

RIVERSIDE, CA  
NOVEMBER 18, 2021



SOUTHERN CALIFORNIA HEADQUARTERS  
**MARY D. NICHOLS  
CAMPUS**  
DEDICATION

# AGENDA

**10:45**

## **WELCOME**

CARB Chair Liane Randolph

## **SPEAKERS**

Senator Richard Roth

Assemblymember Jose Medina

Riverside County Board of Supervisors Chair Karen Spiegel, 2<sup>nd</sup> District

Riverside Mayor Patricia Lock Dawson

Chancellor Kim A. Wilcox, University of California, Riverside

Chancellor Wolde-Ab Isaac, Riverside Community College District

Superintendent Renee Hill, Riverside Unified School District

Executive Director Luis Olmedo, Comite Civico Del Valle, Inc.

Jared Blumenfeld, Secretary for Environmental Protection

Mary D. Nichols, Former CARB Chair

**11:45**

## **RIBBON CUTTING CEREMONY**

**12:00**

## **REFRESHMENTS & ESCORTED TOURS**

Sign up for tours between 9:30–10:30 a.m. in front of the auditorium. Tours will be 20 minutes and begin in the auditorium.

**2:00**

## **HAAGEN-SMIT CLEAN AIR LEADERSHIP TALKS**

Los Angeles & Merced Rivers Rooms

*Today's music is provided by the University of California, Riverside Jazz Ensemble.*





# WELCOME FROM THE CHAIR

Welcome to the official dedication of one of the world's most advanced vehicle emissions testing and research facilities! The new CARB Southern California Headquarters – Mary D. Nichols Campus started as a vision more than a decade ago and now today, it's a reality.

A CARB analysis dating back to 2006 identified the growing need for a new laboratory and vehicle testing facility. While planning continued, CARB persevered with its nation-leading vehicle testing in the existing lab, including detection of illegal defeat devices in certain Volkswagen diesel engines in 2015. One year later, the Legislature recognized the 'exemplary work and tenacity' CARB staff demonstrated in achieving a landmark settlement with the company and allocated funding for a new lab and headquarters. The University of California, Riverside graciously offered the land, and the Riverside community enthusiastically welcomed CARB to its new home in Southern California.

A CARB team spent countless hours meticulously detailing the technical requirements for the new research and vehicle testing facility. As a result, the new facility features an extended range of test cells for heavy-duty trucks and engines, cars and motorcycles and will accommodate new test methods for future generations of vehicles. A separate advanced chemistry laboratory allows researchers to carry out precise and accurate testing of vehicle fuels and evaporative analysis.

ZGF architects' striking design, executed by Hensel Phelps Construction, includes an office interior filled with natural light.

The facility was designed top to bottom with sustainability in mind and is the largest 'zero-net energy' structure of its type in the nation, producing as much energy as it uses. The building is also LEED Platinum certified and meets California's CalGreen Tier 2 threshold for overall sustainability and energy efficiency. While the facility is a remarkable tool that will support CARB's continued leadership over the next 50+ years, it is really CARB's amazing team of engineers, scientists, technicians, analysts and more that will bring to life all the campus has to offer.

We are proud to now be an integral part of the Riverside community, and I am personally delighted to welcome you to the dedication of our new Southern California headquarters. It has been a long time coming, but I'm sure you'll agree that the Mary D. Nichols campus fully reflects – both inside and out – the reputation CARB has earned worldwide for its research and achievements in controlling air pollution and fighting climate change.

Liane M. Randolph  
Chair, California Air Resources Board



## LOOKING TO THE PAST

CARB's reputation as a world leader in vehicle emissions testing and clean air regulation is in large part the result of the dedication and work in its laboratories by staff scientists, engineers and technicians. Since 1973, much of CARB's innovative work and technological advances at curbing emissions took place at the Haagen-Smit Laboratory. Located in El Monte, the lab was named after CARB's first chairman and the scientist who first discovered the link between tailpipe emissions and smog, Dr. Arie Haagen-Smit.

## 1970s

It was at the Haagen-Smit Lab (HSL) that the three-way catalytic converter, developed to address stringent new tailpipe standards, was tested for safety and feasibility. This innovation delivered the single largest reduction of nitrogen oxide, the main precursor of smog, in the history of the internal combustion engine.

## 1980s

HSL also is where CARB engineers and technicians developed the first diagnostic system to monitor the operation of increasingly complex emissions control systems. The result of this "on-board diagnostic" (OBD) system is the ubiquitous "check engine" light that is now a feature on the dashboard display of almost every car and truck in the world.

## 1990s

The Lab expanded its capabilities to support the development of regulations for smaller engines, off-road vehicles, fuels and consumer products. A new generation of testing procedures to enforce the regulations also was invented. And HSL staff got a glimpse of the first generation of zero-emission vehicles.

## 2000s

HSL added a new focus to address the world's first greenhouse gas emissions standards for cars. Lab engineers also helped develop the first generation of portable monitors to measure a car's "real world" emissions outside of the lab's test cells.

As the depth and breadth of CARB's work grew, it became evident that HSL's vehicle emissions and testing capabilities were outdated. A larger facility with the latest test equipment was needed to effectively serve the current and future research and testing needs of the Board. A new lab could better adapt to rapidly evolving vehicle technologies and the challenges of ensuring compliance with increasingly stringent standards.

Initial planning began in 2006 to make a new laboratory with expanded capabilities a reality.

## 2010s

The same federal test procedure developed by CARB in downtown Los Angeles 50 years before played a significant role in cracking the Volkswagen case in 2015. Dogged detective work by CARB staff revealed the illegal "defeat devices" and led to the largest settlement in history for breaking state and federal clean air rules.



# A BUILDING FOR THE FUTURE

To support the state's climate initiatives and determined to demonstrate the highest standards of sustainable practices, CARB designed and constructed the new Southern California Headquarters – Mary D. Nichols Campus to be a green building for the future. By integrating sustainable and energy efficient measures throughout, the facility achieves Leadership in Energy and Environmental Design (LEED) Platinum certification, zero-net energy (ZNE) performance, and California Green Building Standards Code (CALGreen) Tier 2 standards. At 402,000 square feet, it is the largest ZNE building in the United States.

## Cutting-Edge Laboratory

CARB's Mobile Source Testing Laboratory has played a key role in the success of California's clean air efforts. It is the state's leading center for assessing the environmental impacts of motor vehicles. The lab provides air quality decision makers with state-of-the-art measurements of vehicle emissions, fuel analysis and research into vehicle-related pollutants.

When originally established, the lab's primary mission was to test and analyze motor vehicle emissions that were, and still are, the primary cause of smog in California. Staff has built upon this groundbreaking work to support CARB in its development and implementation of progressive strategies and programs to reduce the emissions of additional mobile source pollutants, including toxic air contaminants, fine particle pollution and greenhouse gases.

The new lab's expanded capabilities will support the transition to zero or near-zero emissions technology in all areas recognized as mobile sources through rigorous screening and regulatory testing. It is designed to accommodate testing for passenger cars, motorcycles, trucks and buses, lawn and garden equipment, small off-road engines and marine engines. From the largest heavy-duty vehicle to the smallest off-road engine and everything in between, the new lab is equipped to test them all.

The lab houses light-, medium-, and heavy-duty testing in one facility, with state-of-the-art equipment and expanded emissions testing capabilities in each area. Centralized testing provides more comprehensive, transparent, and accessible scheduling, test status and results, as well as an overall expansion of testing capacity.

The new facility also includes an expanded chemistry lab to analyze motor vehicle exhaust emissions, evaporative emissions and transportation fuels samples. This state-of-the-art instrumentation will provide data to evaluate the toxicity, reactivity and climate change impacts of motor vehicle emissions; assess the effectiveness of control technologies; improve the emissions inventory for specific components of motor vehicle emissions; and, enforce California's Clean Fuels specifications.



## ENERGY-SAVING METHODS EMPLOYED

Chilled beam HVAC in the office areas

Automated lighting control

Building management system that monitors the building's vital operations for problems and to maintain its "green" efficiency

Solar arrays throughout to supply at least 3.5 megawatts of electricity

Battery back up

Central plant for chilled water

Integrating sustainability and efficiency measures for regenerative dynamometers

Orienting the light-duty lab wing perpendicular to predominant wind direction to reduce the possibility of testing exhaust being drawn back into the building

Fresh outdoor air is conditioned via a dedicated outdoor air system to maintain the heating, cooling and humidity requirements of the testing spaces



## FACILITY FEATURES

19-acre site

402,000 square feet

\$419 million (includes  
\$108 million for equipment)

7 light and medium-duty  
emission test cells;  
3 heavy-duty emission test  
cells; and, 2 motorcycle  
emission test cells with  
additional space for creating  
new testing methods

Space for enhanced  
on-board diagnostics  
and portable emissions  
measurement system  
development

Chemistry laboratory

Office and administration  
space to accommodate  
approximately 460 staff

Formal reception area

Media center

250-person auditorium  
with adjacent overflow

120 charging stations  
for electric vehicles

28 bike lockers including  
electrical hookup for e-bikes

Leadership in Energy and  
Environmental Design  
(LEED) Platinum certification

Zero-net Energy  
(ZNE) performance

California Green Building  
Standards Code (CALGreen)  
Tier 2 standards

## Office & Administration Space

To accommodate approximately 460 employees, great thought went in to designing an office and administrative space that promotes collaboration while also contributing to the sustainable nature of the campus complex and keeping employee comfort and productivity in mind. Making best use of natural light was a key factor in the design along with window selection and placement. Employee comfort and health was also a priority consideration. All offices and cubicles were built with ergonomics in mind to ensure employee comfort, including sit-stand desks with monitor arms to meet users' individual needs. Lowered cubicle partitions offer a private workspace but also allow for collaboration. A cafeteria and a variety of break areas both indoors and outdoors with comfortable seating build on providing multiple areas for social interaction, and a custom-built perimeter walking path outside was designed for jogging and walking.

## CARB's New Home in Riverside

The support demonstrated by the Riverside community, including the Chamber of Commerce, city and county, was an integral part of the Board's decision to locate the new southern California headquarters in Riverside. So too was the proximity to Riverside's educational facilities. CARB believes that support for its work depends on creating a scientifically literate public. In 2019, CARB representatives signed Memorandums of Understanding (MOUs) with the University of California, Riverside, Riverside Community College District and Riverside Unified School District. These mutually beneficial partnerships will utilize CARB's new facility to offer classes, facility tours and educational opportunities for faculty and students to advance research and inspire students at all levels to learn more about air quality, the impacts of climate change, and CARB's efforts to clean the air.

The MOUs facilitate collaboration for joint air quality and climate change research, promotion of science career pathways, employment opportunities, and training programs for local residents to become scientists and technicians in the environmental arena, all with an emphasis on reaching disadvantaged and underrepresented populations.

Other opportunities include synergistic partnerships to develop training programs and delivery of STEM (Science, Technology, Engineering and Math) courses and other STEM-based career and technical education training programs, as well as development of continuing education and certificates.



# MARY D. NICHOLS

No history of CARB, or of California, is complete without recognizing the significant influence Mary Nichols has had on clearing California skies and fighting climate change. Known for pioneering efforts to protect the public from harmful air pollution, she left a body of tough, creative regulations at CARB that established California as a model of innovative air pollution science, cleanup and protection throughout the nation and world.



A graduate of Yale Law School, she began her career cleaning up air pollution as a lawyer for the Center of Law in the Public Interest. She filed one of the first suits in 1972 under the Clean Air Act on behalf of the City of Riverside and required the EPA to take immediate action to clear the air throughout the entire Los Angeles basin.

In 1974, Governor Jerry Brown appointed her to the California Air Resources Board where she spearheaded the effort to get lead out of gasoline, a move later adopted nationwide. She continued efforts to reduce tailpipe pollution with tough restrictions on smog-forming  $\text{NO}_x$  emissions based on the principle that stringent performance standards would drive industry to develop innovative, cost-effective solutions. The result was the rapid development of the catalytic converter, now a standard feature on gasoline-fueled engines worldwide. As chair of CARB from 1979-1983, she strengthened the legal office and expanded and reshaped the agency's research program.



After practicing law in private practice, Mary founded the Los Angeles Office of the Natural Resources Defense Council to specifically address urban and environmental justice issues. In 1993, she was appointed Assistant Administrator for Air and Radiation at the U.S. EPA, leading a four-year review and adoption of revisions to the national health standards for ozone and fine particles under the Clean Air Act.

In 1999, Governor Gray Davis appointed her Secretary for Resources where she oversaw a new urban parks initiative funded by the largest resources bond measure at the time. Mary also laid the foundation for California's climate change programs by establishing the California Climate Change Action Registry.



Mary left state service to direct the Institute of the Environment at University of California, Los Angeles returning as CARB chair for a second time when Governor Arnold Schwarzenegger appointed her to the position in 2007. Just one year later, she oversaw a major effort to reduce exposure to diesel exhaust, especially for residents in communities hardest hit by vehicle traffic. She also oversaw the development of the initial Scoping Plan (AB 32) that established the blueprint for an economy-wide approach to cut greenhouse gases and set California on a sustainable, low-carbon energy future.





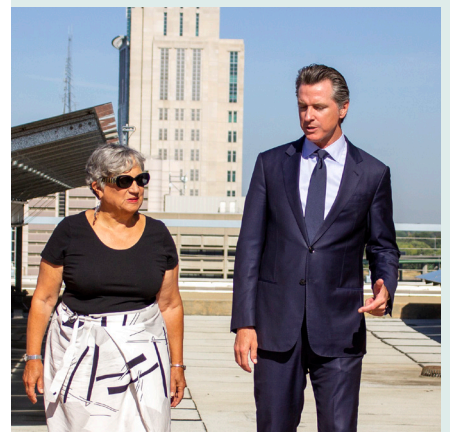
During her 13-year tenure as chair, Mary continued to drive the development of new programs to clean the air, cut carbon pollution and invest billions of dollars from the Cap-and-Trade Program into projects that benefited disadvantaged communities. In 2020, in the final months of her term as chair, she helped usher in the next chapter of California's leadership on transportation when she stood beside Governor Gavin Newsom as he announced California's commitment to 100% zero-emission technology for all cars and trucks over the next two decades.

Today, Mary continues the fight for clean air and the environment as a private citizen. She currently is Co-Chair of the Commission on the Future of Mobility, Professor of Law at UCLA Law School, and Vice Chair of the California-China Climate Institute at the University of California, Berkeley. In addition, she holds several academic fellowships.

With more than 278 regulations, 37 State Implementation Plans, 16 incentive programs, 10 State Air Quality Standards and 3 climate action plans adopted during Mary's tenure as chair, the work she spearheaded will ensure CARB continues to address environmental justice, improve air quality, and fight climate change in California, the United States and far beyond.

Perhaps the greatest testament to her extraordinary career and accomplishments is the view of the hills and mountains surrounding L.A. In 1967, the L.A. Basin had 186 Smog Alerts signifying extremely unhealthy air, and the mountains were obscured by haze. Despite three times the number of cars and trucks on the road today compared with 1967, there have been no Smog Alerts for nearly 25 years, and the mountains are visible daily.

That is the indisputable result of an unwavering commitment to clean air and public health that marks Mary Nichols's career at CARB over four decades and under three governors. To honor and celebrate that legacy, CARB is proud to announce that our Southern California headquarters and laboratory complex – designed to continue CARB's leadership role through the twenty-first century – will be known as the Mary D. Nichols Campus.



# SPEAKERS



**Liane Randolph**  
CARB CHAIR

Liane Randolph has spent most of her career in public service, specializing in environmental law and policy, effective administration, and a commitment to transparency and public process. She was appointed Chair of the California Air Resources Board by Governor Gavin Newsom in December 2020.



**Richard Roth**  
SENATOR

First elected in 2012, Senator Roth represents the 31st Senate District, comprised of nearly one million Californians residing in Western Riverside County. Senator Roth's Senate District includes portions of Riverside County including the communities of Corona, Eastvale, Jurupa Valley, March Air Reserve Base, Moreno Valley, Norco, Perris and Riverside.



**Jose Medina**  
ASSEMBLYMEMBER

Assemblymember Jose Medina was elected in November 2012 to represent California's 61st Assembly District, which consists of Riverside, Moreno Valley, Perris and Mead Valley. He currently serves as chair of the Assembly Committee on Higher Education.



**Karen Spiegel**  
RIVERSIDE COUNTY BOARD OF SUPERVISORS CHAIR, 2<sup>ND</sup> DISTRICT

Karen Spiegel was elected to represent the Second Supervisorial District in 2018. The Second District includes the unincorporated communities of Coronita, El Cerrito, Home Gardens and Highgrove, and the cities of Corona, Eastvale, Jurupa Valley, Norco and the western half of the City of Riverside.



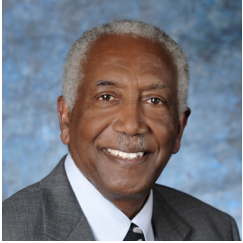
**Patricia Lock Dawson**  
MAYOR OF RIVERSIDE

Mayor Patricia Lock Dawson is a Riverside native and small business owner. Mayor Lock Dawson's historic election makes her the first U.C. Riverside graduate and second woman to be elected to Riverside's only citywide office in its 150-year history. She has an extensive record of service to Riverside, the Inland Southern California region, and the state, having served two political appointments under two gubernatorial administrations.



**Kim A. Wilcox**  
CHANCELLOR, UNIVERSITY OF CALIFORNIA, RIVERSIDE

Kim A. Wilcox was appointed U.C. Riverside's ninth chancellor in August 2013. During his tenure, U.C. Riverside has seen transformative growth across its education, research and public service missions, as well as the establishment of new schools of medicine and public policy.



**Wolde-Ab Isaac**  
CHANCELLOR, RIVERSIDE COMMUNITY COLLEGE DISTRICT

A noted scholar and education activist, Wolde-Ab Isaac, Ph.D. has more than 35 years of experience as an educator, faculty member and administrator. In 2018, he was selected to serve as the Chancellor of the District which oversees the administration of Moreno Valley College, Norco College, and Riverside City College.



**Renee Hill**  
SUPERINTENDENT, RIVERSIDE UNIFIED SCHOOL DISTRICT

Renee Hill is proud to serve as the 12th Superintendent in Riverside Unified School District. Throughout her 28 years of experience in RUSD, Ms. Hill has held the roles of teacher, site administrator, and math specialist.



**Luis Olmedo**  
EXECUTIVE DIRECTOR, COMITE CIVICO DEL VALLE, INC.

Luis Olmedo is Executive Director of Comite Civico del Valle, an organization located in the California Salton Sea Region whose mission focuses on addressing environmental justice and public health, with the endeavor of improving the lives of disadvantaged communities primarily located the Imperial and Coachella Valleys. He is a community advocate who advises on local, regional, and state environmental health programs affecting Imperial County and Eastern Coachella Valley and a member of various state and national networks that focus on environmental policy and regulation.



**Jared Blumenfeld**  
CALIFORNIA SECRETARY FOR ENVIRONMENTAL PROTECTION

Jared Blumenfeld is California's Secretary for Environmental Protection. Appointed by Governor Gavin Newsom in January, he is one of America's most innovative environmental leaders, with more than 25 years of environmental policy and management experience at the local, national and international levels.

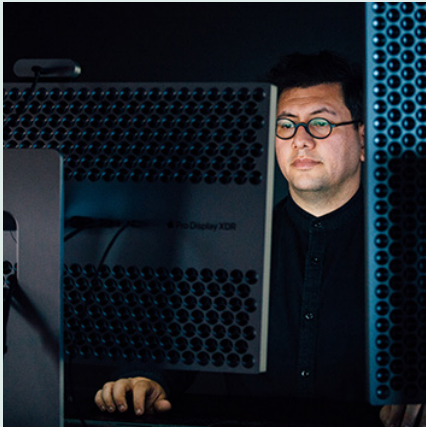


**Mary D. Nichols**  
FORMER CARB CHAIR

Mary Nichols is the former Chair of the California Air Resources Board, where she occupied the attorney seat. She has served on the Board under three different Governors. Today, she continues the fight for clean air and the environment as a private citizen. She currently is Co-Chair of the Commission on the Future of Mobility, Professor of Law at UCLA Law School, and Vice Chair of the California-China Climate Institute at the University of California, Berkeley. In addition, she holds several academic fellowships.

# FEATURED ARTISTS

Refik Anadol



To complement the design of the building and reflect the stature of CARB as a world-leading air pollution and climate change agency, CARB, along with art consultants Dyson & Womack, commissioned five artists to create a collection that is comprised of sculpture, photomontage, installation, poetry, video, and digital art that seeks to inspire and facilitate discussions about air quality and climate change. This investment of \$2.4 million in the arts sets an example for art in public spaces and ensures that CARB will be a part of the thriving Riverside art community.

Refik Anadol is a media artist and director known globally for his aesthetic interpretations of large and often invisible datasets. Anadol's work addresses the challenges and the possibilities that ubiquitous computing has imposed on humankind, and what it means to be a human in the age of machine intelligence.

Air quality data from air monitoring stations across California was Anadol's inspiration for developing this poetic data painting. Datasets containing statistics of various air pollutants throughout the state are processed through unique algorithms to create a visual narrative celebrating nature at the intersection of humanity and artificial intelligence. This living, dynamic artwork changes motion and color based on the machine's dreams, a process of reassembling data as pigments.

"California Air: AI Data Painting" captures minor marks on the environment that cause collective harm. Inspired by the programs and actions CARB initiates to fight climate change, the artwork reminds us of our shared duty to nature, sustainability, innovation, and the power that synergistic relationships between humans and machines have to effect change.

Tomás Saraceno



Tomás Saraceno's practice is informed by concepts linking art, life science, and the social sciences. Enmeshed in the junction of these worlds, his floating sculptures, community projects, and immersive installations propose sensory solidarity with the planet through a social, mental, and environmental ecology of practice.

Composed of habitat-like geometries, Saraceno's "Spatial Echoes of Breath" reveals the elemental properties that, through the very essence of our lives, seem to perpetually recede from view. We are living in a moment of environmental crisis. Clouds are disappearing, replaced by new clouds of toxic pollution particulates: ash, black carbon, organochlorine pesticides, sulfur dioxide – particles that populate what once was simply wind and rain, throwing into question the very fiber of our world.

In reflection, reality is revealed. The participant is inextricable from the surrounding environment in both cause and effect, bound by a vision in the mirror's plane. We see ourselves, part of this ensemble, as the structure's lines draw seemingly impossible connections to a future on, in, and with the air.

## Jennifer Allora & Guillermo Calzadilla



For the last 20 years, Jennifer Allora and Guillermo Calzadilla have used sculpture, live performance, video, sound, and photography to evoke contemporary geopolitics, cultural artifacts, and the deep time of archaeological history.

In their artwork "Petrified Petrol Station," the processes of fossilization are at work where a petrol station appears to have turned into stone. Made from fossil-filled limestone, the sculpture incorporates ancient life forms, visible throughout, attesting to the organic abundance of earth's pre-history. Today, fossils provide the material used commonly to generate energy.

This fossilized depiction imagines the material traces of human activity from our current geological era into the future. This technofossil collapses intervals between past and present, technological progress and obsolescence, artificial materials, and natural phenomena. One is left to ponder the legacy of human culture in the history of our planet.

## Kameelah Janan Rasheed



Kameelah Janan Rasheed is invested in the shifting ecosystems of Black epistemologies, and the relationships between reading, writing, archiving, editing, translating, publishing, reflecting upon, and arranging narratives about lived Black experiences.

In her work "There are Many Idioms About Breathing and Yet," Rasheed's poetic text addresses both the literal mechanics of breath, as complicated by air pollution, and the notion of progress in the fight for environmental justice. Here we are either "holding our breath" in anticipation of change or "catching our breath" as new information is revealed about the multigenerational impacts of air pollution. This artwork considers waiting, comfort, and our desired proximity to change. What does it mean to hold one's breath always? When will we experience a political shift as a breath of fresh air?

Rasheed's text is accompanied by a video artwork that similarly focuses on the politics and poetics of breathing. As a meditation on pacing and temporality, the artwork is a form of preparedness for the hard work ahead.

## Noé Montes



Over the last 25 years, Noé Montes has developed a socially engaged practice in which he creates documentary work around a specific social issue or geographic location. Montes then uses that work as a tool for community and civic engagement through programming with local partners and works to integrate the stories of the communities he documents into the American historical narrative.

Montes' project, "Paradise," began with photo documentation of a journey of investigation into the human causes and impacts of air pollution in the Inland Empire. The body of work Montes created is presented pictorially as a sculpted photomontage. The artist chose portraits representing the diverse relationships that residents of the Inland Empire have with issues of air quality and climate change in their communities, from public health, local government, and economics to community organization and respect for nature.

The portraits are set within depictions of nature from the Inland Empire. The human and natural world together present a vision of balance and equity between our needs as a society and the health of our planet and everyone in it.



CALIFORNIA  
AIR RESOURCES BOARD  
MARY K. WOODS CAMPUS





2019

# HAAGEN-SMIT CLEAN AIR AWARDS

The Haagen-Smit Clean Air Awards, also known as the 'Nobel Prize' of air pollution and climate-science achievements, recognize individuals who have made outstanding contributions toward protecting public health through extraordinary careers improving air quality and climate change science, technology and policy. The contributions of award winners have lasting impacts for air quality and climate goals not only in California, but throughout the world.

Annually since 2001, CARB has bestowed the distinguished Haagen-Smit Awards to recognize significant career accomplishments by individuals in at least one of these air quality and climate change categories: research, environmental policy, climate change science, science and technology, education, community service and environmental justice, and international leadership. Winners have ranged from research scientists and educators to public agency administrators.

California's premier air quality award is named for the late Dr. Arie Haagen-Smit, who is best known as the "parent" of air pollution science and control for linking smog in Southern California to automobile emissions. The Clean Air Awards recognize individuals who embody Dr. Haagen-Smit's legacy through their work in air quality and climate change. Awardees are selected by a committee of former winners.



## Who was Dr. Arie Haagen-Smit?

Originally from the Netherlands, Dr. Haagen-Smit was a biochemistry professor at the California Institute of Technology in Pasadena for 16 years before beginning air pollution research in 1948. Through a series of innovative experiments, he demonstrated that most of California's smog is the result of motor vehicle exhaust and industrial smokestack pollution reacting with sunlight to create ground-level ozone. This breakthrough discovery provided the foundation for the development of air pollution control programs in California that in turn influenced regulations and cleaner vehicle technology worldwide. Dr. Haagen-Smit was also instrumental in the formation of the California Air Resources Board and in 1968 became its first chairman. In 1977, CARB's laboratory in El Monte was dedicated in his name: Arie Jan Haagen-Smit Laboratory.

# CLEAN AIR AWARD RECIPIENTS



POLICY

## Stephen O. Andersen Ph.D.

DIRECTOR OF RESEARCH,  
INSTITUTE FOR GOVERNANCE &  
SUSTAINABLE DEVELOPMENT (IGSD)

Dr. Stephen Andersen's service to the global environment and his many achievements span more than four decades. Most notable is his immense contribution to protecting Earth's climate and its stratospheric ozone.

After earning a Ph.D. in Agricultural and Resource Economics from UC Berkeley in 1974, Dr. Anderson worked for environmental organizations and as a college professor before joining U.S. EPA's nascent Stratospheric Protection Division in 1986. At EPA, Dr. Andersen was among the first to recognize that the industries responsible for introducing ozone-depleting substances are also best positioned to invent solutions.

A coalition builder without equal, in 1987 he founded — and co-chaired for 25 years — the Montreal Protocol Technology and Economic Assessment Panel, engaging industry partners in voluntarily developing alternative technologies needed to phase out production and use of ozone-depleting substances across multiple industries.

A master motivator, Dr. Andersen organized in 1990 U.S. EPA's Stratospheric Ozone Protection Awards, and later, its Climate Protection Awards, proven tools in inspiring collaborative efforts of business, government, and nongovernmental partners around the world. Additionally, he worked with military organizations worldwide to eliminate nonessential use of ozone-depleting substances.

When NASA briefly lost access to space with the loss of space shuttle Challenger, Dr. Andersen brokered a deal with the Union of Soviet Socialist Republics to orbit a U.S. ozone mapping spectrometer on a Soviet rocket. As EPA's liaison to the U.S. Department of Defense, he worked with military organizations worldwide to eliminate nonessential use of ozone-depleting substances.

Beyond his central role in establishing the Montreal Protocol's initial protections of Earth's stratospheric ozone layer, Dr. Andersen demonstrated extraordinary courage, foresight and tenacity in realizing that treaty's potential to control climate-changing emissions. In 2006, as some questioned the continued usefulness of the Montreal Protocol, Dr. Andersen rallied support to accelerate the Protocol's phase-out of hydrochlorofluorocarbons. Forming a team of scientists to analyze the Montreal Protocol's climate-change implications, in 2009 he authored a paper which projected the climate impacts of the expanded use of hydrofluorocarbons in the developing world, and which ultimately led to a global phase-down of HFCs enshrined in the 2016 Kigali Amendment to the Montreal Protocol. When fully implemented, the amendment can prevent 0.5° C of projected warming by 2100.

Dr. Andersen holds many awards from countries around the world, and he continues to be a leading researcher and advocate for improving the climate performance of mobile air conditioning. For example, he has organized bulk procurement of energy-efficient, more climate-friendly air conditioners in developing economies such as India, Brazil and Morocco.

Dr. Andersen's unique approach to environmental leadership is equally worthy of recognition. His flexible, good-humored, yet relentless approach has been uniquely effective in changing minds and driving policies needed to protect the global environment. Dr. Andersen embodies optimism, fairness and productivity, and has inspired countless others to solve problems initially thought intractable, if not impossible to solve.

For all of this, CARB is honored to bestow Dr. Stephen Andersen with a 2019 Haagen-Smit Clean Air Award in the Policy category.





SCIENCE AND TECHNOLOGY

## John Birks Ph.D.

PROFESSOR EMERITUS,  
CHEMISTRY AND BIOCHEMISTRY,  
UNIVERSITY OF COLORADO, BOULDER

Dr. John Birks has advanced our understanding of Earth's atmosphere through more than four decades of research, teaching, and technological innovation. He deepened our understanding of atmospheric kinetics, called our attention to the dire consequences of human activities for Earth's stratosphere, and invented and applied technologies that substantially expanded the analytical scope of environmental chemistry. His early work on the chemistry of chlorine helped unravel the complex processes of stratospheric ozone depletion, and as co-developer of the theory of "nuclear winter," Dr. Birks focused global attention on the catastrophic climate effects of nuclear warfare. A prolific technological innovator, Dr. Birks developed a range of lightweight portable instruments that dramatically improved scientists' capacity to measure and analyze atmospheric air quality.

In the fall of 1968, University of Arkansas graduate John Birks came to a UC Berkeley to study physical chemistry. His advisor, Professor Harold Johnston, studied atmospheric kinetics and was analyzing the potential impacts of supersonic aircraft exhaust on stratospheric ozone. This sparked Birks's lifelong interest in atmospheric chemistry.

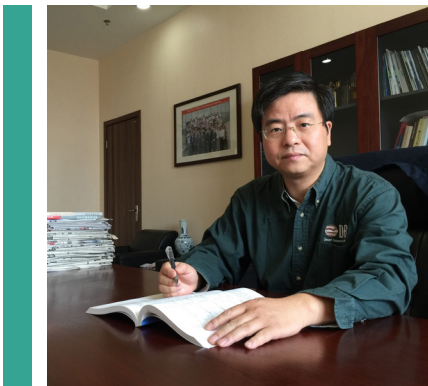
Later, Dr. Birks and his own graduate students focused on the kinetics of reactions affecting stratospheric ozone depletion, discovering key reactions and estimating temperature-dependent rate coefficients for the first time. Birks's group introduced the species chlorine nitrate, for example, later found to play a key role in the formation of the Antarctic ozone hole.

A few years later, Dr. Birks teamed with Nobel-winning stratospheric chemist Paul Crutzen to develop the theory of nuclear winter. Their conclusion that smoke from fires on Earth's surface caused by nuclear warfare would block sunlight and jeopardize agricultural production spurred further study of nuclear winter and improved climate modeling by integrating the effects of aerosol scattering and absorption.

In the last decade of his award-winning teaching career at the University of Colorado, Dr. Birks's research focused on vertical profiling of the atmosphere. Using kites, balloons, powered parachutes and light aircraft to carry advanced chromatographic instruments, he studied long-range transport of air pollutants and landscape-scale fluxes of CO<sub>2</sub> above forests and agricultural lands. For projects as far afield as Greenland, the Azores, Australia, and Nova Scotia, Dr. Birks's team developed novel miniature air monitoring instruments to meet the size, weight, and power constraints of airborne data collection.

Portable, low-power analytical instruments for atmospheric measurement would also underpin Dr. Birks's post-academic career: He co-founded 2B Technologies, a manufacturer of analytical instruments for atmospheric and environmental measurements. 2B's instruments measure atmospheric ozone, nitric oxide, nitrogen dioxide, mercury, black carbon, and other particulates. The company has sold more than 5,700 instruments to researchers worldwide, providing essential data for over 900 peer-reviewed papers cited more than 16,000 times.

By deepening our understanding of atmospheric kinetics, calling attention to the dire consequences of human activities for Earth's stratosphere, and inventing and applying technologies that substantially expanded the analytical scope of environmental chemistry, Dr. Birks has contributed much to many. For such dedicated service, CARB is honored to bestow John Birks with a Haagen-Smit Clean Air Award in the Science & Technology category.



## INTERNATIONAL LEADERSHIP

### Junji Cao Ph.D.

**PROFESSOR & PRESIDENT,  
INSTITUTE OF ATMOSPHERIC PHYSICS,  
CHINESE ACADEMY OF SCIENCES**

Dr. Junji Cao has been, and continues to be, a prolific contributor to clean air research, policy, science, technology and education. In particular, his work has helped to address aerosol pollution throughout China, beginning at a critical time in that nation's development. By focusing attention on the sources and risks of airborne particulates in major Chinese cities, his research helped drive China's air quality programs, which has improved the health of millions while reducing emissions of short-lived climate pollutants.

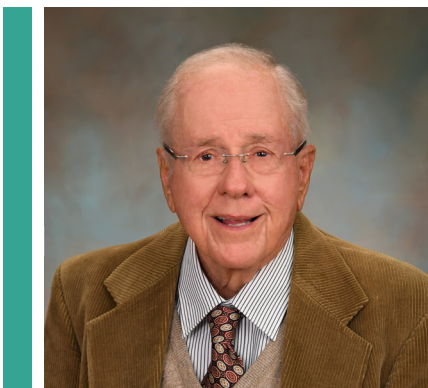
Dr. Cao's early research on long-range transport of Asian dust enhanced our understanding of background concentrations of airborne particulates in both China and the western United States. As he explored new ways of combining geochemistry with the study of air pollutants, Dr. Cao was among the first to document the history of carbon emissions through analysis of ice and sediment cores, later demonstrating that black carbon deposited on Tibetan glaciers accelerated the retreat of those glaciers.

In the early 2000s, Dr. Cao moved ahead with long-term analyses of the chemical composition of ambient PM<sub>2.5</sub> in China. Measuring PM<sub>2.5</sub> mass and chemical composition in 14 Chinese cities, Dr. Cao established a national baseline for ambient PM<sub>2.5</sub>, against which control strategies can be evaluated. His research formed the technical foundation for adoption of China's 2012 national air quality standards for PM<sub>2.5</sub>, and ensured the accurate evaluation of China's pollution control programs. At China's Institute of Earth Environment, Dr. Cao co-authored hundreds of influential papers and mentored over 150 young aerosol scientists.

The founder of China's section of the Air and Waste Management Association, and organizer of many important international conferences on geoscience, aerosol research, and particle technology, Dr. Cao has helped to create a strong platform in China for global exchange of information among government, industry, and academic scientists. And, as an affiliate professor at Nevada's Desert Research Institute since 2012, Dr. Cao translated "Smogtown: The Lung-Burning History of Air Pollution in Los Angeles" into Chinese. A year later, he authored "PM<sub>2.5</sub> and the Environment in China," the first Chinese book to combine aerosol pollution control science and policy.

Moreover, Dr. Cao's commitment to clean air extends beyond documenting and communicating air pollution problems: He has successfully transferred innovative technologies from basic research laboratories to field demonstrations of cost-effective solutions. For example, applying advanced photocatalytic and air filtration technologies, Dr. Cao's team designed and built a full-scale urban air cleaning tower that reduces local exposure by removing PM<sub>2.5</sub> and its precursors from ambient air. More recently, he developed a real-world, real-time source apportionment system for air pollution in China's capitol region, enabling substantial air quality improvements.

Dr. Cao holds over a dozen patents and several prestigious international awards for his technological innovations and scientific achievements. For his rare combination of abilities in science, engineering, public education, and government policy, plus all he has accomplished for the global scientific community and the breathing public, CARB is honored to bestow Dr. Junji Cao with a Haagen-Smit Clean Air Award in the category of International Leadership.



## RESEARCH

### William B. DeMore Ph.D

SENIOR RESEARCH SCIENTIST,  
JET PROPULSION LABORATORY, RETIRED

Scientists who measure or model atmospheric ozone today stand on the shoulders of Dr. William DeMore's half century of service. Dr. DeMore is being celebrated for his lifetime contributions to our knowledge of gas-phase processes central to stratospheric ozone chemistry and photochemical smog formation, and for his cool-headed, statesman-like leadership. His diplomacy was vital to the resolution of many knotty issues in analytical chemistry with high stakes for air quality management.

Having earned his doctorate at the California Institute of Technology (Caltech) in 1957 and then a post-doctoral appointment at NASA's Jet Propulsion Laboratory in Pasadena, the young Dr. DeMore saw first-hand the effects of frequent and severe smog events.

He ultimately spent more than four decades at Caltech and JPL in leadership roles. As a founding member and supervisor of the Chemical Kinetics and Photochemistry group, he directed early studies of elementary kinetics essential to the atmospheres of Earth and other planets. He also oversaw the Chemistry and Physics programs at JPL, equivalent to leading the Earth and Planetary Sciences department at a major university.

By the early 1970s, Dr. DeMore had been recruited to help build NASA's upper Atmosphere Research Program, created by Congress to study depletion of the stratospheric ozone layer. Lacking a common set of chemical constants, models of stratospheric ozone depletion from various groups were producing different results at the time, NASA created the Panel for Data Evaluation, calling on Dr. DeMore to chair the group. This panel reviewed the

literature's data for each important atmospheric process, publishing a critical evaluation for each one, along with recommendations for use by the modeling community. Dr. DeMore, who is perhaps best known for his stalwart service on this panel, edited 10 editions of its recommendations over more than 20 years. Widely adopted by the modeling community, the Panel's recommendations ultimately brought much-needed consistency to the comparison of model calculations.

Dr. DeMore also guided the process that identified the most accurate way to measure ambient levels of atmospheric ozone. In 1973, CARB and the Los Angeles Air Pollution Control district needed to resolve a substantial gap in their atmospheric ozone estimates. Although data from both agencies was precise and reproducible, the discrepancy between their estimates threatened to hamper enforcement of air pollution control rules. An expert committee appointed by CARB to resolve this critical issue elected Dr. DeMore to be its chair.

Dr. DeMore provided test facilities and defined a laboratory protocol for intercomparison of the conflicting measurement techniques. He also provided consistent, impartial guidance, prioritizing data integrity and unbiased interpretation, based on his belief that resolution of political issues must follow the data.

Regarded by his peers as "a true gentleman," Dr. DeMore helped resolve this and many other controversies among highly qualified scientists by providing impartial guidance and prioritizing data integrity and unbiased interpretation.

Both for his calm, steadying influence and for his many substantive contributions to the atmospheric chemistry of ozone, CARB is honored to bestow Dr. William DeMore with a Haagen-Smit Clean Air Award in the category of Research.



## EDUCATION

**Ms. Janice E. Nolen M.A.,  
(1954-2020)**

**DIRECTOR OF POLICY DEVELOPMENT,  
AMERICAN LUNG ASSOCIATION**

As director of policy development for the American Lung Association (ALA), Ms. Nolen was a gifted communicator and tireless advocate for the respiratory health of all Americans through implementation and enforcement of the Clean Air Act. Her accomplishments in educating policy makers and the public on the benefits of clean air have yielded substantial health benefits for Americans across the country.

Prior to joining the American Lung Association of Tennessee as director of programs in 1994, Ms. Nolen rolled out media campaigns and wrote speeches for a variety of public-interest organizations. In Tennessee, which has one of the nation's highest rates of smoking, she helped strengthen tobacco control laws, directed educational outreach, and trained volunteers to educate the public about the health impacts of smoking and the realities of lung disease.

In 2001, she began directing development of the ALA's national policy on lung diseases, indoor and outdoor air pollution, and tobacco control. It was on the national stage that Ms. Nolen's gifts for education, communication and advocacy would come into full bloom.

While air quality is monitored in every state, not every state provides a straightforward annual summary of air quality status and trends for the public and policy makers. The State of the Air report, perhaps Ms. Nolen's greatest labor of love and service, delivers that and more to every community in the nation. For

20 years, Ms. Nolen was the guiding hand behind the creation and distribution of the ALA State of the Air, which distills complex monitoring data into simple air quality grades that clearly convey the health risks of local air pollution. The first air quality report of its kind, State of the Air places air pollution results in thousands of local and national media stories annually, is cited in peer-reviewed literature, and helps drive the clean-air policy conversation locally and nationally. Recent editions have highlighted climate change-related air quality impacts in California, including the role of record heat and catastrophic wildfires in increased ground-level ozone and particle pollution.

During her years in Washington D.C., Ms. Nolen emerged not only as a gifted educator, but as an articulate and effective advocate who brought compelling data and stories, told by physicians, public health experts, and people directly impacted by air pollution. Moreover, during her 15 years of service on the American Thoracic Society's Environmental Health Policy Committee, she helped achieve significant national respiratory health policy victories, including more protective National Ambient Air Quality Standards for ozone, particulate matter, and air toxics. She also worked tirelessly to protect the Clean Air Act against those who sought to weaken its authority.

For her decades of effective leadership in educating policymakers and the public, and for the real-life improvements she helped make to the air we all breathe, CARB is honored to bestow Ms. Janice Nolen with a Haagen-Smit Clean Air Award in the category of Education.



CLIMATE CHANGE SCIENCE

## Karl Taylor Ph.D.

### RESEARCH SCIENTIST

Dr. Karl Taylor's is being recognized for consistent leadership in every aspect of large climate model evaluation over the past three decades. His contributions — both in building essential infrastructure to improve climate modeling, and through his own far-reaching research— have helped make it possible for the climate science community to evaluate and improve model performance; to distinguish human impacts on climate; and to estimate uncertainty in projections of future climate change.

Dr. Taylor's persistent attention and innovative solutions to the complex technical challenges of climate model intercomparison fundamentally improved climate science. And his own research advanced modelers' ability to assess the separate impacts of aerosols and greenhouse gases on climate change.

After earning his doctorate in geology and geophysics at Yale University, Dr. Taylor's "scientific salad" days spanned research and consulting on the astronomical theory of ice ages, avalanche modeling, and the atmospheric response to auroral forcing. In 1985, he joined the atmospheric science division of Lawrence Livermore National Lab, where he rose to direct its highly regarded program for climate model diagnosis and intercomparison.

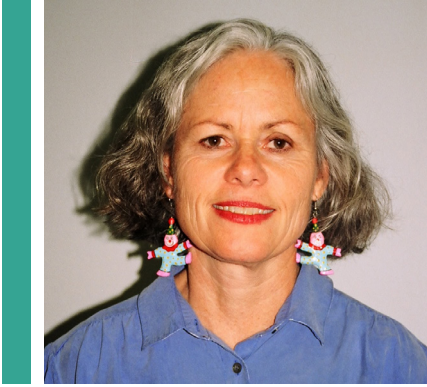
However, climate models cannot be effectively compared without first harmonizing the technical aspects of their simulations across a far-flung and diverse modeling community. For decades, Taylor labored at this immensely complex technical task, demonstrating exceptional patience, skill and diplomacy. For

example, for more than 10 years, Dr. Taylor led the Paleo Climate Modeling Intercomparison project, one of the first systematic international efforts to compare climate models. Later, he chaired the metrics panel for the World Climate Research Programme, helping scientists develop objective measures of climate model performance. He also led committees dedicated to developing metadata conventions and standard statistical measures of model performance needed to systematically identify and correct climate model weaknesses.

Dr. Taylor helped direct three multi-year major model intercomparison projects. He authored the Climate Model Output Rewriter — the climate science equivalent of Star Trek's 'universal translator' — to resolve thorny issues flowing from idiosyncratic differences across simulation outputs from different modeling centers. Dr. Taylor also developed the now-routinely-used Taylor Diagram, an elegant graphical solution to the problem of how to represent the multiple dimensions of model performance in a single, compact figure.

Advancing the development of climate model intercomparability would be more than enough to occupy most scientific lifetimes, but Dr. Taylor also contributed highly influential climate research findings of his own. To take just one example, Dr. Taylor — with co-author Dr. Joyce Penner — was the first to compare the climate system's response to anthropogenic greenhouse gas and sulfate aerosol emissions, providing modelers with a template for gauging their separate impacts on global temperature change.

For his unflagging and prolific leadership of the decades-long campaign to enhance the climate modeling community's heuristic capacities, and for his own wide-ranging and influential research achievements, CARB is honored to bestow Dr. Karl Taylor with a Haagen-Smit Clean Air Award in the category of Climate Change Science.



COMMUNITY SERVICE &  
ENVIRONMENTAL JUSTICE

### **Ms. Joy Williams MPH**

RESEARCH DIRECTOR, ENVIRONMENTAL  
HEALTH COALITION, RETIRED

Joy Williams has devoted her professional life to empowering residents of low-income communities of color to protect their environments and themselves from the hazards of toxic pollutants. For more than 30 years, she has taught others to harness the power of science, community, and advocacy to defend the right of all races, cultures and income levels to fair and respectful treatment in the development and implementation of environmental laws and policies.

Beginning in the late 1980s, Ms. Williams conducted research on air quality, land use, and public health for the Environmental Health Coalition in the San Diego-Tijuana region. Engaging local residents, she led citizen science investigations that revealed damage to vulnerable communities caused by stationary and mobile sources of toxic pollutions.

In 1996, the Port of San Diego began fumigating imported fruit with methyl bromide, emitting the unfiltered pesticide a quarter mile from Barrio Logan's Elementary School. In response, Ms. Williams organized a local air quality monitoring program staffed by community volunteers. The data revealed dangerously high levels of the pesticide, prompting the port to ban methyl bromide use.

As leader of a 1997 health survey of San Diego's most pollution-burdened neighborhoods, Ms. Williams brought together community health advocates with researchers from UC San Diego and San Diego State University to co-author the survey. She recruited and trained local

volunteers to execute the survey, collecting responses from more than 800 families. The survey data showed, for the first time, elevated asthma rates among children living in Barrio Logan, National City, and other neighborhoods near port facilities.

With collaborators from University of Southern California's Keck School of Medicine and San Diego's Family Health Centers, Ms. Williams led "Land Use, Environmental Justice and Children's Health," a multi-year assessment of the risks of children's exposure to industrial emissions in San Diego's low-income communities of color. By documenting and communicating the risks, Ms. Williams enabled residents to improve conditions by advocating for their families' health in land use planning and implementation processes. Her research linking air quality, respiratory health and land use raised the profile of environmental justice in regional and statewide planning. It also positioned her to contribute to the environmental justice screening model, a precursor to CalEnviroScreen, California's premier tool for geographic analysis of the cumulative impacts of social and environmental vulnerabilities.

The contributions of Ms. Williams to the environmental impact report for the recent Tenth Avenue Marine Terminal redevelopment plan will yield significant reductions in pollutant emissions over the life of the plan. And her service on the steering committee of San Diego's Community Air Protection Program is guiding collection and analysis of air quality data that will enable the air district to identify and mitigate harmful pollutant emissions in portside neighborhoods.

For her skillful integration of sound science with grassroots organizing, and for her decades of effective environmental service in San Diego, CARB is honored to bestow Joy Williams with a Haagen-Smit Clean Air Award in the category of Community Service & Environmental Justice.



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