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Lee Latimer 2010 Petersen Award Recipient

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Chair's Message

Paul Vartanian

The California Section is always open to new ideas and welcomes anyone who wants to help in its activities. We have a group of very involved members who enjoy the

many activities we have, but there is always room for more as we try to expand our service to the members and help bringing the good works of the chemical sciences to the attention of students and the public.

A new item is the listing of job openings on our web site, www.calacs.org. For a nominal fee employers who have openings in the chemical area may list their jobs and members may respond to those that interest them. We hope this expands a help to our unemployed members find suitable jobs.

One old item you may not be aware of is our sponsorship for a long-term care insurance program offered by the John Hancock Life Insurance Company. The Section does not receive any compensation of any type for this program, but publicizes it only for the welfare of its members. Several members have found that this is a competitive program for long-term care insurance and that it fit into

their general life financial planning. If this type of insurance fits into your financial planning you may contact Allen E. Vivell, Jr., MBA, CLU (CA License # 0B80402) of John Hancock (925) 946-4445, for additional information or view a brochure at: http://www.jhltc.com/uploadedFiles/Product_and_Programs/Custom_Care_II/Product_and_Benefit_Brochures/ltc_4701_cap.pdf?n=7875

This month we honor the 50 and 60 year members of the American Chemical Society at a luncheon. It is a good opportunity to hear short stories of how their careers progressed over the years and simultaneously have a good Saturday lunch.

We also have the Walter B. Petersen Award at this meeting. Lee Latimer has served the Section in a number of ways since he moved into our area. It is a well deserved honor for him to be presented with the award, named for a long serving member of the Section and Past Chair, Walter Petersen. I hope that this meeting fits into your plans.



*American Chemical Society
May Meeting Luncheon
Honoring 50 and 60 Year Members of the
American Chemical Society
Walter B. Petersen Award Presentation*

Date: Saturday, May 22, 2010

Time: 12:00 noon, social; 1:00 pm, lunch; 2:00 pm, presentations

Place: The Solano Bar and Grill, 1133 Solano Avenue, Albany, California

Lunch: Cost \$21, Salad and choice of:

Oven Roasted Breast of Chicken, or

Vegetarian Dirty Rice, or

Grilled Miso Glazed Atlantic Salmon Fillet

Reservations: RSVP by Friday May 14, to the Section office by e-mail to:
office@calacs.org or call (510) 351-9922

The American Chemical Society honors those members who attain 50 and 60 years of membership. The list of those in the California Section who have attained these honors this year includes:

50 Years

Evan Appleman
David Chan
William Foshee
Guenter Grethe
John Hannah
Hugh Hempill
Lloyd Kuhn
Harry Metzger
Jerry Moseley
William Nicholson
Dilip Ray Chaudhuri
Frank Snitz
Evan Thompson
Raymond Ward
John Wilson
Joseph Wirth
Shao Yuan

60 Years

Jared Abell
Berni Alder
Hermas Beaudet
Douglas Currell
William De Acetis
Glenn Fuller
Robert Glass
Charles Greene
Y. Gust Hendrickson
Bacon Ke
Joe Lavigne
Robert Lindblom
Harold Mason
Jesse Meadows
Robert Micheli
Carl Moeller, Jr.
Arthur Morgan, Jr.
David Nethaway
N. Ogimachi
John Zderic

The Walter B. Petersen Award

This award honors the memory of Walter B. Petersen by recognizing a person who has made significant contributions over a period of years to the well being of the California Section. Walter B. Petersen was noted for his many years of outstanding service to the Section. He held numerous section offices and was Chair of the California Section in 1969. He authored a popular column in the *VORTEX* entitled "Personals by Petersen" that covered news of promotions, awards and general information about Section members. Thus it is in his honor, with recollection of his high standards of service, that we recognize others who have given significantly to the advancement of the California Section. This award was established in 1982 and is supported by the California Section. Nominees must be a member, a former member, or an affiliate of the Section.

This year's recipient is Lee Latimer, former Section Chair, current Councilor, and Chair of the Local Section Activities Committee of the ACS.

California Section - American Chemical Society 2010 San Francisco Bay Area Science Fair Special Awards

The Section again participated in the San Francisco Bay Area Science Fair held on March 22 to 25, at the San Francisco County Fair Building in Golden Gate Park by judging entries for a special awards certificate of \$100, and a subscription to the ACS magazine CHEMMATTERS. Two entries were selected for the Section awards. The awards are made for excellent entries that involve some principle of the chemical sciences. The awards were presented to the students by Dr. Trudy Lionel, the co-chair of the Women Chemists Committee, at the Awards Ceremony held by the Fair on March 25.

We congratulate all the Fair participants and especially the two students who received the Section's awards:

Student Timmy Brown
School Woodside Elementary
Entry Title The Power of Oxygen
Teacher Mr. Dolyniuk

Caroline Ho
St. Matthew Catholic (San Mateo)
Natural and Effective Ant Repellants
Mrs. Salvatto



**MODERATION
AND COMMON
SENSE.
IS THERE
HOPE?**

Attila Pavlath
Was I the voice crying in the wilderness during the past two years? I started out

with that feeling. As I am writing the epilogue of this series, I hope it is not just wishful thinking that I was able to start you looking at the energy problem with this title in mind. Judging from the number of responses I received, I think that the light at the end of tunnel is indication of logical thinking and not the light of another train coming from the other direction. In the previous part, I pointed out that even the President of the United States realized the necessity of building more atomic energy generators. Recently, he continued to approach the problem through common sense balance by lifting the ban on some offshore drillings and urging the development of more alternate energy sources.

I am optimistic that the way I wrote shows the scientific approach towards easing the energy problem. I say, "easing" not "solving" the problems. Why? I did not address the most important major factors of the problem, since it cannot be discussed with a scientific approach, although the Moderation and Common Sense should apply to it too. This factor is the ever-increasing population of our world. We somehow keep sweeping this under the rug; perhaps it is not politically correct to talk about it.

The United Nation issued a 254-page document discussing population growth. The good news is that the population growth peaked at 2.2% annual rate in 1960, but it is still around 1.2% today. The present popu-

lation is 6.8 billion, which will pass the 7, 8 and 9 billion milestones in 2012 and 2040. The problem is even more serious considering that the growth will occur in the less developed countries, which make up more than 50% of the world population. These countries are rapidly increasing their per capita energy consumption to approach those of the developed countries. Around 1960 the world population was 4 billion with two-thirds of them in underdeveloped countries. At that time their per capita energy consumption was 6% of that of the United States. China, the most populous nation in the world wnet from 6% to 14% today. Obviously, their people want to have the same conveniences as the developed countries, e.g., cars, refrigerators and appliances.

What is the solution? Among the alternate energy resources I have discussed, only the nuclear fusion is capable of providing enough energy for thousands of years to meet the ever-increasing energy hunger of an increasing population. Naturally, the population growth coupled with increasing per capita energy consumption will deteriorate the environment. Will someone come up with some solution to curb the population growth? This would deserve a Peace Nobel Prize, but the politicians rather attack problems with speeches instead of actions.

This is the last part of this series. I am assembling all of it in one file and I will be happy to send it to you. Perhaps you can use it in talking to neighbors, students in schools and civic organizations to spread the Moderation and Common Sense thinking. I also welcome your thoughts, corrections and criticism. Contact me at Attila Pavlath, WRRRC, 800 Buchanan, Albany, CA 94710 or AttilaPavlath@yahoo.com.

Thanks for listening.





ELK-N-ACS

Evaldo Kothny
Fumigant

In C&EN of October 27, 2008, p. 28 was an article about the use of the “highly toxic and controversial” methyl iodide as a soil sterilant. Con-

troversial, indeed. The article touches a similar vein as that of carbofuran. In another argument it is noted that methyl iodide is safer than its bromide cousin because it does not deplete ozone in the upper atmosphere. Unfortunately, in long term experiments with laboratory animals it shows that the substance is neurotoxic, suppresses thyroid hormone synthesis, damages DNA and is a carcinogen, i.e., it is not much different than a few common metals, tobacco or medications. Out in the environment, the substance is very unstable and decays fast, probably into free iodine and photolytic organic radicals.

The article reminded me that in one of the organic chemistry classes at the University of Buenos Aires, the professors Zappi and Calderon emulated some experiments glanced from here and suggested to the students synthesizing some alkylated halogen solvents. Among the student groups they were given the task of making either ethyl bromide, methyl iodide, or similar compounds. All that people had been exposed to vapors or had even enjoyed the pleasure of sniffing these ethereal solvents. Methyl iodide was really unstable and on the shelf quickly turned to a darker color. Fortunately, nobody got sick, had a headache or became drowsy during this one-of-a-kind practice.

Nevertheless, the temporary use of methyl iodide as a fumigant has concerned a large number of scientists and action groups, also academicians and governmental offices who oppose the practice. If the product is biogenically harmful, would anyone including the “fresh grocer” of channel 5 know the long term effect after a continued use of the substance or its degradation products on crops and consumers? Since most of the new

generation of scientists are inclined to conserve, would it not be better to switch to proven safer products, rather than risk destroying an Andean desert in the removal of large tonnages of iodine or endanger wildlife with cheap over-the-counter carbofuran? Better yet, make your own compost if you can and grow your own tomatoes and strawberries: they taste much better, are sweeter and more flavorful than the commercially grown varieties. Do not you agree?



NATIONAL LAB DAY

In 2009, a coalition of educators, science and engineering associations, philanthropies and other organizations announced the launch of National Lab Day (NLD), a new grassroots initiative designed to reinvigorate science and math education in the nation’s K-12 schools and after-school programs. Volunteers, university students, Science, Technology, Engineering and Math (STEM) professionals and, more broadly, members of the community are working together with educators and students to bring discovery-based science experiences to students in grades K-12.

This education initiative has been lauded by President Obama, where he proclaimed, “Lifting American students from the middle to the top of the pack in STEM achievement over the next decade will not be attained by government alone. I applaud the substantial commitments made today by the leaders of companies, universities, foundations, non-profits and organizations representing millions of scientists, engineers and teachers from across the country.”

NLD is more than just a single day, and events are occurring throughout the year and continuing thereafter. To find out more about the individual projects, and locate ones in your area that you might be willing to help out, see http://www.nationallabday.org/projects_map Note that you need to zoom in on the California Section to see all the events that are occurring in our region.

We hope you will join this effort to promote STEM education in California.





The Impacts of Impacts: Aspects of Catastrophic Climate and Ecological Changes by Asteroid Impact (Part 3)

Bill Motzer

In Part 1, I discussed current dinosaur extinction theory from the Cretaceous-Tertiary (K-T) boundary layer based on findings by Drs. Louis and Walter Alvarez and their colleagues. In Part 2, I reviewed some of the evidence and probable effects of the Chicxulub asteroid impact. What is the importance of understanding the environmental/envirochemical effects of asteroid/comet impacts? There are several:

(1) Understanding Global Extinction

Events: Global extinction events by impacts are rare, perhaps now occurring on the order of 50 to 100 million year intervals. However, smaller impacts occur on a millennium basis (e.g., Barringer or Meteor Crater in Arizona, a 1,200 m wide crater produced by a 50 m wide iron-nickel meteorite) and on a century basis (e.g., on March 3, 2009, a 20 to 50 m wide meteor - 209 DD45) passed at an altitude of 72,000 km over the south Pacific. Impact by an object of this size is believed to have flattened about 2,000 km² of Siberian forest in 1908 (the Tunguska Event) with an explosive force of 10 to 15 Mt_{TNT} (about the size of a thermonuclear bomb).

(2) Environmental effects of smaller impacts that are perhaps 50% of the size of the K-T event (i.e., 5 km diameter asteroids and assuming that they are singular and not multiple impacts) - may have immediate disastrous effects on civilization, including devastation from tsunamis (if the impact is oceanic), regional fires with associated soot and polycyclic aromatic hydrocarbon (PAH) contamination, immediate and drastic global climate change, perhaps resulting in a "nuclear" winter from the input of dust and SO₂ aerosols, subsequent global warming from large CO₂ inputs, and ozone destruction. These effects would drastically affect

agriculture: first from a nuclear winter by abrupt cooling and then from accelerated global warming from CO₂ when SO₂ aerosols settle out of the atmosphere. If the impact(s) occurred near a coastal urban area such as New York or Los Angeles, the immediate devastation from impact-derived tsunamis would be enormous and would also have extensive global consequences. Most likely modern human civilization would cease.

(3) Long term environmental effects on Earth's ecology would occur perhaps lasting decades to centuries on the short end of the time scale to tens of millennia on the long end. If the impactor is similar in size to the K-T asteroid, such ecological devastation could last up to 1,000 centuries.

How do we prepare for such an event and is there anything that we can do to prevent such a disaster from occurring? According to Astronaut Russell L. Schweikart, Chair of the B612 Foundation (www.b612foundation.org) we now have the capability to anticipate and prevent an asteroid impact. First we must detect and catalog more than 500,000 near earth objects (NEOs) over the next 15 years; then the space-faring nations must conduct mission planning for manned/unmanned spacecraft to intersect and divert potential impactors.

To paraphrase Sun Tsu (The Art of War): "...know thine enemy." In this case the enemy consists of various types of rock and metal asteroids hurtling toward the earth. We currently do not have a great amount of knowledge of the composition of the asteroid belt (which mostly lies between the orbits of Mars and Jupiter). Only a few dedicated robotic missions have occurred (i.e., Mathilde and Eros) to investigate the asteroid belt; therefore, we have to rely on other sources to determine asteroid compositions. Meteorites may reflect some asteroid compositions because asteroid collision fragments have been inserted into Earth's orbit; however, meteorite sources also include those of other origins such as ejecta from asteroid impacts on other planets and satellites (e.g., Mars and the Moon) where the ejecta had escaped back into space, comets

(Continued on page 12)

California Academy of Sciences Report

A Presidential Outreach a day before the 239th National Meeting in San Francisco.

This event was held at the California Academy of Sciences in Golden Gate Park. The Saturday event was planned by the National ACS Office of Community Activities staff members LaTrease Garrison, Clint Harris, and Alvin Collins, with the Committee on Community Activities (CCA) under Chair Lynn Hogue.

The volunteers began setting up tables outside on the East Patio of the Academy, next to the Maya Lin sculpture on Endangered Species.

There were more than twenty tables for experiments, sign-in, sign-out and computer survey, with posters, safety goggles and other supplies and equipment. Soon three buses arrived from Moscone Center bringing ACS volunteers from all over the U.S.

and Puerto Rico. There was a great deal of excitement and enthusiasm as the mostly student volunteers set up the experiments. One could see many wearing T-shirts from their home institutions: CSU Fresno, Barry University (Florida), CSU Chico, Central Michigan University, U. of Arizona, Florida Southern College, Huntingdon College (Alabama), Illinois Valley Community College, Lake Forest College (Illinois), NOBCCHE (National Society for the Professional Advancement of Black Chemists and Chemical Engineers), San Fran-

cisco State U, Southeastern Oklahoma State University, Spelman College (Georgia), Texarkana College (Texas), UC Berkeley, U San Francisco, Wilkes University (Pennsylvania), Florida International University, Loras College (Iowa), U of Puerto Rico, South Texas College, U of Tennessee Martin, and CUNY-College of Staten Island!

The sustainability experiments were designed for youthful scientists and included pencil electrolysis, Lincoln penny surface tension, iron in breakfast cereal, producing oxygen gas and more. The most visually arresting was Magic Nuudles for chemical structures which quickly morphed into amazing hats.

Visitors to the Academy on that special Saturday were enticed to the patio to try the experiments and received chemistry goodie bags in return. The highlight of the event was the visit by Joe Francisco, who clearly enjoyed meeting the volunteers, and the atmosphere



of fun with Chemistry. Volunteers and other ACS visitors had a wonderful opportunity

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to mingle with students and faculty and the visitors.

After four hours, the experiments were packed up and volunteers had time to visit the Aquarium, Planetarium, Rain Forest, Living Roof and other exhibits before boarding their buses to return to the Moscone Center.

Many thanks go to the ACS staff, to Chevron for the safety goggles, and to Tisha Hong of the Academy of Sciences Special Events Department for a very successful day.

California chemists will have another opportunity to visit the Academy for a family event being planned later in the summer this year.

Trudy Lionel, Co-Chair WCC



Picture Captions

Page 9 Paul Vartanian and Trudy Lionel
Page 9 ACS President Joe Francisco
Page 10 below Trudy Lionel and SFSU Volunteers



May Historical Events In Chemistry

Leopold May
May 2, 1855 Pennsylvania and Lehigh Zinc Company was incorporated on his date.

May 4, 1892 On this date, T. L Willson of Spray, SC. made acetylene.

May 5, 1905 Proctor & Gamble Co., was incorporated on this date.

May 6, 1635 Three hundred years and seventy-five years ago, Johann Joachim Becher was born on this date. He was a phlogiston theorist and considered matter to be made of four principles; water and three "earths", vitreous, combustibile, and mercurial

May 6, 1742 Jean Senebier, who was born on this date, showed that green plants in light converted 'fixed air' (carbon dioxide) to 'dephlogisticated air' (oxygen).

May 7, 1871 Richard B. Moore, who advocated the use of helium for balloons and dirigibles, was born on this day. He supervised the production of radium salts in US.

May 10, 1860 One hundred and fifty years ago on this date, Robert Bunsen and Gustav R. Kirchhoff announced the discovery of cesium (Cs, 55).

May 12, 1910 One hundred years ago in 1910, Dorothy Crowfoot Hodgkin was born. Using x-rays, she determined the structure of Vitamin B12. She received the Nobel Prize in Chemistry in 1964 for her determinations by X-ray techniques of the structures of important biochemical substances.

May 15, 1796 Edward Jenner inoculated boy with cowpox virus on this date.

May 18, 1901 Vincent du Vigneaud, who studied sulfur-containing proteins, including insulin, was born on this day. He researched transmethylation and the metabolism of single carbon compounds. In 1955, he received the Nobel Prize for his work on biochemically important sulfur compounds, especially for the first synthesis of a polypeptide hormone.

May 20, 1860 One hundred and fifty years ago on this date, Eduard Buchner was born. He discovered alcoholic fermentation without yeast cells in 1896 and zymase in 1897. In 1907, he was awarded the Nobel Prize in Chemistry for his biochemical researches and his discovery of cell-free fermentation.

May 23, 1854 Edgar Fahs Smith, who was a researcher in electrochemistry and history of chemistry, was born on this date. He served three times as President of ACS.

May 26, 1865 Max Julius Louis Le Blanc, born on this date, did research on electrochemical polarization and electrodes introducing the hydrogen electrode.

May 27, 1840 Lars F. Nilson, who was born on this day, discovered scandium in 1879.

May 28, 1887 Kasmir Fajans established the radioactive displacement law and initiated the concept of heat of hydration of gaseous ions. He was born on this date.

Additional historical events can be found at Dr. May's website, <http://faculty.cua.edu/may/Chemistrycalendar.htm>



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from the Oort Cloud and Kuiper Belt, and interstellar debris. Meteorite compositions and classifications are quite complicated; most are silica rich (rocky materials with some metals) consisting of chondrites (those that have been heated), achondrites (those that have been melted and differentiated), stony irons composed of metals (i.e., iron with nickel ranging from 5 to 20%) and accessory phases such as sulfide minerals, and metallic iron.

More important are meteorite densities: measured chondrite bulk densities range from 1.58 to 3.75 g/cm³. Stony irons have higher densities (4.16 to 4.22 g/cm³), pallasites have even higher bulk densities (4.82 to 4.97 g/cm³) because they contain significant amounts of metallic iron, and iron meteorites tend to have the highest bulk densities (6.99 to 7.59 g/cm³). Densities are important because the chondrites and achondrites can be easily crushed (with laboratory crushing strengths of 1 to 10 bars), whereas the metallic meteorites are extremely strong (with strength of about 3.5 kbars) and are ductile. The latter compositions may be difficult to destroy with even nuclear explosives.

Asteroid compositions are even more difficult to determine with most categorized by instrument-based spectroscopy (with visual spectra ranging from ~0.4 to ~0.9 - 1.1 μm) and reflectivity (visual albedo, when available and radar returns). There are about 20 asteroid classes, grouped into C-Type (carbonaceous), S-type (siliceous or stony and stony-iron), and M-type (metallic). However, M-type asteroids have virtually no reflectance and are difficult to detect; and these are the ones that we are most concerned with because of their high densities.

Once NEOs have been cataloged and their compositions and densities have been determined, then mission plans to intersect these bodies can be implemented. These may range from (1) destruction strategies including the use of conventional or atomic explosives or (2) deflection strategies such as gravitational tugs and changing the NEO's albedo, planting of solar sails, or installing rocket motors

to change the NEOs orbit. If the NEO is detected and approaches from Earth's night side, we may have sufficient preparation time; if it is detected and approaches from the Sun, we may not.

Lest you think that all of this is science fiction or conjecture, Apophis is a NEO, approximately 240 m in diameter with a mass of 1.7×10^{10} kg. Discovered in 2004, it will first approach Earth in 2029 at a distance of ~29,400 km (18,300 mi). There is a small probability of impact (~2.7%) in 2029. However, it may miss Earth by passing through a gravitational keyhole ~600 m across. If that occurs then a future impact could then occur on April 13, 2036. As of October 7, 2009, the impact probability was 1:250,000). NASA has calculated an impact release of 510 Mt_{TNT} (about 50 times the Barringer and Tunguska events).

It would be ironic if the "cosmic cannonballs" that caused the extinction of so many species, also enabled the rise of sentient specie that could anticipate and prevent its own destruction. Perhaps the dinosaurs did not die in vain.

(Note: an excellent review of the Chicxulub asteroid impact was just recently published by Schulte, et al., in the March 5, 2010 issue of Science, v. 327, pp. 1214-1218.)



New Chair-elect for the California Section

Due to unforeseen circumstances the Chair-elect has had to resign his position. The Section Bylaws provide that a vacancy in the office of Chair-elect shall be filled by the nomination of a candidate by the Chair of the Section and approved by a vote of at least two thirds of the Executive Committee. We are fortunate that Dr. Bryan Balazs agreed to be the candidate and his appointment was confirmed unanimously at the March Executive Committee meeting. Dr. Balazs previously served as Chair of the Section in 1997. Dr. Balazs will succeed to the position of Chair in January 2011.

Sustainability Engagement Event

During our spring National Meeting in San Francisco, ACS hosted an innovative Sustainability Engagement Event (SEE). The SEE brought together people in support of Goal 3 of the ACS Strategic Plan for 2010 and Beyond. Within the coming weeks, all ACS members and stakeholders will be invited to participate in the resulting action teams to integrate them into the ACS structure and make these projects into a reality.

A preliminary list of ideas that were refined includes:

Linking Chemists with Non-Profit Service Organizations that can Apply their Chemical Expertise

How Chemists Can Help with Major Recycling Efforts and Inspire the Public
Infusing Green Chemistry into the Curriculum

Greener ACS Meetings: Your Ideas

Sustainable Energy: Developing the Science and Technology

Suggest Policy Priorities for the ACS to Advocate (National, State, and Local)

Create Positive Viral or Buzz Marketing of

Chemistry and Sustainability

Incorporating Sustainability into the 2011 International Year of Chemistry Celebration

Promote and Develop Programs and Materials to Bring Sustainability into K-12 Education

Avoid and Reduce Pollution through Chemistry: Minimizing Waste Streams

Addressing the ideas that have resulted from the SEE requires the creative input of all the planet's scientists. Please revisit this site in the coming weeks for more information. www.acs.org/sustainability and join the continued conversation taking place at the ACS Network to develop the resulting ideas. Working together we can make the ACS vision of "Improving people's lives through the transforming power of chemistry," a reality.

Section Website

New on the Section website, www.calacs.org, is "Job Postings" located as the second item on the main menu bar. Companies that have a position open can purchase a listing for a minimum of 30 days. The listing company provides the copy usually in a pdf format that can be viewed and downloaded that describes the position and its requirements. We suggest that the listings be checked often because new listings can show up at any time.

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The New World of the Anthropocene

Environmental Science & Technology

In just two centuries, humans have wrought such vast and unprecedented changes to our world that we actually might be ushering in a new geological time period that could alter the planet for millions of years, according to a group of prominent scientists that includes a Nobel Laureate. They say the dawning of this new epoch could lead to the sixth largest mass extinction in the Earth's history. Their commentary appears in ACS' bi-weekly journal *Environmental Science & Technology*: "The New World of the Anthropocene."

Jan Zalasiewicz, Mark Williams, Will Steffen, and Paul Crutzen (the Nobel Prize-winning atmospheric chemist) reflect that recent human activity, including stunning population growth, sprawling megacities and increased use of fossil fuels, have changed the planet to such an extent that we are entering what they call the Anthropocene

(New Human) epoch. The notion of such drastic human influence was controversial for many years. However, as more potential consequences of human activity - such as global climate change and sharp increases in plant and animal extinction - have emerged. The Anthropocene (a term proposed by Crutzen a decade ago) has gained support. Currently, the worldwide geological community is considering whether Anthropocene should join Jurassic, Cambrian and other more familiar units on the Geological Time Scale.

Zalasiewicz, Crutzen and colleagues note that getting that formal designation could be contentious. But they conclude, "However these debates will unfold, the Anthropocene represents a new phase in the history of both humankind and of the Earth, when natural forces and human forces became intertwined, so that the fate of one determines the fate of the other. Geologically, this is a remarkable episode in the history of this planet."



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