that reducing methane offers the strongest, most effective lever we have for slowing climate change over the next decade or two.

Methane is emitted from natural and human-caused sources. One natural source is volcanic activity, but there is no evidence that today's volcanic eruptions emit more methane than in the past. Another is methane released from thawing permafrost in the Arctic; scientists expect such emissions to increase with global warming have not yet observed signs of runaway emissions from the region. The natural system that concerns Jackson the most today is tropical wetlands, such as those in the Amazon, where he has conducted fieldwork for many years. In tropical regions, methane emissions are already increasing as temperatures rise. The microbes that produce methane grow faster in warmer conditions, releasing more methane into the atmosphere. In this way, the tropics are experiencing increases in so-called "natural" emissions–but these increases are occurring as a result of human-caused warming.

Photo 5 Collecting natural gas from a stove

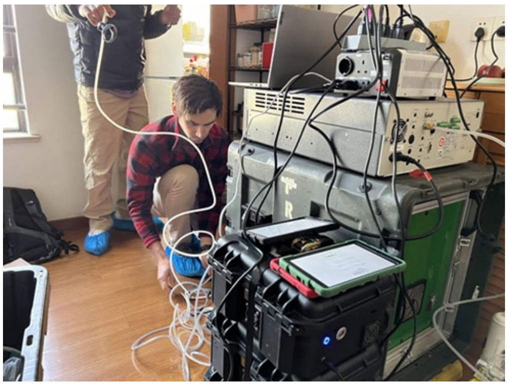


Photo 6 Measuring pollutant emissions in a kitchen in Shanghai

Natural sources account for roughly one-third of global methane emissions. The remaining two-thirds arise from human activities. These anthropogenic emissions include methane released from fossil-fuel use in transportation, extraction of oil and natural gas, emissions from livestock (especially cattle through belching), methane generated by bacteria breaking down organic matter in flooded rice paddies, emissions from landfills and other waste sources, leakage from pipelines that deliver gas to homes and buildings, and leaks from household appliances such as gas stoves, heaters, and water heaters.

About two-thirds of human-caused methane emissions come from agriculture, with the remaining one-third originating from energy-related sources. However, emissions from both sectors continue to rise. Moreover, methane contributes not only to global warming but also to air pollution. When methane is burned indoors, it emits pollutants such as nitrogen oxides (NO_x gases), carcinogenic benzene, and other harmful substances that can impair human health, contributing to asthma and various respiratory diseases. For these reasons, Jackson warns of the dangers associated with burning methane (or “natural gas”) indoors and stresses the need to address it.

Over the past decade, Jackson has developed a strong interest in methane and other greenhouse gas emissions from homes and buildings. He and his colleagues have been investigating pollution caused by household fossil-fuel appliances. Since methane emissions from residential and commercial buildings had rarely been measured before, his group began collecting field data across a variety of locations. Jackson explains that standing next to a gas or propane stove may expose a person to the same pollutants released from a car’s tailpipe. Consequently, the group’s research aims not only to quantify the climate impacts of methane leakage but also to assess its effects on human health. Their findings indicate that the amount of methane leaking from gas stoves alone each year is roughly equivalent to the methane emissions produced by about half a million cars.

Due to methane’s severe impacts on both climate and health, Jackson states that methane reduction offers one of the most promising solutions for mitigating global warming. The key lies in methane’s relatively short atmospheric lifetime—around ten years. If methane emissions can be reduced drastically, atmospheric methane levels would fall quickly, making it possible to lower global average temperatures by as much as 0.5°C within the next decade or two. Methane is the only greenhouse gas capable of slowing global warming so significantly within such a short time frame, a factor which gives Jackson hope for its reduction potential.

＜Atmospheric Restoration＞

One of the areas in which Jackson is currently most deeply engaged is the concept of “atmospheric restoration,” an idea he promotes in his new book Into the Clear Blue Sky (Penguin; Simon & Schuster). He believes that this idea has the potential to resonate with the public. Abstract targets—such as “limiting the global average temperature rise to 1.5° or 2° C above pre-industrial levels”—are difficult for many people to understand or relate to. In contrast, the notion of repairing something that is broken and returning it to a healthy state is intuitive and easier to grasp. For this reason, Jackson argues that this reasoned mindset should be applied to the atmosphere itself. By framing climate action as the restoration of the atmosphere, he hopes to make the challenge of addressing global warming more relatable—and more hopeful—for people around the world.

Jackson argues that methane should be the top priority in atmospheric restoration. The reason is straightforward: reducing methane can deliver rapid and substantial benefits. He outlines three key approaches needed to achieve this:

1. Reduce methane emissions at their sources.
2. Destroy methane before it is released into the atmosphere.
3. Break down methane that is already present in the atmosphere.

In Jackson's laboratory, researchers are working to develop new catalysts capable of oxidizing methane and converting it into carbon dioxide or other gases. Although this technology is still in development, the team is also pursuing strategies to prevent methane from entering the atmosphere in the first place. Their work includes measuring methane leaks from pipelines and household systems, as well as using satellites to identify major methane emitters around the world, thereby helping to curb emissions at their sources. Jackson emphasizes that preventing methane emissions is far more efficient and cost-effective than attempting to destroy methane that is already in the air. His motivation for measuring greenhouse gas emissions and striving to reduce them comes from a strong desire to contribute to solving the climate crisis. One of the goals of his research, he explains, is to help people understand the real and immediate benefits that come from transitioning to clean energy. Jackson says that as an environmental scientist, his dream is to reduce methane emissions enough to restore the atmosphere within his own lifetime.

＜Global Carbon Project (GCP)＞

The Global Carbon Project (GCP) was established in 2001 through the collaboration of several international organizations involved in climate change and biodiversity, with support from the United Nations and related agencies. Since its founding, the project has made major contributions to global efforts—by governments, corporations, institutions, and individuals—to reduce greenhouse gas emissions and lessen humanity's environmental impact. Jackson serves as the Chair of the project. Within the GCP, Jackson and his colleagues measure and track greenhouse gases—including carbon dioxide, methane, and nitrous oxide—around the world. Their work investigates how much of these gases is emitted from natural environments such as oceans, forests, and wetlands and how much originates from human activities, including transportation and electricity generation. By tracking and analyzing these emissions, the project seeks a comprehensive understanding of the Earth's overall situation and to identify key emission sources and effective strategies for reducing them.

The GCP's efforts have not only brought global attention to greenhouse gases beyond carbon dioxide; the data and analyses produced through the project have also been widely used in major international frameworks and reports, including the Paris Agreement under the UN Framework Convention on Climate Change (UNFCCC), and the IPCC Assessment Reports.

Photo 7 The steering committee of the Global Carbon Project some years ago

＜Future Research Areas＞

Over the past decade or so, much of Jackson's research has focused on measuring and mitigating greenhouse gas emissions in the built environment—such as methane leaks during oil and gas extraction, methane released when fossil fuels are used, and emissions occurring in urban settings. Looking ahead, Jackson intends to expand his research in natural environments. Building on his ongoing work measuring methane emissions in the Amazon, he plans to extend these measurements to other regions of South America, Africa, and beyond. He is also beginning new studies on biodiversity and soil diversity in old-growth forests in Europe and North America. By examining symbiotic fungi—mycorrhizae—that coexist with roots in the soil, this research may help identify ways to accelerate forest restoration around the world. Pursuing ecological research in natural settings alongside his work in the built environments continues to fuel Jackson's intellectual curiosity.

Another project that Jackson has recently begun focuses on anticipating the future. Specifically, he is working to understand what might occur as society transitions to a hydrogen-based energy system, in which hydrogen is expected to become a major source of clean energy. When burned as a fuel, hydrogen generates only water vapor. With postdoctoral scientist Zutao Ouyang, Jackson just led the first Global Hydrogen Budget for the Global Carbon Project published in December of 2025.

Hydrogen itself is not a greenhouse gas. However, it has the chemical property of depleting atmospheric substances that help remove methane and other greenhouse gases. If large quantities of hydrogen were to leak into the atmosphere, methane would remain in the air far longer. In other words, hydrogen leakage could indirectly intensify global warming by reducing the "detergents" that cleanse our air. For this reason, Jackson is working—from this early stage, before the world fully transitions to a hydrogen economy—to understand the environmental impacts of hydrogen. His goal is to ensure that future shifts toward clean energy genuinely benefit the planet.

＜Guiding Principles of an Environmental Scientist＞

Although reducing greenhouse gas emissions requires substantial investment, a major challenge in addressing climate change is that humanity continues to extract increasing amounts of energy, resources, land, and other materials from the Earth—while also increasing pollution. Excessive consumption, Jackson says, is the core problem underlying climate change, biodiversity loss, plastic pollution, and many other environmental crises. People in poorer countries are the ones who bear the greatest costs of our excessive consumption and resource use. For this reason, he argues that meaningful climate action is impossible without the cooperation of businesses, industries, and governments. Unless companies and nations actively participate, we will not be able to solve the climate crisis. He also emphasizes that addressing this imbalance requires reducing our use of resources, sharing them more equitably around the world, and avoiding excessive exploitation.

In a world facing such profound challenges, Jackson stresses that what matters most in scientific inquiry is not conducting research to obtain the answers one wants, but conducting research to discover the answers as they truly are—and doing so in an open and repeatable manner. He adds that scientists have a responsibility to provide high-quality information that enables governments, research institutions, and companies to make better, more informed decisions. This, he says, is the foundation of scientific credibility and the core principle that guides him as a scientist.

Photo 8 Rob filming a gas leak in an oil field
(Photo Credit: Phil Roberge, Stanford University)

＜Family and Hobby＞

Jackson lives with his wife and three sons—a family of five. He met his wife, Sally, through mutual friends at Rice University, and they married a few years after he began working for the Dow Chemical Company in California. Sally, now active as a ceramic artist, describes her husband as a dedicated, self-driven, and deeply curious person who always strives to share credit and expertise with others.

In his private life, Jackson enjoys spending time outdoors, just as he did in his childhood. One of his favorite activities is birdwatching with Sally, who previously studied ornithology in graduate school. They also enjoy hiking together, and he often goes on fishing trips with friends—an activity he has loved since he was young. At home, Jackson tends a vibrant garden. He has planted many varieties of fruit trees in the yard, and in the kitchen garden he grows thyme, dill, oregano, and other herbs, taking pleasure in working outside.

In addition to his scientific work, Jackson has published books of poetry for children, and his passion for photography has led to his photographs being featured in major newspapers and magazines in the United States. Thus, beyond being a scientist, he is also active as a writer and photographer.

Photo 9 Rob speaking at Stanford University

Photo 10 Rob at the Djerassi Resident Artists Program

＜A Message to Young People＞

Finally, Jackson shared a message for young people:

“I work hard to be hopeful and optimistic. Young people look around the world and are concerned about their future, for climate and for other reasons. I want to help them see that things can get better. Many things already have. Infant mortality has declined around the world. In many wealthy nations, air and water quality have improved. Although injustice and inequality remain, global poverty has decreased compared with the past. The Montreal Protocol, created to protect the ozone layer, avoided billions of skin cancers and millions of cataracts. The Clean Air Act saves hundreds of thousands of lives every year because of cleaner air and less air pollution. So yes—many things are better today than they used to be. I love those kinds of success stories, and I want people to see that we can address environmental problems and solve them. That's a really critical message today because, when it comes to climate, we're heading in the wrong direction.”

“My strongest message about climate change is that it isn't just about future generations—it's about today. It's about our health right now. Clean energy will save lives. I believe in climate solutions and clean-energy solutions because they help us both today and tomorrow.”