UC San Diego
UC San Diego News Center

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UC San Diego Chemist Named among World's Top 10 'Public Defenders'

As a research institution working for the common good, the University of California San Diego is known for its bold approach. The Department of Chemistry and Biochemistry's Kim Prather exemplifies this reputation as one of the world's 10 top "Public Defenders" according to the Analytical Scientist, a print and digital magazine featuring professionals in the fields of analytical science.

Kim Prather, distinguished chair in atmospheric chemistry, is named among the top scientists who protect people and the planet. Photo courtesy of Kim Prather

Taking a different approach to its annual "Top 100 Power List" this year, the publication took nominations for scientists in 10 categories—from the "Stars of Separation Science" and "Mass Spectrometrists," to "Pharma Pioneers" and "Giants of Nano." Prather was selected under the "Public Defender" category—scientists who protect people and the planet.

"This is great news and well-deserved," said Steven Boggs, dean of the Division of Physical Sciences at UC San Diego. "Kim is an international leader in developing instrumentation to study the chemical and physical properties of atmospheric aerosols. Her work in this area has transformed our understanding of how aerosols impact the environment and demonstrated the critical role they play on the climate."

As founding director of the Center for Aerosol Impacts on Chemistry of the Environment (CAICE) administered by the Division of Physical Sciences, Prather makes a difference for the planet with research on how aerosols impact clouds and precipitation processes—research that may help explain the current increase in the number of climate-related disasters. Aerosols occur in the environment in a variety of forms, including sea salt and microbes in ocean spray and smoke from a variety of combustion sources, including wildfires. They play an enormous

role in our daily lives—from affecting visibility and global climate to endangering our health. Due to applications in research, medicine and industry there is great scientific interest in aerosols, yet there is limited understanding of their complex chemistry.

Under Prather's direction, CAICE, a National Science Foundation Center for Chemical Innovation, helps shed light on the chemical complexity of atmospheric aerosol particles. Her research focuses on developing and using new analytical methods for probing aerosol chemistry in real-time—moving beyond isolating particles on filters and analyzing them in the lab. For example, Prather and her colleagues developed aerosol-time-flight mass spectrometry, referred to as ATOFMS. It's the first analytical technique capable of providing instantaneous information on the precise size and chemical composition of individual aerosol particles.

"In field studies, we strategically position our transportable instruments at ground sites that allow us to monitor the evolution of single particles in pollution over time," explained Prather. "In regional and international studies, we are using these instruments to study the effects of aerosols on visibility, regional climate and human health. These instruments can now be flown through clouds to directly measure the seeds that form clouds and their impacts on precipitation."

To study sea spray, which is controlled by biochemical and physical processes in the ocean, including breaking waves and phytoplankton blooms, Prather and her colleagues established a unique ocean-atmosphere interaction facility that produces natural sea spray aerosol in a controlled setting. This approach allows unique studies of how ocean biology is impacting the composition of our atmosphere and changing our climate.

"This is an extremely complex problem as there are thousands of different biologically derived organic species that get ejected in sea spray particles, yet only 10 to 20 percent of them have been identified," said Prather, who is working with her colleagues to address how human activities versus natural ocean biology processes are impacting clouds, climate and precipitation. "CAICE studies are directly addressing some of the largest gaps in our understanding of climate change, the largest environmental problem facing humanity in the 21st century and thus the results of these studies have major implications for the common good."

The Distinguished Chair in Atmospheric Chemistry also holds a joint appointment at Scripps Institution of Oceanography, where she is a co-principal investigator on a project to build the Scripps Ocean Atmosphere Research Simulator (SOARS)—technology that will mimic the ocean

with unprecedented accuracy, enabling scientists to explore how the introduction of pollutants by human activities are changing the chemistry of the ocean and atmosphere.

“In environmental research, multi-disciplinary collaborations are critical to making a difference on solving complex problems,” noted Prather. “During my career, the most impactful collaborations have been with meteorologists, oceanographers and marine biologists.”

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