

## Facing Up to Climate Change

**By Charles F. Kennel**  
**Dickson Professor Emeritus of Atmospheric Science, SIO**  
**and Sanford Lakoff**  
**Professor Emeritus of Political Science**

*In the North this offensive is underway. Enemy forces have seized huge swaths of territory; with each passing week, another 22,000 square miles of Arctic ice disappears. Experts dispatched to the battlefield in July saw little cause for hope, especially since this siege is one of the oldest fronts in the war. "In 30 years, the area has shrunk approximately by half," said a scientist who examined the onslaught. "There doesn't seem anything able to stop this."*

*In the Pacific this spring, the enemy staged a daring breakout across thousands of miles of ocean waging a full-scale assault on the region's coral reefs. In a matter of months, long stretches of formations like the Great Barrier Reef – dating past the start of human civilization and visible from space – were reduced to white bone-yards.*

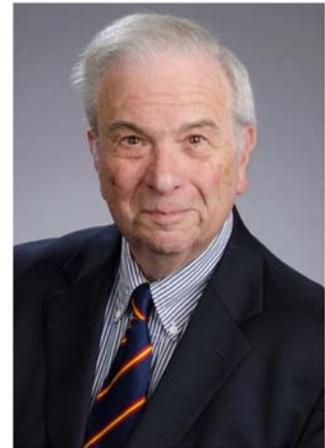
*Day after day, week after week, saboteurs behind our lines are unleashing a series of brilliant and overwhelming attacks. In the past few months alone, our foes have used a firestorm to force the total evacuation of a city of 90,000 in Canada, drought to ravage crops to the point where southern Africans are literally*



**Professor Emeritus Charles F. Kennel**

*eating their seed corn, and floods threaten the priceless repository of art in the Louvre. The enemy is even deploying biological weapons to spread psychological terror: The Zika virus, loaded like a bomb into a growing army of mosquitoes, has shrunk the heads of newborn babies across an entire continent; panicked health ministers in seven countries are now urging women not to get pregnant. And as in all conflicts, millions of refugees are fleeing the horrors of war, their numbers swelling daily as they're forced to abandon their homes to escape famine and desolation and disease.*

**Bill McKibben**, "A World at War," *The New Republic* (September 2016)



**Professor Emeritus Sanford Lakoff**

The 2016 election campaign has ended with the election of a president who pledges to undo America's participation in global climate negotiations on climate change. The inescapable truth remains, however, that that no more urgent challenge confronts the →

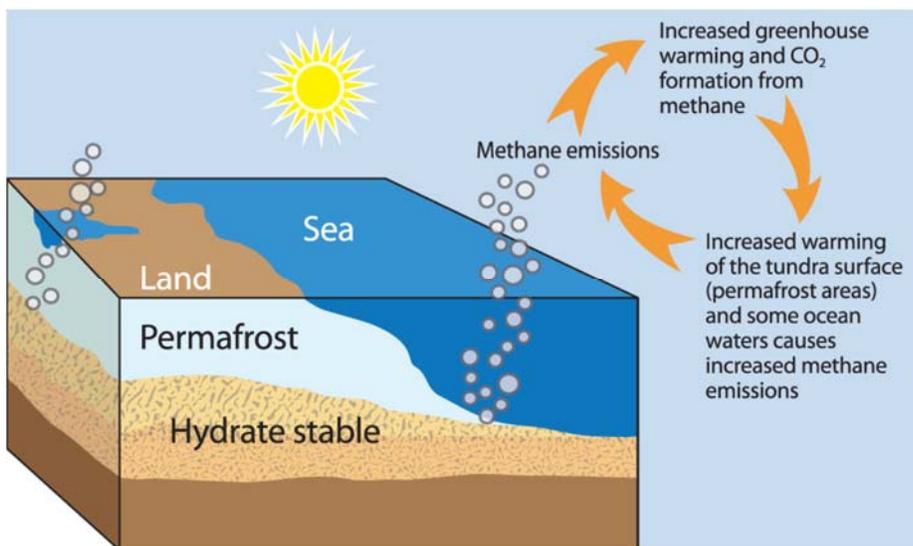
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world. McKibben does not exaggerate in comparing it to a war waged against humanity by a relentless foe. It is time to mobilize the entire American academic community, its natural and social scientists, its humanists and religious scholars, its campus managers, and its alumni, to help ensure the continuance of our civilization into the next century. UC President **Janet Napolitano** has set the entire university on this path. UCSD is leading the way and an epic battle for public attention lies ahead.

In 2015, President **Obama** adroitly enabled the U.S. to play a leadership role in a global conclave on climate change by persuading other world leaders to set as its goal a voluntary accord rather than a treaty -- knowing a climate treaty would again fail to gain ratification by the Senate. President-Elect **Trump** has pledged to repudiate the Paris agreement; he will have the support of a Republican Congress whose science committee chair flatly rejects the scientific consensus on climate change.

Climate change has been, is, and must continue to be a major concern at UCSD, where the issue was first brought to the world's attention. In 1957 **Roger Revelle** and **Hans Suess** published a landmark paper affirming the hypothesis advanced by the Swedish chemist **Svante Arrhenius** in 1896 that the atmospheric increase of "greenhouse gases" (chiefly carbon dioxide) due to the burning of fossil fuels would raise global temper-

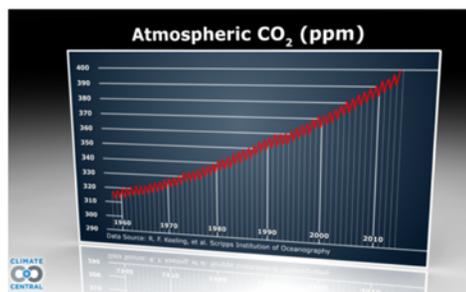


atures, with potentially serious adverse consequences. Early empirical findings followed showing that only some of the CO<sub>2</sub> emitted by human activities would be absorbed by the oceans. More than half would linger in the atmosphere for at least twenty years. (We know today that the number is closer to a hundred years.) This estimate was based on lab experiments; the key question was whether the atmospheric concentration was actually increasing. To find out, Revelle recruited **Charles David Keeling** from CalTech. Keeling installed a monitoring station atop Mauna Loa in Hawaii. By 1961 the iconic "Keeling curve" charting the steady rise of atmospheric CO<sub>2</sub>—now an historic artifact displayed on a wall of the National Academy of Sciences headquarters -- showed unmistakably that CO<sub>2</sub> levels were rising at rates consistent with human industrial activity.

It was not yet obvious, however, whether the rise in atmospheric CO<sub>2</sub> concentrations translated directly into rising global temperature. Elaborate studies to determine the complex linkage followed, synthesized in a series of major reports by the Intergovernmental Panel on Climate Change. SIO and UCSD researchers have figured prominently in the five IPCC reports generated since 1990--notably **V. "Ram" Ramanathan, Rich-**

**ard Somerville, and David Victor.** These studies, continually refined by new evidence, show that the rising concentrations are indeed responsible for global warming. The IPCC has warned that unless the world's nations take timely steps to reverse the increase, rising sea levels would inundate islands and coastal communities; storms and flooding would be intensified; more endangered species would go extinct; famine and forced migration could result from deforestation and loss of agricultural productivity; and new diseases would arise from vectors moving as the climate changes. A potentially destabilizing potential would be the melting of permafrost in the far north, which could release trapped methane gases even more damaging than CO<sub>2</sub>.

The alarm raised by scientists led to the adoption of the Framework Convention on Climate Change by the U.N. in 1992, agreed to by 196 parties, including the U.S. Its objective is "to achieve . . . the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropocentric interference with the climate system." The first attempt to achieve that recommendation hit a political brick wall in 1997, when the US Senate refused to ratify the Kyoto Protocol. The political set-



*The iconic Keeling curve*

back was palpable, but in the end the Protocol would have failed and did fail. Its principal weakness was that it exempted developing countries like China and India that already were becoming the biggest emitters. It became clear that a truly effective agreement needs global participation. A new goal was reached in the 2009 Copenhagen Accord, which recognized “the scientific view that the increase in global temperature should be below 2 degrees Celsius.”

For a time, political, economic, and ideological conflicts continued to prevent action on climate change. Developing countries contended that the advanced industrial countries should be the ones to sacrifice while they were allowed to catch up. The oil and coal-producing states objected that they would bear too much of the burden of an energy transition. Skeptics questioned the validity of the scientific findings, pointing out that not long before scientists had warned of global cooling. The fossil fuel producers have been joined by opponents of government regulation who argue (like Senator **James Inhofe** of Oklahoma) that the science is a “hoax” perpetrated by a cabal of climate scientists driven by self-interest in winning grants and big-government radicals who want to override the free market. Major conservative spokesmen and media voices, until recently the Wall Street Journal editorial board, and lately the president-elect, have spearheaded the resistance. “The concept of global warming was created by and for the Chinese,” **Trump** has observed, “in order to make U.S. manufacturing noncompetitive.”

Climate science needed other scholars to make the case against the skeptics. While at UCSD the historian of science **Naomi Oreskes** (now at Harvard), with **Erik Conway**, published *Merchants of*

*Doubt*, which had an immediate impact on the way the media portrayed the scientific consensus on climate change. Earlier, in 2004, Oreskes had shown that 97% of the papers published by climate scientists in refereed journals accepted that humans were partially responsible for climate change. *Merchants of Doubt* compared the climate disinformation campaign of the skeptics with the efforts of the tobacco industry to cast doubt on the research on the harmful effects of smoking.

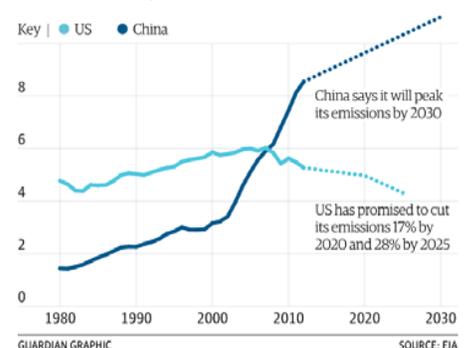
The growing sense of frustration led to a redesign of the climate negotiations. Five years of serious political thinking led to the breakthrough achieved at “COP21” --the twenty-first “conference of parties” to the original UN covenant. Thanks to strong leadership, effective diplomacy, and a well-designed agenda, this conference produced the 2015 Paris accord. The deal recently went into effect when 55 countries responsible for 55% of global greenhouse gas emissions formally signed it. It is not guaranteed to work. As the newspaper *The Guardian* has put it, “The overall agreement is legally binding but some elements – including the pledges to curb emissions by individual countries and the climate finance elements – are not.” The accord relies on voluntary pledges by the assembled nations, using their own accounting standards, and on sub-international consortia. There is no enforcement mechanism other than “naming and shaming.”

The emphasis on voluntary efforts and consortia rather than an overall agreement on targets follows the recommendation of UCSD political scientist **David Victor**. In his *Global Warming Gridlock*, Victor suggested that rather than strive for an impossibly utopian comprehensive and mandatory global regime, it would be bet-

ter to rely on “bottom-up initiatives at national, regional, and global levels.” There are now many examples of such initiatives. Our own campus has been cited for major efforts in promoting energy sustainability. In 2014 California and Quebec agreed to use cap-and-trade rules to reduce emissions, and Manitoba and Ontario are set to follow suit. Low-lying islands are entering another consortium. Gov. **Andrew M. Cuomo** of New York has set a goal of getting 50 % of the state’s power from renewable sources by 2030. The U.N. Collaborative Program on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries was launched in 2008. With Governor **Jerry Brown’s** leadership, California’s legislators agreed to slash the state’s emissions to 40% below 1990 levels by 2030, along with other measures. Even oil-rich Texas now gets 16% of its electricity from wind turbines and is poised to install enough solar power in the next five years to place second to California on that score.

The two largest greenhouse gas emitters, the U.S. and China, reached an agreement to reduce emissions in 2015. The U.S. intends to achieve an economy-wide target of reducing its emissions by 26%-28% below its 2005 level in 2025 and to make best efforts to reduce its emissions by 28%. China intends to achieve the peaking of CO<sub>2</sub> emissions around 2030, to make best efforts to peak early, and to

CO<sub>2</sub> emissions, billion tonnes



increase the share of non-fossil fuels in primary energy consumption to around 20% by 2030. Both sides intend to continue to work to increase ambitions over time.

The agreement between China and the U.S. was one of the main reasons COP21 was a success. Another was Pope Francis' encyclical, *Laudato Si*, which emphasized that acting on climate change is a moral obligation. Prior to the writing of the encyclical, the Pontifical Academies of Sciences and Social Sciences co-sponsored a conference that outlined the scientific and social challenges of climate change and sustainability. Scripps' Ramanathan co-chaired this conference, which was also attended by **Walter Munk** and Kennel from SIO, as well as Oreskes. Another reason was that a new spirit of cooperation with advanced nations is emerging in the developing world, symbolized by the easy passage of the UN Sustainable Development Goals in September, 2015, just three months before the Paris conference.

The 2015 Paris agreement is an auspicious start, even though fulfillment of the pledges would result in the temperature rising by at least 2.7 degrees, not the 1.5 degrees agreed upon. But the agreement creates a pathway to solution, since the countries agreed to return every five years to review, and presumably update, their commitments. As in other areas of international cooperation—like arms control and monetary policy—they must have confidence that economic competitors are taking similar actions and that the collective effort is leading to real improvements in environmental quality and social wellbeing. Governments at all levels will implement only those emission strategies that work economically and socially. Their citizens must believe that if their leadership is demanding long-term

discipline it is also protecting them from the short-term risks of climate change. Success depends on joining political credibility to technical innovation.

Putting the Paris agreement into full effect will require new and different roles for natural and social science. In addition to answering questions that have been a mainstay of scientific assessment, research will need to focus more on providing information that is directly useful to those government officials, managers of firms, and NGOs that are searching for practical ways to control emissions and manage climate impacts from the local to global levels. Chief among these new responsibilities will be the development of sophisticated indicators of the stress that human activity is putting on both the climate and social systems.

As the tangible evidence has mounted -- notably that the last ten years have been the warmest on record -- American public opinion has begun to shift. In a January 2013 survey, a Pew survey found that 69% of Americans say there is solid evidence that the earth's average temperature has gotten warmer over the past few decades, up six points since November 2011 and twelve points since 2009. But voters are not yet convinced that it deserves priority attention. In an international survey of 39 publics last year, Americans were among the least concerned about climate change. When asked last November about long-range foreign policy goals, 37% named global climate change as a top long-range goal; by comparison, 83% cited guarding against terrorist attacks and 81% named protecting American jobs as top goals.

The World Economic Forum in Davos announced after the Paris Conference that the greatest single

threat to the world economy was the failure to mitigate or adapt to climate change. But the opposition of the newly elected president and majorities in both houses of Congress threatens all progress on climate change in the U.S. Nonetheless, there is real hope that American technological and economic innovation will continue to play a leading role, regardless of the formal actions of the government. As the economist **Paul Krugman** has pointed out, "the technological and economic basis for such action [to lower emissions] has never looked better. In particular, renewable energy — wind and solar — has become much cheaper in recent years, and progress in energy storage looks increasingly likely to resolve the problem of intermittency (The sun doesn't always shine, the wind doesn't always blow.)" According to **Mark Z. Jacobson**, a civil engineer and director of Stanford's Atmosphere and Energy Program, the U.S. could generate 80 to 85% of its power from sun, wind, and water by 2030, and 100% by 2050, with a kind of Manhattan Project in all 50 states.

Now, more than ever, it is time for all of us in academia to mount a determined campaign of public education to make clear that climate change is a grave existential threat to this country and the world. UCSD should play a major role in that effort.

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*Kennel, former director of SIO, co-leads a University of Cambridge study of climate risk. Through SIO, the University of California is accredited to the UN Climate Negotiations, and every year sends a delegation of faculty and students to them. Kennel recently attended the meeting in Marrakech, where ten students carried the UCSD flag with pride. Lakoff has studied and written on relations of science and government.*

## Engaging with What Lies Behind, Around, & Ahead: The Role of the Humanities and Arts at UCSD

By Cristina Della Coletta  
Chancellor's Associates  
Professor of Italian Studies  
Dean, Division of Arts &  
Humanities

I first visited a museum in the U.S. in the late 1980s. It was the John Paul Getty Villa in Malibu and the collection featured many Roman statues. The temperature inside was strictly monitored. You couldn't get close to the statues or a docent's face would materialize at your side like in the Haunted House at Disneyland. I had just spent time in Cairo. In Cairo the museums had open windows, lots of mummies, and cats stretching on sunny windowsills. And I had grown up in Italy, where city parks were littered with statues of armless ladies and bearded men on horses.

My first encounter with the Villa was disorienting. It spoke of a fascination with a past that had been displaced and rearranged somewhat incongruously, if tastefully. From what, to us Europeans, was the epitome of the horizontal society--the Southern California of freeways and suburban sprawl--the Villa fast-tracked you back into the depths of antiquity. Getty's aesthetic marvel started with an

act of reverence, in its literal meaning of "someone standing in awe" before something out of the ordinary. It worked for me, with a disorienting vengeance. But after awe, what?

There are two ways to come to terms with a space like the Getty Villa. One is to look at it as the rendering of a visionary's utopia, a nostalgic echo of voices long gone, of places remote. This is the past seen as *mise-en-scène*: a pretext to escape into an elsewhere that has all the conservative appeal of the exotic. The other way of coming to terms with that past is to engage with it, to activate it, to push back against it. This is the sense of the past that challenges the amnesias of horizontal thinking and the nostalgia of reverential wonder, in favor of the critical engagement with layers of meaning, of histories, and people. This is the sense of the past of the analytical mind, a mind that humbly learns how to build before it tears apart, how to bridge rather than divide, and how to thoughtfully preserve rather than completely forget. This is a humanist's mind.

A humanist's mind is self-reflectively aware of its own situated-ness vis-à-vis what lies *behind* (traditions, histories), *around* (present cultures and societies), and

*ahead* (expectations directed at the future). This mindset is especially relevant to a research university, like UCSD, which thrives on entrepreneurial innovation and forward-looking technologies, and the Division of Arts & Humanities promotes this type of situated and perspectival talent. We look actively at what is *behind* our students (their families, their stories, their education) and *around* them on campus and in the community, as we prepare them to look *ahead* with clarity of choice and opportunity for professional success. A \$2.59 million grant from the Andrew W. Mellon Foundation, entitled "Activating the Humanities in the 21<sup>st</sup> Century: A Collaborative Path for Transfer Students from Community College to Research University and Beyond," recently sealed a ground-breaking partnership between our Division of Arts & Humanities and the San Diego Community College District (SDCCD). The Collaborative builds new connections across the regional system of higher education, creating opportunities for students from traditionally disadvantaged communities while engaging faculty and graduate students from both institutions through shared teaching and support activities such as student outreach, and recruitment and retention programs; a summer academy in the humanities that prepares incoming transfer students for the demands of a research university; and a faculty connections program aimed at reinvigorating humanities education for the 21st century through, among other things, a robust digital infrastructure fostering digital literacy and commu-



*The Getty Villa, Malibu*

nity. An important goal of the Collaborative is to promote the understanding of the humanities among students, their parents, and society as a relevant and valued course of study with measurable benefits. We also wish to enhance the diversity of the campus with increased enrollment from low-income, under-represented and under-served minority students.

A sign of our campus commitment to the humanities is the support provided for the creation of the Institute of Arts & Humanities (IAH). Launched this past October (Humanities Month), the Institute is one of the key divisional initiatives to promote the arts and the humanities in an interdisciplinary framework on campus and beyond. The Institute is devoted to scholarly work in four primary areas: (a) equity, diversity, and inclusion, with a focus on race, ethnicity, and social justice; (b) global arts and humanities, with an effort to link investigation of diverse cultures across geographic and chronological boundaries; (c) public arts and humanities, with collaborations with local and regional libraries, museums, and communities and, (d) digital arts and humanities, with an emphasis on how digital tools can support new forms of research, pedagogy, art practice, at and beyond the university. In the words of IAH director Professor **Luis Alvarez**: “the Institute pushes the arts and humanities in new directions, and brings multiple constituencies together in the understanding that humanistic knowledge makes better scientists, physicians, or engineers as much as it does better artists, historians, or philosophers.”

A commitment to interdisciplinary investigation marks the Division of Arts and Humanities. UCSD is a world leader in creating

medical, scientific, and technological innovation. Discoveries in these areas are reshaping the possible—the “not yet”—with breathtaking speed. As new knowledge impacts society, important questions about its ethical applications emerge. Ethics is about informed choice. Are we well equipped to make informed choices? Are the health professionals, policy and lawmakers, scientists, and innovators whom we trust for a better tomorrow trained to choose wisely? Are they prepared to answer emerging questions from new discoveries that culminate in the common good? Can we balance important progress and beneficial applications against concerns about the misuse of new technologies? Ethical reasoning helps society and its decision-makers recognize important distinctions. The ability to think critically and make the appropriate distinctions comes through a holistic education attained through the liberal arts.

At UCSD, the Division of Arts and Humanities works to empower our future leaders, scientists, scholars, artists, and physicians through its broad and thoughtful courses of study. Taking this commitment further, the division is currently at work to design an Institute of Practical Ethics (IPE) that will integrate the realities of scientific discovery with the moral investigation of field-leading ethicists. The envisioned IPE will bring together philosophers and scientists to debate and analyze important ethical questions and pave new interdisciplinary paths in ethical research, transforming our world-leading institution’s scientific research and its practical applications with a new philosophical rigor promoting “science for the common good.” To keep pace with the development of new science, we need innovations in

bioethics, environmental ethics, big data ethics, clinical ethics, research methodologies, and more. Building on the campus’s history of intellectual daring, the IPE will be a bridge between academia and policy, between scientists and humanists, and between technologists and the general public. We expect this dialogue to provide our experts with the clearest foresight into what must be done to achieve the greatest benefits while reducing the risk of harm to future generations.

As technological advances continue to prompt changes in the ways that we interact with others, learn and create, artists play an important part in integrating novel technology into human activity. By strengthening technical training for emerging artists and building their capacity to innovate, we supply the arts with a versatile cadre of practitioners prepared to make the most of advances in computing and engineering. At the same time, artists as scholars will partner with those who develop technology-based solutions for our rapidly transforming world, bringing to bear their lived experience as performers, authors, designers, painters and sculptors – among others – in guiding the expressiveness and cultural continuity of breakthrough invention. Our faculty and student artists are creating dynamic links between humanism and technology as they combine artistic vision and performance with scientific/technical research and development, and critical/theoretical investigation. A vivid new world where innovation allows human beings to live better and more freely is not merely enhanced by artists – it depends on their mastery in connecting what has been to what can be.

As UCSD comes of age, its past and its present acquire tex-  
→



Anecdote, continued from page 7.

## How to Become Canadian

For those so traumatized by the presidential election that they are thinking of heading north, advice from someone who spent seven years in Toronto before winding up in La Jolla:

*Dress warmly and bring galoshes.* Although global warming lowered Canada's national thermostat last year by 30%, it still gets chilly. You can count on not breaking a limb on the ice if you plan to arrive in early May—April in Vancouver. Head to Myrtle Beach for the winter.

*Forget about using French outside Quebec.* The country really does have "two solitudes," as a famous writer put it. And in Montreal wear an American flag pin to stay safe.

*Don't be surprised if you turn on the TV and see 20 minutes of caribou marching across the screen.* Broadcasters are required to include some "Canadian content" along with all the standard American soaps and sitcoms.

*Canadians are just as religious as we are.* Only they worship hockey. "He shoots – he scores!" is their version of "Exultate Deo!"

*Learn the language.* Practice saying *garadge* instead of garage, *shedule*, not schedule, and *oat*, not out. And of course end every declarative sentence with "eh?"

*Be prepared for a lot of repetition in national life.* **Trudeau** was the prime minister when I got there and Trudeau is the prime minister today. (Yes there's a parallel in California but at least it's the same **Brown**.) Every few years the separatist Parti Québécois calls for a referendum on whether to secede. Then the fierce winter descends and the Quebecers forget about it because they get too busy digging out. Trudeau *père* was once reported to

## Chronicles

Newsletter of the UCSD Emeriti Association



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have hurled a foul epithet at a hostile questioner in Parliament. He denied it, saying what he had said was "Fuddle Duddle!" His son **Justin** will probably resort to similar euphemisms.

*Finally, don't be surprised if you find Canada not all that different from the U.S.* They say up there that Canada was supposed to have the best of three national influences: British government, American know how, and French culture, but instead wound up with British know how, French government, and American culture. Some truth in that.



## Mark your Calendar!

***Emeriti & Retirement Associations  
Festive Holiday Party (\$10 per member)***

***Saturday, December 3, 1 - 4 PM  
Ida & Cecil Greene Faculty Club***

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**Clifford Kubiak, Distinguished Professor of Chemistry  
& Bio-chemistry**

*"Solar Fuels-Liquid Fuels from Sunlight, Water & Air"*

**Wednesday, January 11, 3:30 - 5:00 PM**

*Ida & Cecil Greene Faculty Club*

