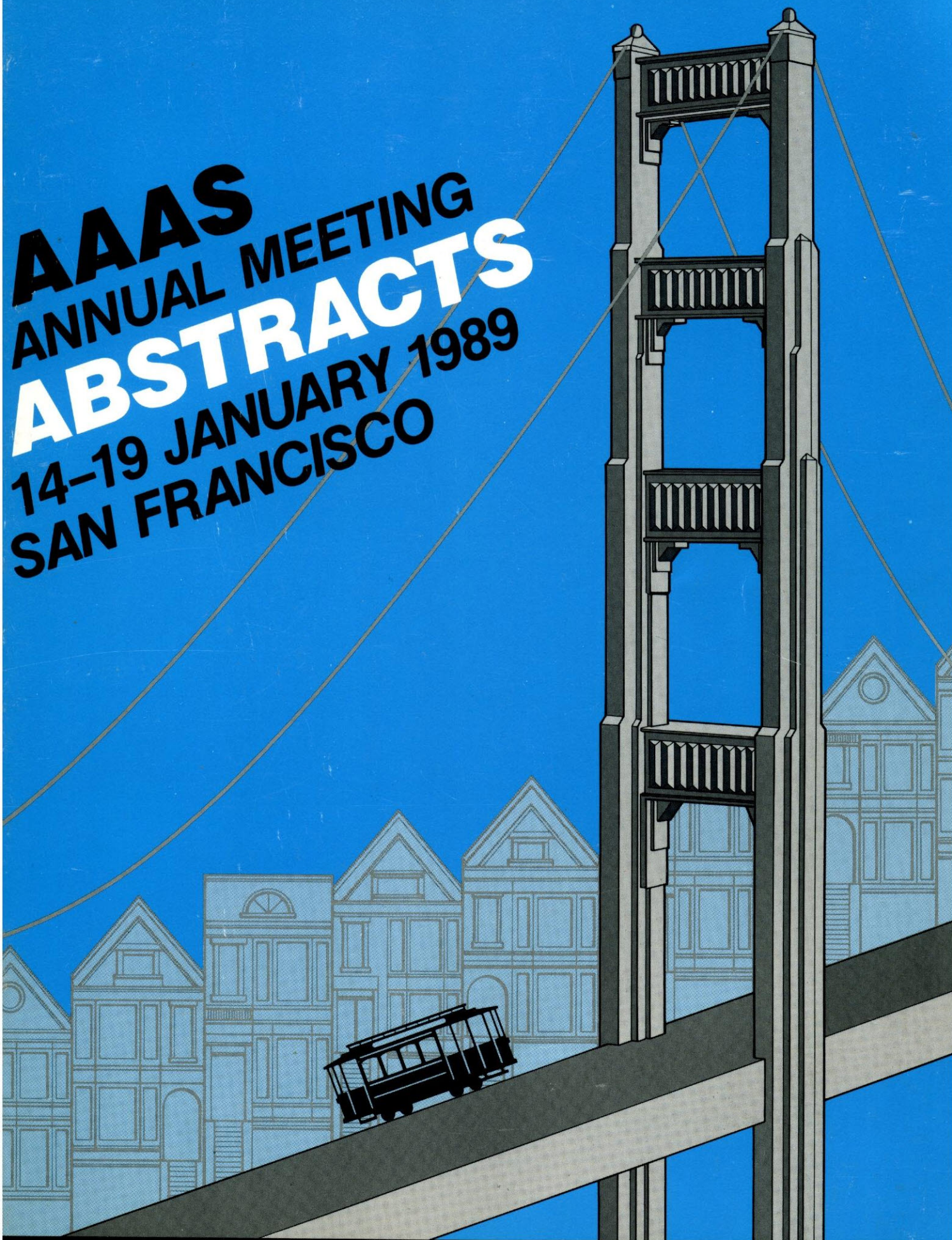


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(ONR 804) consisted of a quadrant photometer, an array of cooled solid-state particle spectrometers, a plasma probe, and an X ray detector. The SEEP photometer monitored the molecular nitrogen excitation line (391.4 nm) with two narrow bandwidth filters ( $\Delta\lambda = 0.8$  and  $2.4$  nm) and an atomic oxygen line (630.0 nm,  $\Delta\lambda = 1.6$  nm). These are known from groundbased studies to be components of the lightning spectrum. The geographic distribution of lightning flash events is found to be consistent with the location of the major thunderstorm centers. This global distribution was acquired at a local time ~10:30 in the evening. VLF waves generated from a lightning burst will interact with electrons in the Van Allen radiation belts causing some of the electrons in the belts to precipitate into the atmosphere. These Lightning-induced Electron Precipitation (LEP) events were measured in situ with the SEEP particle spectrometers during some of the observed lightning flashes. The observed lightning flashes were also accompanied on occasion by electric field transients as measured by the on-board plasma probe.

#### 242 Thunderstorm Effects in Space Observed with the SEEP S81-1 Satellite

H. D. VOSS, J. MOBILIA, and W. L. IMHOF (Lockheed Palo Alto Research Laboratory, Palo Alto, Ca. 94304)

Strong coupling is suggested between the terrestrial and space environment based on the low-altitude SEEP/S81-1 satellite data. The SEEP observations above thunderstorms include: remote sensing of 391.4 and 630.0 nm wavelengths from lightning flashes, in situ measurements near 200 km altitude of medium scale travelling ionospheric disturbances (TIDs), lightning-induced electron precipitation (LEPs) and electric field transients. Thunderstorm weather fronts have been identified from weather satellite maps as being located in the 391.4 nm flash regions and directly beneath the in situ SEEP measurements of TIDs, electric field spikes, and LEP bursts. The TIDs have a horizontal wavelength of about 200 km and may be the result of a gravity wave produced from the thunderstorm activity. The transient electric field signatures have rise times faster than the instrument resolution of .064 sec. The energetic electron precipitation bursts ( $50 < E < 500$  keV) have energy fluences as great as  $10^{-3}$  ergs  $cm^{-2}$  and were frequently observed in the radiation belt slot region between L-shells of 2 and 3.

#### 243 A Review of U.S.-Soviet Cooperation With Regard to Global Climate Change: 1974 - 1988. RENEE L. TATUSKO

(U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Climate Program Office).

Working Group VIII (WG VIII) fosters cooperative projects between the United States and the Soviet Union that are designed to enhance an understanding of the sensitivity of climate to natural and man-induced environmental changes. This group is one area of study under the general US-USSR Agreement on Protection of the Environment. Since its inception in June 1974, the organization and activities of WG VIII have been modified to reflect a shift in the growing awareness of potential environmental problems created by greenhouse gases, ozone depletion, and future climate change. Details on the establishment of the general bi-lateral Agreement, the importance attached to climate change by the Soviet Union and the United States leading to the foundation of WG VIII, and continued successes and future direction of WG VIII will be presented and discussed.

#### 244 Applying a Quasi-Completeness Test to Climate Research. FRED BERNARD WOOD (F B WOOD, SR) (Computer Social Impact Research Institute, Inc., P.O. Box 5583, San Jose, CA 95150)

When I review the recent work on climate and atmospheric carbon dioxide with the "zeitgeist" of the MIT Radiation Laboratory (1941-1945) and the spirit of testing hypotheses of the 1953 AAAS Section L discussions, I feel that current researchers are not attempting to examine the complete climate system. A quasi-completeness test would start with an accounting for the matter and energy coming from the nuclear fusion energy of the sun and the matter and heat coming from

radioactive decay in the center of the earth. These two streams of energy become connected through the nutritional minerals in the soil derived from tectonic processes and glaciation, affecting the tree growth and the photosynthesis utilization of carbon dioxide as proposed in the Hamaker Thesis (1982). There is a danger that catastrophic glacial precursor climate changes could destroy our food supply before the present scientific research program develops proof of the nature of the climate change. To help bring philosophers back into the picture, I have prepared a display of significant climate/carbon dioxide research work broken up into different segments, each in a different color.

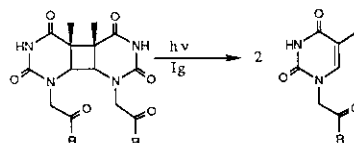
## 301-342 Biochemistry; Biology; Agriculture

(Mon., 16 Jan., 10:00-11:30 am)

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#### Photosensitized Cleavage of a Thymine Dimer by an Antibody. ANDREA G. COCHRAN (Univ. of Calif., Berkeley), RENEE SUGASAWARA (Igen, Inc.), PETER G. SCHULTZ (Univ. of Calif., Berkeley).

An antibody elicited to a (*cis, syn*)-thymine dimer has been shown to sensitize the photocleavage of the dimer. The wavelength dependence of the antibody-catalyzed reaction, as well as the quenching of antibody fluorescence upon substrate binding, are indicative of a binding site tryptophan. The quantum yield for photocleavage in the binding site is estimated to be at least 0.4. The antibody-catalyzed reaction shows saturation kinetics with  $K_m = 6.5 \mu M$  and  $K_{cat} = 1.2 \text{ min}^{-1}$ . The antibody exhibits a high degree of substrate specificity; the photocleavage of the corresponding N,N'-dimethyl substrate is not sensitized. This study represents the extension of antibody catalysis to carbon-carbon bond cleavage reactions.



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#### The Rational Design and Engineering of a Hybrid Enzyme. DAVID R. COREY (Univ. of California, Berkeley), DEHUA PEI (Univ. of California, Berkeley), PETER G. SCHULTZ (Univ. of California, Berkeley).

The relatively nonspecific deoxyribonuclease, staphylococcal nuclease was fused to an oligonucleotide binding site of defined sequence to generate a hybrid enzyme. A cysteine was substituted for Lys 116 in the enzyme via site-directed mutagenesis and coupled to an oligonucleotide containing a 3' thiol. The resulting hybrid enzyme cleaved single stranded DNA at sites adjacent to the oligonucleotide binding site. Subsequently further mutagenesis was performed on the enzyme to improve the hybrid's effectiveness and versatility.

5' P<sup>32</sup> GCGCCGACACACAAAATTAGAGTCTTAAAGAGAGAGATTTTTCACAGCTTCTTCCGCGGATTAACAC 3'

LNZ