DR. MELVILLE: I GUESS I NEED TO PRACTICE MY "ALOHA" IN A SLIGHTLY STRANGE ACCENT.

IT'S MY PLEASURE TO REPRESENT SCRIPPS INSTITUTION OF OCEANOGRAPHY IN WELCOMING YOU TO THIS SYMPOSIUM IN CELEBRATION OF THE 50TH ANNIVERSARY OF THE GLOBAL CO2 RECORD.

THESE MEASUREMENTS, BEGUN AND SUSTAINED BY DAVE KEELING THROUGHOUT HIS CAREER AT SCRIPPS, HAVE HAD A PROFOUND IMPACT ON CLIMATE SCIENCE AND OUR ABILITY TO REPRESENT TO THE PUBLIC IN A SINGLE GRAPH THE INEXORABLE EFFECT OF MAN'S IMPACT ON OUR PLANET. THE "KEELING CURVE" HAS BECOME AN ICON OF EARTH SCIENCES AND CLIMATE CHANGE.

IT MAY SEEM CURIOUS THAT THE MOST PROMINENT SINGLE SCIENTIFIC PROGRAM AT AN OCEANOGRAPHIC INSTITUTION SHOULD BE THE MEASUREMENT OF CO2 IN THE ATMOSPHERE, BUT DAVE KEELING FINDING HIS HOME AT SCRIPPS WAS DUE TO ROGER REVELLE, SCRIPPS DIRECTOR AT THE TIME, WHO HAD PUBLISHED, WITH HANS SEUSS, ON THE UPTAKE OF CO2 BY THE OCEAN, AND WAS INTERESTED IN STARTING ATMOSPHERIC CO2 MEASUREMENTS DURING THE INTERNATIONAL GEOPHYSICAL YEAR IN '57 AND '58. IT'S

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ALSO CONSISTENT WITH REVELLE'S STATEMENT THAT "OCEANOGRAPHY IS WHATEVER WE DO AT SCRIPPS."

(LAUGHTER)

AS A POST-DOC AT CALTECH, DAVE WAS ALREADY DEVELOPING THE SCIENTIFIC METHODS OF MEASURING CO2 IN THE ATMOSPHERE. HE HAD ALREADY RECRUITED A MARINE CHEMIST AT SCRIPPS, NORRIS RAKESTRAW, TO COLLECT GAS SAMPLES FROM SHIPS IN THE TROPICAL PACIFIC, REMOTE FROM ANTHROPOGENIC SOURCES. RAKESTRAW INFORMED REVELLE OF DAVE'S WORK.

WITH THE APPROACH OF THE INTERNATIONAL GEOPHYSICAL YEAR, HARRY WEXLER, THE DIRECTOR OF THE DIVISION OF METEOROLOGICAL RESEARCH AT THE U.S. WEATHER BUREAU, WANTED TO BEGIN MEASUREMENTS OF CO2 AT MAUNA LOA. HE TRIED TO RECRUIT DAVE TO LEAD THE PROGRAM, BUT EVEN THEN LA JOLLA SEEMED A MORE ATTRACTIVE PLACE TO LIVE THAN WASHINGTON, AND DAVE CAME TO SCRIPPS.

HOWEVER, IT WAS THE SUPPORT FROM WEXLER AT THE WEATHER BUREAU THAT WAS CRUCIAL IN GETTING DAVE'S PROGRAM GOING AND WAS THE BEGINNING OF A LONG RELATIONSHIP BETWEEN DAVE, SCRIPPS, AND NOAA THAT HAS OVER TIME EVOLVED INTO THE GLOBAL CO2 PROGRAM.

AS THAT PROGRAM HAS EVOLVED, IT HAS ENCOMPASSED THE ATMOSPHERIC, OCEANOGRAPHIC,

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TERRESTRIAL, AND OTHER APPLIED SCIENCES IN EXPLAINING THE SEASONAL CYCLES, SPECIFIC EVENTS, AND LONGER TERM VARIABILITY IN THE CO2 RECORD. WITH ANNUAL BUDGET CYCLES AND SEMANTIC ARGUMENTS OVER THE DIFFERENCES BETWEEN "MONITORING" AND "SCIENTIFIC" MEASUREMENTS, WE STILL HAVE TO ARGUE FOR THE BENEFITS OF LONG-TERM GLOBAL MEASUREMENTS IN ADDRESSING SCIENTIFIC AND SOCIETALLY IMPORTANT PROBLEMS THAT STRETCH OVER

DECADAL AND LONGER TIME SCALES. BUT THE CO2 RECORD SHOULD CLEARLY ESTABLISH THEIR IMPORTANCE.

I DON'T WANT TO DWELL ON THE HISTORY AND DETAILS OF THE CO2 RECORD. THEY WILL BE THOROUGHLY DISCUSSED OVER THE NEXT FEW DAYS BY THOSE MUCH BETTER QUALIFIED TO DO SO. HOWEVER, I DO WANT TO TALK A LITTLE ABOUT WHAT IS NEXT, ANOTHER MOTIVATION FOR THIS MEETING. THE INITIATION AND SUCCESS OF LARGE OBSERVATIONAL PROGRAMS IN THE EARTH SCIENCES USUALLY DEPENDS ON THE VISION AND PERSEVERANCE OF ONE OR TWO SCIENTIFIC LEADERS WITH SUPPORT FROM THEIR HOME INSTITUTIONS, GOVERNMENT, AND INTERNATIONAL AGENCIES, AND PERHAPS PHILANTHROPIC SUPPORT. MANY OF YOU AT THIS MEETING HAVE DEMONSTRATED SUCH LEADERSHIP. AN EXAMPLE OF SUCH A PROGRAM IN THE OCEAN SCIENCES IS ARGO, THE GLOBALLY DISTRIBUTED ARRAY OF APPROXIMATELY 3,000 PROFILING FLOATS THAT MEASURE PRESSURE,

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TEMPERATURE, SALINITY, AND CURRENTS OVER THE FIRST 1 TO 2 KILOMETERS OF THE OCEANS AND SEND DATA BACK VIA SATELLITE. ARGO IS ANOTHER EXAMPLE OF NOAA WORKING WITH SCRIPPS AND OTHER SCIENTIFIC INSTITUTIONS AND INTERNATIONALLY TO PROVIDE GLOBAL DATA PRODUCTS THAT WILL BENEFIT MANY AREAS OF CLIMATE SCIENCE. HOWEVER, THERE IS CONSIDERABLE ROOM FOR THE ARGO PLATFORMS AND THE RELATED OCEAN GLIDERS TO SUPPORT NEW INSTRUMENTS TO MEASURE NEW VARIABLES IN THE OCEAN. FOR EXAMPLE, IN RECENT YEARS SPECIALIZED VERSIONS OF THESE PROFILING FLOATS HAVE BEEN AIR-DEPLOYED AHEAD OF HURRICANES TO MEASURE UPPER OCEAN HEAT CONTENT AND HURRICANE-INDUCED OCEAN MIXING, WHICH WILL ULTIMATELY LEAD TO IMPROVED HURRICANE FORECASTING. BUT THERE ARE ALSO POTENTIAL DEVELOPMENTS OF ARGO THAT COULD ADDRESS THE CONSEQUENCES FOR THE WORLD'S OCEANS RESULTING FROM INCREASING ATMOSPHERIC CO2. THESE INCLUDE AN INCREASING TRANSFER OF HEAT FROM THE ATMOSPHERE TO THE OCEANS AND OCEAN ACIDIFICATION.

MY COLLEAGUES AT SCRIPPS WHO WORK ON ANOTHER LONG-TERM COLLABORATIVE EFFORT WITH NOAA, CALCOFI, THE CALIFORNIA COOPERATIVE FISHERIES INVESTIGATION, TOLD ME THERE ARE CONCERNS ABOUT POTENTIAL SUPPRESSION OF UPWELLING AND THE NUTRIENT

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SUPPLIES TO SURFACE WATERS BY STRONGER THERMAL STRATIFICATION OF THE UPPER OCEAN. THIS, ALONG WITH OCEAN ACIDIFICATION, MAY HAVE AN ADVERSE EFFECT ON MARINE ORGANISMS, ECOSYSTEMS, AND COMMERCIAL FISHERIES.

WHILE ARGO ALREADY MEASURES UPPER OCEAN TEMPERATURE PROFILES, IT COULD ALSO CONTRIBUTE TO STUDIES OF CO2 UPTAKE AND OCEAN ACIDIFICATION BY THE DEVELOPMENT OF SMALL, LOW-POWER SENSORS THAT COULD BE DEPLOYED ON PROFILING FLOATS AND OTHER DISTRIBUTED PLATFORMS LIKE GLIDERS. THIS IS JUST ONE EXAMPLE OF HOW WE CAN BUILD ON THE GLOBAL CO2 PROGRAM, AND I'M SURE THAT THERE ARE MANY OTHERS THAT WILL BE

DISCUSSED AT THIS MEETING AND BEYOND.

AS DAVE KEELING UNEQUIVOCALLY DEMONSTRATED, THE DEVELOPMENT OF NEW METHODS TO PRECISELY MEASURE IMPORTANT GEOPHYSICAL VARIABLES CAN PROFOUNDLY AFFECT OUR SCIENTIFIC UNDERSTANDING OF OUR PLANET, THE CONSEQUENCES OF OUR ACTIONS ON IT, AND THE DATA TO SEEK SOLUTIONS FOR ADAPTATION AND MITIGATION.

LIKE YOU, I LOOK FORWARD TO ATTENDING TALKS OVER THE NEXT COUPLE OF DAYS BY LEADERS IN THE GLOBAL CO2 PROGRAM, RELATED SCIENCES, BUSINESS AND GOVERNMENT.

I WISH YOU ALL A VERY SUCCESSFUL MEETING.

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THANK YOU.