DR. WEISS: FIRST OF ALL, I WOULD LIKE TO THANK ALL OF YOU WHO HAVE STAYED FOR THIS REMARKABLE THREE DAYS AND ARE HERE AT THE END, OR NEARLY THE END.

I GUESS I ENDED UP WITH SOMETHING OF A BEWILDERING SITUATION FOR WHICH I FIND MYSELF PARTLY RESPONSIBLE, AND THAT IS THAT THE TITLE OF THE PANEL DISCUSSION WHICH I HAVE BEEN ASKED TO CHAIR HAS THIS TITLE OF "NEW RESEARCH FOR A COMMITTED WORLD," WHICH IS, I GUESS, INTENDED TO KEEP YOU HERE, AND I DECIDED THAT BECAUSE WE HAVE SO MANY DISTINGUISHED PEOPLE HERE THAT WE REALLY OUGHT TO TRY TO MAKE THIS SESSION ONE IN WHICH WE BRING IN ALL OF THE POTENTIAL THINGS THAT HAVE COME UP IN THE LAST THREE DAYS AND TRY TO SEE IF WE CAN TIE AT LEAST A FEW RIBBONS AROUND THEM.

SO I HAVE ASKED SOME OF THE MANY DISTINGUISHED PEOPLE HERE TO HANG WITH US FOR ANOTHER ABOUT AN HOUR AND SIT UP HERE. SUSAN WILL HAVE TO LEAVE FOR THE AIRPORT; BUT I THINK, ACTUALLY, MAYBE WE CAN COME CLOSE TO TAKING ABOUT AN HOUR AND GOING ON WITH THE CONCLUDING REMARKS AFTERWARDS.

AS AN ATTEMPT TO STRUCTURE THIS, I TURNED

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THE TITLE OF THE SESSION INTO A QUESTION, WHICH YOU CAN SEE ON THE SCREEN; AND I GUESS IF WE TURN THIS THING HERE, THE PEOPLE ON THE PANEL CAN SEE IT, AS WELL. SO I THINK ONE OF THE WAYS TO STRUCTURE THIS, WHICH MIGHT BE A LITTLE BIT LESS STRUCTURED THAN THE PREVIOUS PANEL OF THIS TYPE THAT ED MILES RAN, IS TO TRY TO END UP WITH A SIGNIFICANT CONTRIBUTION FROM THE PEOPLE IN THE AUDIENCE BECAUSE I FEEL GUILTY THAT I DIDN'T PUT MANY OF YOU UP HERE ON THE STAGE, WHERE YOU PROBABLY BELONG.

SO WHAT I WOULD LIKE TO DO IS TO HAVE YOU ALL LOOK AT THIS QUESTION, BECAUSE IT REALLY IS A QUESTION -- THERE'S A SEA CHANGE GOING ON IN, I THINK, THE SCIENTIFIC COMMUNITY, AND THAT SEA CHANGE IS BETWEEN TRYING TO PERSUADE THE WORLD THAT WE HAVE SOMETHING THAT IS SERIOUS THAT WE OUGHT TO PAY ATTENTION TO AND PROVIDE THE SCIENTIFIC EVIDENCE FOR THAT, OR TRYING TO, FOR THAT MATTER, TO PERSUADE THEM THAT IT IS NOT SERIOUS, IF THAT'S THE WAY IT TURNED OUT; AND NOW WE FORESEE THAT WE'RE MOVING INTO A NEW WORLD IN WHICH THE QUESTION IS: WHAT IS THE PROPER ROLE OF SCIENCE? HAVE THE ZEALOTS, WHO HAVE ARGUED THAT IT'S TIME TO STOP DOING RESEARCH AND TIME TO DO SOMETHING, UNDERCUT THE SCIENTIFIC COMMUNITY? OR ARE THEY RIGHT? OR IS THERE A REAL ROLE FOR THE

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SCIENTIFIC COMMUNITY? SO THAT THAT IS THE KIND OF FOCUS I WOULD LIKE TO SEE.

AND IF THERE ARE QUESTIONS THAT SHOULD BE DIRECTED TO SOMEONE WHO IS NOT SITTING UP HERE WHEN WE GET TO THE TALKING PART, I THINK THAT IS FAIR GAME, AS WELL.

SO WHAT I WOULD LIKE TO DO IS ASK THE MEMBERS OF THE PANEL TO GO THROUGH THESE QUESTIONS,

THESE POTENTIAL SUBJECTS THAT I HAVE LISTED WITH BULLETS, OR PRODUCE THEIR OWN; AND WE WILL GO THROUGH THE TABLE A COUPLE OF TIMES, AND THAT WILL PROBABLY USE UP ABOUT HALF OF THE TIME, AND THEN WE'LL TRY TO ENGAGE THE REST OF THE PEOPLE IN THE ROOM AND CONTINUE WITH THE DISCUSSION.

ALL THE PEOPLE UP ON THE STAGE HAVE BEEN INTRODUCED AT VARIOUS TIMES DURING THE LAST THREE DAYS EXCEPT FOR ONE, AND THAT IS INEZ FUNG. WHEN I SAW INEZ ON THE LIST OF ATTENDEES, I JUMPED AT THE OPPORTUNITY TO ASK HER TO SIT UP HERE. INEZ IS A PROFESSOR AT THE UNIVERSITY OF CALIFORNIA, BERKELEY, A VERY DISTINGUISHED GLOBAL GEOCHEMISTRY, GLOBAL SYSTEM BIOGEOCHEMISTRY MODELER; AND WHEN I ASKED INEZ WHAT SHE WANTED ME TO SAY ABOUT HER, THE ONE THING SHE SINGLED OUT WAS THAT SHE HAD FILED AN AMICUS BRIEF IN THE MASSACHUSETTS VERSUS EPA THAT WAS NOT

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CHALLENGED IN THE SUPREME COURT.

SO HERE WE HAVE SOME PEOPLE WHO HAVE UNDOUBTEDLY SOMETHING TO SAY ABOUT THIS VERY KEY QUESTION AT THIS TIME IN THE GLOBAL CHANGED WORLD.

SO I THINK I WOULD JUST START DOWN THE TABLE. RALPH HAPPENS TO HAVE SAT NEXT TO ME, SO I WILL ASK RALPH TO BEGIN.

DR. CICERONE: I'M JUST SEEING THESE QUESTIONS FOR THE FIRST TIME, BUT ONE OF THE TOPICS I WANTED TO MENTION IS A RESEARCH OPPORTUNITY AND CHALLENGE I THINK FITS, AND THAT IS THE IDEA THAT WAS MENTIONED BY SEVERAL PEOPLE AT THIS MEETING; AND THAT IS, TO USE ATMOSPHERIC MEASUREMENTS AND POTENTIALLY OCEAN MEASUREMENTS TO MONITOR AND VERIFY VARIOUS THINGS, SUCH AS COMPLIANCE, INEFFECTIVENESS OF INTERNATIONAL AGREEMENTS TO LIMIT EMISSIONS, AND ALSO TO STUDY THE EFFECTIVENESS OF CARBON CAPTION AND SEQUESTRATION IN THE SAME WAY, AND SOMETHING THAT TED SCHUUR RAISED, IS THESE VERY OBVIOUS AND CLEAR THRESHOLDS THAT COULD GOVERN THE RELEASE OF CARBON FROM PERMAFROST. IT WOULD SEEM TO ME THAT THE SAME KINDS OF TECHNIQUES CAN BE USED TO LOOK FOR EARLY SIGNS OF LARGE EMISSIONS. AND THIS RESEARCH WOULD HAVE THE BENEFIT OF CONTRIBUTING TO CARBON CYCLE QUESTIONS; AND I THINK THIS IS A ROLE THAT WE HAVE

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ALL THE ELEMENTS, THE COMPONENTS IN HAND. SOME WORK HAS ALREADY GONE ON, LIKE, FOR EXAMPLE, WITH THE CHLOROFLUOROCARBON. BOTH THE NOAA DATA AND THE AGAGE DATA HAVE BEEN USED IN THIS MODE BEFORE TO DETECT, LET'S SAY, COVERT SOURCES OF CHLOROFLUOROCARBONS FROM VARIOUS COUNTRIES OR TO LOOK FOR UNINTENDED EMISSIONS, SO THAT THE COMPONENTS ARE IN HAND; BUT, YET, THIS WOULD BE A NEW ROLE FOR THE COMMUNITY OF SCIENTISTS, I THINK.

DR. WEISS: PERHAPS, I SHOULD HAVE SAID A FEW THINGS ABOUT WHAT I HAD IN MIND WITH SOME OF THE THINGS THAT WERE LISTED. I THINK REDUCING IMPACT UNCERTAINTIES IS PRETTY OBVIOUS. THIS MEANS MODELING

AND OBSERVATIONS, BECAUSE THERE ARE MANY THINGS THAT ARE UNCERTAIN ABOUT WHERE WE STAND AT THE PRESENT MOMENT.

FACILITATING EFFECTIVE LEGISLATION, I THINK, IS FAIRLY OBVIOUS, TOO. THE LEGISLATION THAT IS PASSED BY OUR LEADERS IN ALL THE COUNTRIES OF THE WORLD HAS TO BE EFFECTIVE, AND IT HAS TO BE VERIFIABLE AND TESTABLE. AND THEY HAVE TO BE LEGISLATING THE RIGHT THINGS. THEY HAVE TO PROVIDE ECONOMIC INCENTIVES AND THINGS OF THAT TYPE. THAT LEADS VERY DIRECTLY INTO THE VERIFICATION OF EMISSIONS. IT IS ALSO THE WAY IN WHICH WE REALLY

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KNOW THAT THE MONTREAL PROTOCOL WORKED, WAS BY MEASURING WHAT ENDED UP IN THE ATMOSPHERE.

SEVERAL TIMES AT THIS MEETING THE ISSUE OF HIGH-RISK AND HIGH-UNCERTAINTY EVENTS HAS COME UP, PROBABLY THE MOST STRIKING EXAMPLE FOR ME WAS -- WELL, THERE'S SEVERAL STRIKING EXAMPLES, BUT ONE OF THEM IS WHAT DO WE DO ABOUT THE PERMAFROST. IS THIS SOMETHING WORTH WORRYING ABOUT, IN WHICH CASE IT MIGHT BE VERY SERIOUS, OR MAYBE IT ISN'T; THINGS LIKE ICE PREDICTIONS, THINGS OF THAT SORT.

COMMUNICATION OUTSIDE THE SCIENTIFIC COMMUNITY, WE'VE HEARD A LOT OF OPINIONS EXPRESSED. SOME PEOPLE THINK THAT SCIENTISTS SHOULD COMMUNICATE BETTER TO PEOPLE WITHOUT A SCIENTIFIC EDUCATION, BUT IT'S DIFFICULT FOR SCIENTISTS TO DO THAT AND MAINTAIN THE OBJECTIVENESS THAT THEIR PEERS EXPECT THEM TO HAVE.

THEN, AT THE VERY BEGINNING OF THIS SESSION, WE HAD FROM RALPH KEELING, WHAT I'VE COME TO CALL THE KEELING PROBLEM, BECAUSE I HAD KNOWN DAVE KEELING FOR MOST OF MY LIFE, AND HE SPENT MOST OF HIS TIME JUST TRYING TO KEEP THIS THING GOING. AND THAT'S GOING TO BE A PROBLEM FOR THE FUTURE, FOR EVERYBODY WHO IS ENGAGED IN THIS LONG-TERM PROCESS, NOT ONLY MAINTAINING THE QUALITY OF THE OBSERVATIONS,

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BUT BY CONTINUITY, I ALSO MEANT PAYING FOR DOING IT RIGHT.

AND THEN, FINALLY, WE DON'T LIVE AS LONG AS THIS PROBLEM IS GOING TO LIVE; AND THOSE OF US WHO DON'T HAVE AN IDEA, ESPECIALLY THOSE OF US UP HERE WHO HAVE GRAY HAIR AND DON'T HAVE AN IDEA OF WHO IS GOING TO BE DOING THIS WHEN WE'RE NOT DOING IT ANYMORE, ARE PROBABLY NOT BEING VERY FORESIGHTFUL.

SO I'LL TURN IT OVER TO SUSAN.

DR. SOLOMON: I THINK THIS IS A GOOD LIST. I GUESS I WANT TO EXPAND A LITTLE BIT ON YOUR POINT ABOUT HIGH-RISK AND HIGH-UNCERTAINTY EVENTS. I DON'T DISAGREE THAT THAT IS ONE OF THE THINGS THAT WE NEED TO DO, BUT I WOULD ACTUALLY LIKE TO BROADEN THAT JUST A TOUCH. IT SEEMS TO ME THAT THAT ISN'T THE ONLY THING WE NEED TO DO. WE'RE GOING TO NEED TO UNDERSTAND HOW CLIMATE IS CHANGING IF WE'RE GOING TO HELP SOCIETY DO SEVERAL OF THE THINGS THAT IT SEEMS

TO WANT TO DO.
ONE OF THEM IS TO MANAGE THE PROBLEM. I TALKED A LITTLE BIT EARLIER WITH A FEW PEOPLE. I THINK THAT THE REALISTIC WAY TO VIEW THIS ISSUE IS PROBABLY THAT WE'RE NOT GOING TO SOLVE IT. IT'S NOT GOING TO BE LIKE ACID RAIN, WHERE WE GO AFTER IT AND BASICALLY SOLVE IT. WE'RE GOING TO MANAGE IT,

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INSTEAD, OVER TIME. AND IN ORDER TO DO THAT, WE'RE GOING TO HAVE TO UNDERSTAND REALLY HOW CLIMATE IS CHANGING. WE'RE GOING TO HAVE TO BE ABLE TO EVALUATE A WIDE RANGE OF OPTIONS; ARE WE GOING FASTER OR ARE WE GOING SLOWER OR MAYBE NOT DOING ANYTHING FOR AWHILE. ALL OF THOSE OPTIONS NEED TO BE THOUGHT ABOUT.

YOU KNOW, YOU CAN IMAGINE A WORLD IN WHICH YOU HAD THREE KATRINAS IN A ROW; AND, YOU KNOW, THERE IS NO QUESTION THAT THAT WOULD PROMPT A CALL FOR SOME ACTION FROM SCIENTISTS TO HELP UNDERSTAND IT. BUT YOU COULD ALSO IMAGINE A WORLD IN WHICH THE RAINFALL PATTERNS JUST SLOWLY SHIFTED AND KEPT SHIFTING, AND AGRICULTURE KEPT GETTING AFFECTED MORE AND MORE EVERY FIVE YEARS.

SO I THINK IT'S NOT JUST HIGH RISK AND HIGH UNCERTAINTY; IT'S THE TOTALITY OF THE PROBLEM, WHETHER OR NOT IT INVOLVES ABRUPT CHANGE. EVEN IF EVERYTHING IS SLOW, THE MANAGEMENT PROBLEM IS GOING TO BE A CHALLENGE THAT WILL NOT BE MET WITHOUT CONTINUING NEEDS FOR SCIENCE AND SCIENTISTS TO BE DOING VERY, VERY CAREFUL WORK.

DR. WEISS: PIETER.

DR. TANS: I SECOND THAT, BUT I SEE SEVERAL FUNCTIONS THAT SCIENCE CAN FULFILL, EARTH SCIENCE, IN

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PARTICULAR. CERTAINLY, NOW THAT THE QUESTION OF WHETHER WE HAVE CLIMATE CHANGE AND WHETHER HUMANS ARE THE MOST IMPORTANT CAUSE OF IT, THOSE QUESTIONS HAVE BEEN SETTLED; AND THAT MEANS OUR ROLE AS SCIENTISTS ALSO HAS CHANGED.

I THINK, BROADLY SPEAKING, WE, AS EARTH SCIENTISTS, HAVE FOUR TASKS OR GROUPS OF TASKS. THE FIRST IS NOT SO MUCH TO PREDICT, I THINK, WHAT THE EARTH CLIMATE AND THE EARTH SYSTEM IS GOING TO LOOK LIKE. I THINK THAT'S TOO HARD, MOSTLY, AT THIS POINT. I THINK WE'RE GOING TO HAVE TO VERY CLOSELY MONITOR IT; AND AS SOON AS ONE OF THESE FEEDBACK EFFECTS GETS OUT OF HAND, WE SHOULD BASICALLY DETECT IT AS SOON AS IS POSSIBLE TO DETECT. SO WE NEED MONITORING SYSTEMS THAT CATCH THOSE THINGS EARLY. FOR EXAMPLE, IF PERMAFROST STARTS TO GO IN A SIGNIFICANT WAY, IT'S IMPORTANT TO DETECT IT NOT FIVE YEARS LATE, BECAUSE A THING LIKE THAT HAPPENING IS AN ENORMOUS SIGNAL TO SOCIETY, AND WE NEED IT AS A SPUR FOR PEOPLE TO TAKE THE PROBLEM EVEN MORE SERIOUSLY, AND POLICIES WILL HAVE TO BE INGESTED. WE CANNOT AFFORD TO SEE IT FIVE YEARS TOO LATE. SO WE NEED THE MEASUREMENTS CAPABLE OF SEEING SUCH THINGS. THE SAME

GOES FOR, AS WE'VE ALREADY SEEN, ARCTIC SEA ICE, MASS LOSS FROM GREENLAND, ET CETERA.

THE SECOND TASK, I THINK, GROUP OF TASKS THAT WE HAVE IS WE HAVE TO HELP SOCIETY MITIGATE. I MENTIONED THIS YESTERDAY. I THINK CARBON TRACKER OR A SYSTEM LIKE CARBON TRACKER CAN BE DEVELOPED IN THAT WAY, AND IT NEEDS TO BE DONE NOT ON THE VERY LARGE SCALES THAT WE NOW ARE ABLE TO SAY SOMETHING REASONABLE ABOUT, BUT DOWN TO VERY REGIONAL AND, LET'S SAY, TO THE SCALE OF LARGE URBAN AREAS. I THINK ONE TASK THAT WE CAN CARRY OUT WITH A LITTLE BIT OF FURTHER DEVELOPMENT AND SOME INTENSIFICATION OF THE MEASUREMENTS IS TO ACTUALLY MEASURE FOSSIL FUEL EMISSIONS BY MEASURING MULTIPLE SPECIES AND BY MEASURING CARBON-14 DOWN TO THE SCALE OF LARGE METROPOLITAN AREAS. THAT'S QUITE A LARGE TASK, AND I DON'T THINK THAT A LABORATORY LIKE WE HAVE, THAT WE WILL BE ABLE TO DO IT ALL BY OURSELVES. I THINK WE WILL NEED PARTNERSHIPS WITH, ACTUALLY, THE STAKEHOLDERS, SUCH AS LARGE URBAN AREAS OR STATES. WE WANT PARTNERSHIPS WITH THEM TO DO THIS TOGETHER.

THIS BRINGS, OF COURSE, INTO THE FORE THE KEELING PROBLEM: HOW DO WE MAINTAIN QUALITY WHEN THERE ARE, SAY, 30, 40 DIFFERENT GROUPS ALL TRYING TO DO HIGH-QUALITY MEASUREMENTS? THIS IS DIFFICULT. AND I CAN THINK OF WAYS WE COULD DO THIS, PERHAPS, SUCH AS WE KNOW THAT AN ESSENTIAL ELEMENT OF QUALITY CONTROL IS DUPLICATION. SO I ENVISION, FOR EXAMPLE, THE SYSTEM WHEREBY STATES WOULD HAVE THEIR OWN MONITORING SYSTEM, AND WE WOULD DO A LITTLE BIT OF BACKUP. WE COULD HAVE AUTOMATED FLASK SAMPLES TAKEN IN PARALLEL WITH CONTINUOUSLY MEASURING INSTRUMENTS, AS DUPLICATE MEASUREMENTS, BECAUSE WE KNOW FROM EXPERIENCE THAT YOU CAN NEVER QUITE TRUST IN THE LONG RUN ANY SINGLE INSTRUMENT. IT'S NOT EVEN THE INSTRUMENT; IT'S THE ENTIRE INTAKE SYSTEM. TOO MANY THINGS CAN GO WRONG. AND THIS ALSO GOES INTERNATIONALLY. I MEAN, WE WILL NEED TO DO THIS IN A COLLABORATIVE WAY WITH INTERNATIONAL PARTNERS, AND A SIGNIFICANT AMOUNT OF IT IS ALREADY GOING ON.

AND THEN IN TERMS OF ADAPTATION, THIS IS NOT SOMETHING THAT I THINK WE, AS CARBON CYCLE MEASURERS OR MODELERS, WILL CONTRIBUTE THAT MUCH TO, FROM NOAA, I THINK. IT IS IMPORTANT THAT WE ARE ABLE TO PROVIDE AT LEAST NEAR-TERM PROGNOSES OF WHAT CLIMATE CHANGE IS GOING TO LOOK LIKE AT LOCAL SCALES BECAUSE THAT'S WHERE THE ADAPTATION TAKES PLACE. AND INCIDENTALLY, IF WE WANT TO DO A CARBON TRACKER-LIKE SYSTEM THAT IS SIGNIFICANT FOR THE LOCAL SCALES, WE NEED A CLIMATE MODEL AND A TRANSPORT MODEL, IN OUR CASE, OR TRANSPORT MODEL DERIVATIVE, IF YOU WILL, FROM A CLIMATE MODEL THAT HAS TREMENDOUS HIGH SPATIAL RESOLUTION. SO, I MEAN, IF NOAA OR SOME OTHER ORGANIZATION IS ABLE TO PRODUCE SUCH A MODEL, THEN WE

COULD USE IT.

AND FINALLY, THERE IS, I THINK, A FOURTH GENERAL TASK, AS WE MENTIONED SEVERAL TIMES IN THIS MEETING; THAT IS, WE, AS EARTH SCIENTISTS, WILL NEED TO BE ABLE TO TAKE A VERY INFORMED AND IN-DEPTH LOOK AT ANY OF THE MANY DIFFERENT PROPOSALS THAT ARE GOING TO EMERGE AS SOLUTIONS FOR CLIMATE CHANGE. WE HAVE TO BE ABLE TO TAKE A VERY CLOSE LOOK AT OUR POTENTIAL EFFECTS, UNINTENDED SIDE EFFECTS, AND HOW SUCCESSFUL THEY MIGHT BE; NOT SO MUCH WHAT IT COSTS BUT WHAT DO THE SOLUTIONS MEAN, WHAT ARE THE LIKELY CONSEQUENCES THAT WE MIGHT NOT BE HAPPY WITH.

AND THEN, FINALLY, THIS IS SOMETHING THAT IS ALSO VERY IMPORTANT AND DEAR TO MY HEART, AND WOUTER MENTIONED IT: WHAT WE DO, ALL OF WHAT WE DO AS SCIENTISTS SHOULD BE COMPLETELY OPEN AND SUBJECTED TO, SO WE MAKE OUR DATA AVAILABLE, WE MAKE OUR MODELS AVAILABLE, WE MAKE THE RESULTS AVAILABLE, AND OTHER PEOPLE CAN VERIFY IT AND DRAW THEIR OWN CONCLUSIONS. WE DON'T REALLY WANT TO HOLD ANYTHING BACK. AND I THINK THIS HOLDS GENERALLY. IN GENERAL, SCIENCE HAS DONE A REASONABLY GOOD JOB OF THAT. ALTHOUGH IT WAS CHALLENGED RECENTLY IN A SOMEWHAT UNPLEASANT WAY,

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THIS FAMOUS ARTISTIC CURVE WAS CHALLENGED BY A CONGRESSMAN, AND THE PEOPLE WHO HAD PRODUCED THAT RESULT, THE IPCC REPORT COULDN'T QUITE REPRODUCE WHAT THEY HAD DONE AND SORT OF GLOSSED IT. THIS IS SOMETHING THAT WE HAVE TO KEEP IN MIND, CERTAINLY IN THE UNITED STATES, A VERY LITIGIOUS SOCIETY, AS YOU KNOW.

MS. MORIN: I THINK IT'S VERY GOOD, I WANT TO ECHO SOME OF THE OTHER COMMENTS AND ADD TO THEM; FROM BEING A REGULATOR, I CERTAINLY, YOU KNOW, HAVE THAT PERSPECTIVE. AND THE WAY THAT SCIENCE HAS DIRECTLY HELPED OUR CAUSES IS IN THE IMPACT ANALYSIS, AND THAT IS CERTAINLY ON COSTS AND ENVIRONMENTAL AND ECONOMIC IMPACTS, AND MAKING THAT SMALLER SCALE IS SOMETHING WE'RE IN DESPERATE NEED OF, BECAUSE IT MAKES IT PERSONAL. AND THAT REALLY HELPS US, YOU KNOW, FACILITATE OUR EFFORTS THAT WE ARE TRYING TO DO; AND INTEGRATING THESE SCIENCE IMPACTS INTO FACILITATING LEGISLATION AND OTHER POSSIBLE CHANGES IN MAKING THAT IT IS SCIENCE-BASED IN TERMS OF LEGISLATION OR OTHER SOCIETAL CHANGES, WHETHER THEY'RE VOLUNTARY OR ENCOURAGEMENT, ARE VERY IMPORTANT, AND WE CONTINUE TO NEED THAT INFORMATION.

I'D ALSO LIKE TO SEE MORE SCIENCE BASED ON HAVING MORE INDEPENDENT ASSESSMENT OF VARIOUS

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POLICIES THAT REGULATORS TAKE AT THE STATE AND FEDERAL LEVEL. I DON'T FEEL WE HAVE A LOT OF INDEPENDENT ASSESSMENT ON HOW WELL SOME OF THESE POLICIES ARE WORKING, AND I ALSO SEE THAT INDEPENDENT ROLE WOULD BE VERY HELPFUL.

BUT THE LAST AREA I WOULD LIKE TO BRING UP THAT I DON'T KNOW -- IT HASN'T BEEN DISCUSSED MUCH AT

THIS CONFERENCE -- I DON'T KNOW IF YOU FEEL IT, BUT I CERTAINLY FEEL IT AS A REGULATOR IS THAT I AM VERY CONCERNED IN A BROAD SENSE ON WHAT HAS HAPPENED, AND I KNOW THERE ARE PAPERS ON THIS, THE KIND OF THE POLITICALIZATION OF SCIENCE IN THAT WE HAVE WITH OUR MEDIA-BASED SOCIETY AND OUR SOUND BITES AND SO FORTH, THAT THE RELIANCE ON SCIENCE AS SCIENCE IS ERODING; AND THAT AS OPPOSED TO THE DISCUSSION BEING ON VARIOUS POLICIES IN REACTION TO THE SCIENCE AND THAT IS WHERE THE DEBATE AND THE POLITICS SHOULD HAPPEN, WHAT I HAVE BEEN FIGHTING FOR TEN YEARS AS A REGULATOR IS THE POLITICS OF THE SCIENCE, AND TO ME THAT'S BACKWARDS. AND I JUST DO THINK THERE NEEDS TO BE MORE EFFORT AND MAYBE MORE EMPHASIS ON THE SCIENTIFIC COMMUNITY GETTING BACK THAT BASIS TO GOVERNMENT AND TO POLITICS, SAYING THAT NO, THIS IS THE SCIENCE, AND YOU HAVE TO ACCEPT IT. YOU CAN MAKE WHATEVER POLICY DECISIONS YOU MAKE, OR WHETHER YOU

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REACT TO IT, BUT I THINK WE'VE ERODED THAT KIND OF FUNDAMENTAL PRINCIPLE THAT WE WILL LOOK AT THE SCIENCE AND THEN WE WILL MAKE OUR SOCIETAL DECISIONS BASED ON THAT; THAT SCIENCE HAS GOTTEN VERY WRAPPED UP INTO POLITICS AND MEDIA CAMPAIGNS. IT IS VERY WORRISOME TO ME BECAUSE I SPEND A LOT OF TIME REFUTING THAT BECAUSE OF THAT. I THINK WE NEED TO SPEND SOME EFFORT GETTING THAT GROUND BACK OR AT LEAST NOT LOSING ANY MORE GROUND IN THAT AREA.

DR. FUNG: I HAVE VERY SPECIFIC THINGS THAT I'D LIKE TO PUT FORTH, AND A LOT OF IT IS BECAUSE SCOTT DONEY AND I, AND I SEE CHRIS JONES HERE, WE'VE PARTICIPATED IN THE CALCULATIONS OF A COUPLE OF CLIMATE PROJECTIONS, AND WE SEE A LOT OF UNCERTAINTIES; AND AT THE END OF IT, I WISH I HAVE DATA TO SHOW THAT I GET AN "A" OR SOMETHING LIKE THAT, BUT THERE'S NO DATA. WHILE WE'RE TALKING ABOUT MONITORING THE FUTURE, THE PROJECTION REQUIRES US TO GO INTO A NEW MODE OF OBSERVATIONS, NEW KINDS OF MANIPULATION EXPERIMENTS BECAUSE WE'RE GOING INTO A CLIMATE SPACE AND A CO2 SPACE THAT THERE IS NO ANALOGUE. WE'RE USING PRESENT-DAY RULES TO GO INTO THE FUTURE, AND WE HAVE NO CLUE, THERE IS NO GUIDELINES AS TO WHETHER THOSE RULES ARE APPLICABLE OR NOT.

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SO, AS SAID IN THE OCEAN SESSION, A LOT OF THE BIOLOGICAL MANIPULATION EXPERIMENTS ARE DONE IN BOTTLES OR IN VERY ISOLATED SITUATIONS THAT MAY NOT BE REPLICABLE IN THE REAL WORLD. SO I PLEAD FOR NEW KIND OF MANIPULATION EXPERIMENTS.

BUT FROM THE PERSPECTIVE OF PROJECTION AND ALSO BUILDING THE KIND OF MODELS, HIGH RESOLUTION, WE CAN DO HIGH RESOLUTION MODELS, WE'RE THINKING ABOUT BUILDING NEW MODELS WHERE WE CAN TEST HYPOTHESES ABOUT CARBON MANAGEMENT, ABOUT HYPOTHESES ABOUT MITIGATION, SO THAT WE CAN LOOK AT THE WHOLE CLIMATE, YOU KNOW, THE WHOLE SYSTEM IMPACT OF A PARTICULAR

STRATEGY; BUT IN ORDER TO DO THAT, WE NEED OBSERVATIONS. SO WHEN I THINK ABOUT OBSERVATIONS AND I THINK ABOUT THE MARVELOUS KEELING, THE CO2 CURVE, THAT'S ONE THING. I THINK ABOUT ME GOING FOR A CHECK-UP, OKAY; BUT THE OTHER -- I THINK ABOUT THE SATELLITE CO2 DATA THAT WALTER TALKED ABOUT IS LIKE GOING FOR A WHOLE BODY SCAN TO SEE IF THE WHOLE SYSTEM IS FUNCTIONING, HOW ALL THE ORGANS ARE DOING; BUT I ALSO SEE -- I'M PICKING UP FROM WHAT RALPH CICERONE SAID THE FIRST DAY, IS WHAT IS "SAFE," SO THAT WE NEED TO DEFINE WHAT IS SAFE AND WHAT IS NOT SAFE, WHERE THE CHALK POINTS ARE. AND IN ONE OF JIM HENSEN'S EARLIER PAPERS, HE SAID A QUARTER MILLION

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DEAD, OKAY, THAT'S A METRIC; AND SO FROM A QUARTER MILLION DEAD, WHAT WOULD BE THE SEA LEVEL RISE AND WOULD BE THE STORM SURGE AND THEN WHAT WOULD BE THE CLIMATE AND WHAT WOULD BE -- SO THERE'S METRICS THAT ARE NOT JUST IN GEOPHYSICAL PARAMETERS.

BUT GIVEN THAT, THEN WHAT I WOULD LIKE TO SEE IS EARLY WARNING SYSTEMS INVOLVED SO THAT WE'RE MONITORING IN VULNERABLE AREAS.

WE TALKED ABOUT THE PERMAFROST. BUT FOR THE CARBON SYSTEM, THERE IS A LOT OF CARBON IN THE TROPICS; AND THE DISCREPANCY, THE LARGE RANGE BETWEEN ALL THE MODEL PROJECTIONS FOR 2100 IS WHAT HAPPENS TO THE TROPICAL RAIN FOREST. DOES IT GET DRY ENOUGH, DOES IT GET DRY ENOUGH THAT THERE IS A DIE-BACK OF THE RAIN FOREST AND, THEREFORE, DECOMPOSITION OF THIS MASS AMOUNT OF CARBON RELEASED TO THE ATMOSPHERE, ET CETERA. SO WE CAN IDENTIFY THE SET OF MONITORING. THERE'S THE MONITORING. OKAY. THERE'S THE WHOLE BODY SCAN, THE SATELLITE DATA THAT GOES AROUND AND MAKES SURE THAT EVERYTHING, YOU KNOW, IS HAPPENING OR NOT HAPPENING THE WAY WE'RE LOOKING. BUT THERE'S ALSO VULNERABLE AREAS OR AREAS WHERE THERE IS ENOUGH SCIENTIFIC UNCERTAINTY THAT WE NEED TO GO IN AND FIGURE OUT WHAT IS GOING ON THERE.

THE RAIN FOREST HAS BEEN VERY SURPRISING.

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RECENT PAPERS FROM "CELESTIA" AND "SCIENCE" SHOW THAT PHOTOSYNTHESIS DURING THE HIGHER PHOTOSYNTHESIS, DURING THE DRY SEASON THAN THE WET SEASON, BECAUSE THEY'RE LIMITED BY SUNLIGHT AND NOT BY WATER, SO A LOT OF THINGS THAT WE HAVE IN THE MODELS, AND A LOT OF NEW OBSERVATIONS ARE CHALLENGING OUR UNDERSTANDING, ESPECIALLY OF THE RAIN FOREST.

MR. BRAINE: I'M GOING TO MAKE A LITTLE BIT OF A COP-OUT HERE AND SAY THAT I LOOKED AT THIS LIST, AND I SAW IT FOR THE FIRST TIME ABOUT TEN MINUTES AGO, AND BASICALLY SAW THAT EVERYTHING ON THAT LIST WAS IMPORTANT; AND THAT THE ROLE OF SCIENCE, TO ME, IS GETTING GOOD SOUND INFORMATION AND THE BEST INFORMATION POSSIBLE, AND THAT'S ABSOLUTELY CRITICAL IN THIS AREA. AND THAT IT'S REALLY HARD TO PICK, YOU KNOW, ONE OF THOSE AREAS IS MORE IMPORTANT THAN ANOTHER AREA.

I THINK THE THINGS THAT ACTUALLY STAND OUT TO ME, COMING FROM A STANDPOINT OF SOMEONE WHO IS A NONSCIENTIST, UNLESS YOU COUNT ECONOMICS AS A SOFT SCIENCE, LET'S SAY, IS THE FACT THAT UP THERE IS COMMUNICATION OUTSIDE THE SCIENTIFIC COMMUNITY. AND I THINK I WAS REALLY STRUCK IN THIS CONFERENCE -- WHICH BY THE WAY, I THINK THE PRESENTATIONS HAVE BEEN GREAT, PARTICULARLY FOR SOMEONE LIKE MYSELF, MANY OF

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THEM OUTSIDE OF MY FIELD, HAVE BEEN VERY, VERY INTERESTING. BUT THE COMMUNICATION WAS BROUGHT UP, I THINK, VERY WELL IN THE FIRST DAY IN THE SUMMARY OF THE IPCC REPORT, WHICH I THOUGHT WAS GREAT, BUT IT ALSO POINTED TO THE FACT THAT COMMUNICATION CAN BE A PROBLEM; AND THAT WITHOUT COMMUNICATION, EVEN THE BEST SCIENCE IS PROBABLY GOING TO BE, YOU KNOW, NOT LISTENED TO OR NOT HEARD; MORE IMPORTANTLY, NOT HEARD. SO THAT'S GOING TO BE ABSOLUTELY CRITICAL.

AND THAT ALL RELATES, I THINK, TO THE OTHER POINT THAT STRUCK A CHORD WITH ME, AND THAT WAS FACILITATING EFFECTIVE LEGISLATION. YOU KNOW, ONE OF THE THINGS THAT PEOPLE IN THIS COMMUNITY NEED TO UNDERSTAND IS THAT TODAY PEOPLE ARE WRITING LEGISLATION, AND THERE'S SOME VERY GOOD FEATURES OF THAT LEGISLATION, THERE'S ALSO, IN MY VIEW, PROBABLY IN SOME PEOPLE IN THIS ROOM'S VIEW, SOME VERY BAD FEATURES OF SOME OF THE LEGISLATION. THERE ARE PROVISIONS AND BILLS NOW THAT SERVE TO RESTRICT THE AMOUNT OF REDUCTIONS THAT CAN OCCUR OR OFFSETS THAT CAN OCCUR FROM CERTAIN METHODS, WHICH STRIKES ME AS SOMEWHAT ODD AND, FRANKLY, COUNTERPRODUCTIVE. BUT THAT'S THE WAY LEGISLATION IS BEING WRITTEN. NOW, PART OF IT, I THINK, COMES FROM THE FACT THAT PEOPLE ARE SOMEWHAT MISINFORMED ABOUT WHAT SCIENCE WOULD

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TELL THEM, AND SOME OF IT COMES FROM OTHER POLITICAL REASONS. BUT THE POINT IS THAT YOU, AS A COMMUNITY, NEED TO BE VERY INVOLVED IN THAT PROCESS, AS WELL AS THE POLICY MAKERS WHO ARE INVOLVED IN THAT PROCESS TODAY.

DR. WALSH: I'M SORT OF A GUEST ON THIS PANEL, BUT RAY INVITED MY OBSERVATIONS. MY FIRST OBSERVATION IS THE SUNSET OCCURS AROUND 5:30, AND THERE IS A MYTHICAL KONA GREEN FLASH THAT YOU DON'T WANT TO MISS, SO I'M GOING TO DO MY UTMUST TO GET YOU OUT OF HERE BEFORE THAT.

JUST TO EXPAND ON BRUCE'S COMMENTS, THIS IS THE ONLY OBSERVATION I HAVE FOR THIS SESSION, THIS WORKING GROUP III REPORT WAS INCREDIBLY POWERFUL, I THOUGHT, WHERE YOU REALLY GOT INTO DETAILS. YOU REALLY SAID, IF YOU DO THESE THINGS, ALONG THE LINES OF WHAT SOCOLOW AND PACALA HAVE BEEN SAYING, WE'VE GOT A PRETTY GOOD SET OF ADVICE, BEST ADVICE AVAILABLE. YET WE FIND IN MANY CASES, AS BRUCE INDICATED, SOME PEOPLE WANT TO BE VERY SELECTIVE ABOUT SCIENCE; AND IN SOME QUARTERS, THEY ARE PROPAGATING THE MYTH THAT WE HAVE A PRECISE

UNDERSTANDING OF HOW THE CLIMATE WORKS; YET BECAUSE WE'RE SOMEWHAT IMPRECISE ABOUT SOME OF THE MITIGATION OPTIONS, WE HAVE TO DISCARD THOSE. AND I CONTINUE TO

RUN THIS TAPE IN MY MIND. WE DON'T HAVE THAT LUXURY. IF ALL OF THE SCIENTIFIC WORK YOU HAVE ACCUMULATED OVER THE DECADES IS ANYWHERE NEAR CORRECT, WE NEED EVERY POSSIBLE MITIGATION OPTION.

SO TO ECHO BRUCE'S THOUGHTS AND IT ECHOES -- DURING THE BREAK SOMEBODY MENTIONED TO ME THAT MAYBE IF YOU DID LIKE A HALF-SIZE VERSION OF THIS IN THE BELTWAY ONCE A MONTH, THAT WOULDN'T BE A BAD THING AT ALL, HALF-SIZE BECAUSE YOU WOULD BE LUCKY TO GET PEOPLE FOR A DAY AND A HALF. THIS INFORMATION HAS TO GET PUT OUT THERE AGAIN AND AGAIN AND AGAIN WITH THE UP SIDE. ALL RIGHT. WE KNOW THE DOWN SIDE. WE KNOW THE RISKS ARE PROVIDED. AND THE UP SIDE IS WE KNOW WHAT SOME OF THOSE ANSWERS ARE RIGHT NOW, AND THEY ARE WIN-WIN ANSWERS. SO THAT'S THE ONLY OBSERVATION I HAVE.

DR. WEISS: I THINK MAYBE THE NEXT STEP WE MIGHT FOLLOW IS TO ASK MEMBERS OF THE PANEL IF THEY HAVE QUESTIONS FOR EACH OTHER OR THINGS THAT THEY THINK OUGHT TO BE STRESSED ABOUT POINTS THAT OTHERS HAVE MADE.

DR. FUNG: I WOULD LIKE TO ASK RALPH AGAIN: HOW DO WE DEFINE "SAFE"? I MEAN, HOW DO WE START THE PROCESS? I KNOW WE DEFINED IT ONCE UPON A TIME AS THE READINESS OF INFRASTRUCTURE TO DEAL WITH THE

CHANGE, BUT I DON'T KNOW WHAT PROCESS WE CAN PUT IN PLACE TO SAY EITHER FORGET ABOUT IT OR IGNORING THE REST OF THE WORK FOR THE TIME BEING, HOW CAN WE DEFINE "SAFE"?

DR. CICERONE: WELL, AS I IMPLIED THE OTHER DAY, I THINK IN MANY PEOPLE'S MINDS IT IS IMPORTANT THAT WE HAVE ENTIRE GOVERNMENTS WAITING FOR THE ANSWER, BUT I DON'T THINK IT IS JUST SCIENTISTS. SO WE GET BACK TO RAY WEISS' QUESTION HERE: WHAT SHOULD BE THE ROLE OF SCIENCE AND SCIENTISTS? I THINK WE REALLY HAVE TO PARTICIPATE IN THAT DEFINITION, BUT WE ALSO HAVE TO INVOLVE STAKEHOLDERS OF ALL KINDS, AND THAT IS GOING TO REQUIRE ENORMOUS COMMUNICATION. SO I THINK WE HAVE A ROLE, INEZ, BUT I DON'T THINK IT IS JUST OUR RESPONSIBILITY.

RAY, I WOULD LIKE TO TAKE ANOTHER CRACK AT SOMETHING. WHEN I LOOK AT YOUR QUESTIONS NOW, I SEE THAT THE FIRST FIVE OF THEM ARE REALLY ABOUT BEING USEFUL TO SOCIETY; AND I THINK IF WE DO THOSE WELL, THEN THE LAST TWO ARE GOING TO TAKE CARE OF THEMSELVES. AND I WANT TO TELL YOU ABOUT ONE ACTIVITY THAT WE'RE TAKING ON NOW AT THE NATIONAL ACADEMY OF SCIENCES. WE'RE TRYING TO FIGURE OUT WHAT WE CAN DO TO HELP TO ASSURE A SUCCESSFUL TRANSITION FOR THE NEW UNITED STATES PRESIDENT, WHOEVER THAT IS

GOING TO BE, AND TO PROVIDE HELP SO THAT THE NEXT

PRESIDENT WILL BE SUCCESSFUL. TYPICALLY, ABOUT THIS TIME WHEN THERE IS GOING TO BE A NEW PRESIDENT, EVERYBODY BRINGS FORWARD THEIR WISH LIST. IN FACT, WE'VE HAD FORMAL ADVICE FROM SOME PEOPLE, TELLING US THAT WE SHOULD BE PROPOSING NOW THE NEXT SET OF BIG SCIENCE PROGRAMS AND WHY WE SHOULD BE DOUBLING THE NSF BUDGET AND GET BACK TO DOUBLING THE NIH BUDGET AND ALL THAT KIND OF THING. BUT WE'VE DECIDED, INSTEAD, TO TAKE A VERY DIFFERENT APPROACH THIS TIME, AND WE'RE STARTING TO PREPARE, AND I THINK WE CAN HELP TO ANSWER RAY'S QUESTIONS.

THE APPROACH WE'RE GOING TO TAKE IS TO PREPARE VERY, VERY SHORT, CONCISE STATEMENTS FOR ALL OF THE CANDIDATES ON WHY THEY NEED SCIENCE AND TECHNOLOGY IN THE NEW ADMINISTRATION TO HELP TO RUN THE COUNTRY AND TO BE PRETTY SUCCESSFUL WORLDWIDE. SO WE'RE GOING TO NEED EXAMPLES. AND THIS COMMUNITY HAS PROVIDED SOME FANTASTIC EXAMPLES OF HOW, FIRST, QUALITY SCIENCE IS BEING USEFUL AND CAN BE USEFUL. IT'S STRIKING BECAUSE I'VE BEEN VISITED BY PEOPLE FROM SO MANY DIFFERENT COUNTRIES ASKING HOW OUR NATIONAL RESEARCH COUNCIL WORKS AND HOW IS IT THAT YOU GET SCIENTIFIC AND TECHNOLOGY ADVICE INTO THE UNITED STATES GOVERNMENT, AND WE CANNOT DO IT IN OUR

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COUNTRIES. BUT WHEN WE LOOK AT WHAT WE'RE DOING IN THIS COUNTRY RIGHT NOW, IT IS TERRIBLE. WE HAVE TO CONVINCE THE NEXT PRESIDENT THAT THIS IS NOT NORMAL, THE WAY WE'RE BEHAVING, WITH SO LITTLE SCIENCE AND TECHNOLOGY INPUT TO THE GOVERNMENT. SO WE'RE GOING TO TAKE A COMPLETELY NONPARTISAN, NONPOLITICAL APPROACH, WITH NO PRESCRIPTIONS; THAT IS, IF YOU CHOOSE YOUR TOP FIVE ISSUES WHERE SCIENCE AND TECHNOLOGY ARE INVOLVED, WE'RE NOT GOING TO TRY TO TELL THE NEW PRESIDENT OR THE CANDIDATES WHAT THE ANSWER IS. WE'RE JUST GOING TO TRY TO SHOW THEM, DEMONSTRATING HOW MUCH THEY'RE GOING TO NEED HIGH-LEVEL SCIENCE AND TECHNOLOGY INPUT; AND WE'RE COMPILING A LIST OF ALL THE TOP POSITIONS IN THE FEDERAL GOVERNMENT WHERE THEY'RE GOING TO NEED THAT INPUT, SO THAT WHEN THE TRANSITION COMES UP, THEY WILL HAVE SOMEWHAT OF A BETTER FEELING ON THE KINDS OF PEOPLE THEY'RE GOING TO NEED AND WHY.

AND I THINK RAY HAS MADE A VERY GOOD LIST OF THE WAYS WE CAN BE USEFUL, AND I REALLY THINK THAT SUPPORT FOR SCIENCE WILL FOLLOW WHEN PEOPLE UNDERSTAND BETTER OF HOW USEFUL WE CAN AND SHOULD BE.

DR. WEISS: ONE OF THE OTHER QUESTIONS I THOUGHT I MIGHT RAISE IS: WHO ISN'T HERE WHO SHOULD BE HERE? AND IN MY MIND, WHEN WE OFTEN BOUNCE THIS

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AROUND BECAUSE IT CAN DISTORT SCIENTIFIC DISCUSSION OR A DISCUSSION, LET'S SAY, BETWEEN THE BUSINESS WORLD AND THE SCIENCE WORLD, THE WORLD OF ECONOMICS, TO HAVE THE PRESS HERE, BUT I DON'T BELIEVE WE DO HAVE THE PRESS HERE, AT LEAST NOT SITTING THROUGH THREE DAYS OF THINGS. AND I'M TRYING TO IMAGINE WHAT

WOULD HAPPEN IF WE HAD ANDY REVKIN HERE OR TOM FRIEDMAN, EVEN, WHAT MIGHT HAPPEN.

ANYWAY, WE'RE KIND OF HALFWAY THROUGH THE TIME ALLOTTED, BELIEVE IT OR NOT, ESPECIALLY IF YOU'RE GOING TO SEE THE SUNSET AND HEAR SOME COMMENTS FROM OUR CONVENERS, SO I WOULD LIKE TO OPEN IT UP FOR PEOPLE TO RAISE QUESTIONS OR MAKE SPEECHES, AS LONG AS THEY'RE NOT TOO LONG.

DR. KEITH: DAVE KEITH.

I THINK THIS IS A REALLY NICE LIST OF THINGS. I AGREE WITH ALL OF THEM.

ONE THING YOU MIGHT CONSIDER ADDING TO THAT LIST IS FINDING WAYS TO REDUCE EMISSIONS. SO, OBVIOUSLY, THIS IS . . . I TAKE IT THIS WAS ADDRESSED TO THE EARTH SCIENCE COMMUNITY. EVEN FOR THE EARTH SCIENCE COMMUNITY, ACTUALLY FINDING WAYS TO REDUCE EMISSIONS IS SOMETHING THE EARTH SCIENCE COMMUNITY CAN PLAY A ROLE IN, WHETHER IT IS FIGURING OUT NOT JUST HOW CARBON CAPTURE AND STORAGE MIGHT FAIL, BUT

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THINKING ABOUT HOW TO MAKE IT WORK BETTER OR FIGURING OUT HOW WE MIGHT LEARN HOW TO USE WHAT WE KNOW ABOUT GEOCHEMISTRY TO DO A BETTER JOB OF KEEPING CARBON IN SOILS. WE NEED TO THINK ABOUT SOLUTION SCIENCE, NOT JUST ABOUT TRYING TO FIGURE OUT WHAT THE PROBLEM IS, WHICH OF COURSE WE HAVE TO KEEP DOING, OR FIGURING OUT HOW TO VERIFY WHAT OTHER PEOPLE DO, OR FIGURING OUT HOW TO SEE WHAT THE ERRORS IN WHAT THEY DO ARE, BUT ALSO FIGURING OUT HOW TO DO IT BETTER, SO WE'RE PART OF THE SOLUTION.

DR. WEISS: I REALLY ACCEPT THAT COMMENT VERY FAVORABLY. I'M FEELING GUILTY. IF I HAD A KEYBOARD IN FRONT OF ME, I WOULD ADD IT.

DR. DENNING: WELL, I'M A SCIENTIST, AND I'M SENSITIVE TO THE REMARK ABOUT SCIENCE IS NOT POLICY AND SCIENCE IS NOT POLITICS. BUT SPEAKING AS A CITIZEN, RATHER, AND REALLY ASKING ESTEEMED COLLEAGUES ON THE PANEL ABOUT THE ROLE OF THE POLICY AND PARTICULARLY THIS BUSINESS ABOUT FACILITATING EFFECTIVE LEGISLATION, I HAD AN INTERESTING CONVERSATION OVER DINNER LAST NIGHT WITH BRUCE REGARDING THE NEED TO DO ALL THIS REALLY QUITE CUTTING-EDGE TECHNOLOGY DEVELOPMENT AND EMISSIONS REDUCTION. IN FACT, DEPENDING ON WHOSE MATH YOU CHOOSE, $8 TO $30 MULTITRILLION WEDGES NEED TO BE

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CREATED AND PAID FOR IN THE NEAR FUTURE. AND YET WE HEARD THIS AFTERNOON FROM MIKE, THIS JUST MUSTN'T INVOLVE TAXES. AND SO WE HAVE THIS MARKET MECHANISM. NOBODY IS REALLY GOING TO PAY FOR IT, IT IS ALL SORT OF GOING TO COME FROM COMPETITION IN THIS WAY, THIS MARKET-BASED MECHANISM. BUT WHAT BRUCE TOLD ME LAST NIGHT WAS THAT IT HAS TO HAPPEN WITH NO RATE INCREASES BECAUSE THE LEGISLATION AT THE STATE LEVEL, AT THE PUC LEVEL, MANDATES THAT ALL OF THIS TECHNOLOGY DEVELOPMENT HAS TO HAPPEN. IF THERE IS A 5-PERCENT RATE INCREASE, THE UTILITY COMPANIES ARE

COMING UP AGAINST MASSIVE OPPOSITION TO RAISING RATES. NOBODY GETS TO PAY FOR THIS THE WAY THAT THE LEGISLATIVE STRUCTURE IS SET UP NOW. WE CAN'T HAVE TAXES, WE CAN'T HAVE RATE INCREASES.

YOU KNOW, WE HEARD THAT NOBODY IN THE ROOM KNOWS WHAT THEY PAY FOR THEIR ELECTRIC BILL; YET THE PRICE OF GAS TRIPLED IN THE LAST THREE YEARS AND PEOPLE KEEP DRIVING. SUPPOSE THE BASE OF ELECTRICITY INCREASED BY A FACTOR OF THREE IN THREE YEARS AND PRODUCED BILLIONS OF DOLLARS OF NEW REVENUE, WHY CAN'T WE USE THAT KIND OF THING? WHY IS IT THAT THE POLITICS OF THIS -- AND, OBVIOUSLY, I'M NO EXPERT, I JUST READ THE NEWSPAPER -- HOW COME WE CAN'T DO THIS? HOW COME WE CAN'T RAISE MONEY FROM EVERYBODY?

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AND FORGIVE ME, I AM MAKING A SPEECH, BUT 120 YEARS AGO IF YOU HAD SAID WE'RE GOING TO BUILD AN EXTRACTION INDUSTRY THAT WILL TAKE 8 BILLION TONS A YEAR OF CARBON OUT OF THE GROUND, DISTRIBUTE IT TO EVERY STREET CORNER ON EARTH, WE'RE GOING TO WIRE IT TO EVERYBODY'S HOUSE AND BUILD FLAT-SCREEN TVS IN EVERYBODY'S HOUSES AND A BILLION CARS A YEAR, AND HERE'S THE BILL, NOBODY WOULD HAVE WANTED TO PAY FOR THAT. BUT WE DIDN'T GO BROKE PAYING FOR THAT; WE GOT RICH PAYING FOR THAT. AND WHAT WE HAVE TO DO IS DO IT AGAIN.

SO HOW DO WE FACILITATE EFFECTIVE LEGISLATION THAT WILL ALLOW US TO RAISE THE MONEY TO FUND $30 MULTITRILLION WEDGES WITHOUT RAISING TAXES OR RATES?

DR. WALSH: I WOULD LIKE TO MAKE A SHORT CLARIFICATION. I DIDN'T SAY THAT THERE SHOULDN'T BE TAXES. I SAID I DON'T SEE A SINGLE SERIOUS LEGISLATIVE PROPOSAL THROUGHOUT THE UNITED STATES TO DO CARBON TAXES. OKAY.

THIS IS NOT GOING TO BE FREE. DOLLARS SPENT ON CLIMATE MITIGATION ARE NOT AVAILABLE FOR HEALTH CARE OR SCHOOLS OR ROADS OR OTHER THINGS THAT WE ALL WANT.

I'M FULLY PREPARED TO INVEST SOME OF OUR

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PERSONAL SOCIAL CAPITAL IN THIS, BUT I HAVE SAID FOR A DECADE THAT WE CAN MAKE MAJOR PROGRESS, AT LEAST IN THE UNITED STATES, ON CLIMATE CHANGE AT A COST THAT INVOLVES PENNIES PER GALLON. AND THAT'S WHAT MY JOB IS TO DO, IS TO STRETCH YOUR INVESTMENT DOLLAR, GET AS MUCH BANG FOR THE BUCK AS WE POSSIBLY CAN. BUT PENNIES PER GALLON IS JUST NOT SUITABLE. IT WILL BE COSTLY.

AND I DON'T KNOW WHY GLOBAL CLIMATE CHANGE -- WHEN YOU ASK PEOPLE WHAT PROBLEMS WE SHOULD SOLVE IN THIS COUNTRY, GLOBAL CLIMATE CHANGE DOESN'T COME UP ON THE LIST, BEFORE YOU ASK HOW MUCH ARE YOU READY TO SPEND ON IT. SO WE HAVE SOME BIG PROBLEMS HERE. I THINK THE PUBLIC IS PREPARED TO SPEND, BUT THEY WANT IT SPENT WELL. AND I DON'T THINK THERE'S CLARITY ON A WHOLE LOT OF TAXES INVOLVED, EVEN PEOPLE

IN WASHINGTON. THAT'S A PERSONAL STATEMENT.

MS. MORIN: I WOULD LIKE TO ADD TO THAT. I MEAN THE TROUBLE WE'RE HAVING IS THAT WE DON'T HAVE THE COST ESTIMATES FOR NOT DOING ANYTHING. SO EVERY TIME WE COME IN FOR A PROPOSAL, THEY'RE SAYING, OKAY, IT IS GOING TO COST -- EVEN ON RGGI, THE ONLY WAY IT DOESN'T COST IS IF WE INVEST IN ENERGY EFFICIENCY. I'M STILL FIGHTING WITH PEOPLE IN NEW HAMPSHIRE THAT, OH, WE'VE ALREADY DONE ALL THE ENERGY EFFICIENCY

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THERE IS TO DO. THAT'S THE RESPONSE WE'RE GETTING BACK FROM BIG BUSINESSES, IS: WELL, WE'VE DONE IT ALREADY. AND WE KNOW FOR A FACT THAT ISN'T TRUE.

BUT THE POINT IS EVEN IF WE DO THOSE ECONOMICS, SHOWING THAT ENERGY EFFICIENCY ACTUALLY MEANS RGGI IS GOING TO SAVE ON YOUR ENERGY BILL DOWN THE ROAD, IT'S AN INVESTMENT IN MAKING OUR ENERGY SYSTEM MORE COST-EFFECTIVE, WE'RE STILL NOT INCORPORATING THE COSTS; AND IF WE DON'T DO IT, WHAT IS GOING TO HAPPEN TO OUR ENERGY SYSTEM. AND IT IS THAT DELTA THAT WE HAVE GOT TO GET OUT THERE BECAUSE THE COSTS FOR INVESTING ARE NOTHING COMPARED TO THE COSTS WE'RE GOING TO HAVE.

YOU KNOW, THE ONE THING WE'VE USED IS WE'VE HAD THREE 100-YEAR FLOODS IN THREE YEARS. AND OF COURSE, I'VE TAKEN THOSE BILLIONS OF DOLLARS AND HAVE PUT THEM ON ALL MY SLIDES TO SAY -- YOU KNOW, BECAUSE THAT ONE THEY CAN GET REAL FAST -- HERE'S THE REAL COSTS; IF THESE KEEP INCREASING, YOU'RE GOING TO HAVE TO REBUILD THAT BRIDGE FOR THE TENTH TIME, ESPECIALLY SINCE YOU DIDN'T BUILD IT TO A NEW LEVEL BECAUSE OF THIS FLOODING.

BUT IN TERMS OF, YOU KNOW, THE POLITICS AND SCIENCE, THE POINT I WAS TRYING TO MAKE IS THAT WE HAVE GOT TO STOP ARGUING -- THIS AUDIENCE, I THINK,

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IS UNBELIEVABLE -- BUT I STILL SPEND TIME SAYING, CLIMATE CHANGE IS REAL. I LOVE IT WHEN ALL OF YOU SAY, WELL, IT'S OVER, THE SCIENCE IS HERE. AND I GO, OH, MY GOD, PLEASE, COME IN MY OFFICE AND DO THAT SOME MORE.

THERE'S STILL WORK TO BE DONE, AND THAT'S WHAT I'M FRUSTRATED WITH, IS THAT, YOU KNOW, POLITICIANS ARE ARGUING THE SCIENCE. NO, THE SCIENCE IS THE SCIENCE; AND I WISH WE COULD GET BACK TO THAT A LITTLE STRONGER, SAYING WE CAN DEBATE WHETHER WE SHOULD REACT TO IT, HOW MUCH IT SHOULD COST TO REACT TO IT, THE POLICY OPTIONS; BUT I WISH WE'D GET A LITTLE BIT MORE AWAY FROM DEBATING THE SCIENCE, BECAUSE I THINK THAT IS REALLY INAPPROPRIATE. I THINK THE SCIENTIFIC COMMUNITY SHOULD SAY WHAT IS THE CURRENT STATE OF THE ACCEPTED SCIENCE; AND THAT, IN CLIMATE CHANGE, DID NOT HAPPEN UNTIL THIS LAST 12

MONTHS, I WOULD SAY, AT LEAST IN MY WORLD.

DR. SOLOMON: YOU HAPPEN TO COME FROM A STATE THAT BELIEVES IN "LIVE FREE OR DIE."

(LAUGHTER)

I'M MAKING A JOKE, BUT I'M ACTUALLY SOMEWHAT SERIOUS ABOUT IT. AND I THINK IT IS NOT UNRELATED TO SCOTT'S COMMENT. YOU KNOW, THERE IS A VALUE SYSTEM AND A HISTORICAL MIND-SET THAT WE COME FROM, AS AMERICANS, WHICH IS FUNDAMENTALLY PART OF THE ISSUE HERE, IN MY PERSONAL, VERY PERSONAL OPINION. YOU KNOW, THAT IS WHY THIS ISSUE IS SO RIFE WITH EMOTION. THE PUBLIC NEEDS TO UNDERSTAND THAT, YOU KNOW, THEIR SUV'S AREN'T GOING TO BE TAKEN AWAY, AND THAT IS A BIG ISSUE. YOU KNOW, WE HAVE TO MAKE SOME CHOICES, BUT WE ALSO HAVE TO MAKE CHOICES THAT PEOPLE COLLECTIVELY OWN.

DR. MARQUIS: I HAVE ONE COMMENT AND ONE QUESTION.

I WANTED TO CLARIFY, RAY, THAT I TRIED VERY HARD TO GET PRESS HERE, AND I DID BEG ANDY REVKIN TO COME. I HAD SEVERAL CONVERSATIONS WITH HIM, AND HE SAID HE WOULD HAVE COME HAD IT BEEN IN BOULDER, BUT HE JUST COULDN'T SQUEEZE THIS IN, IT WAS TOO MUCH TRAVEL.

I TRIED TO GET TOM FRIEDMAN, AND HIS FEE BEGAN AT $75,000; AND WE DIDN'T HAVE THAT KIND OF MONEY.

AND SHARON BEGLEY, WHO WROTE AN OUTSTANDING STORY ON THE COVER OF NEWSWEEK, I HAD A NUMBER OF CONVERSATIONS WITH HER; AND SHE SAID SHE COULDN'T CONVINCE HER BOSS, HER EDITORS, TO LET HER COME, PARTLY BECAUSE PUBLICATIONS ARE STRUGGLING TERRIBLY FINANCIALLY.

AND I TOLD HER, I KNOW THAT, I'M MARRIED TO A NEWSPAPER GUY. I HAVE SEEN HIS NEWSPAPER BE DECIMATED SEVERAL TIMES OVER; BUT PLEASE COME, THIS IS IMPORTANT.

AND SHE SAID, WELL, NEWSWEEK JUST CAN'T TAKE ANY MORE BRUISES. WE HAVE NEVER GOTTEN THAT KIND OF HORRIBLE REACTION, AND MY EDITORS REALLY DON'T SUPPORT ME BRINGING UP SUCH A VOLATILE TOPIC AGAIN.

NOW, PIETER TANS AND JIM CAN CORRECT ME IF ANYTHING IN MY MEMORY HERE IS WRONG. I SHARED THE EMAILS WITH THEM BOTH AND SAID, "PLEASE HELP ME RESPOND TO SHARON BEGGLY IN AN EFFECTIVE WAY THAT WE CAN GET NEWSWEEK TO COME AND COVER THIS IMPORTANT CONFERENCE." AND WE DID OUR DARN BEST, AND WE DIDN'T SUCCEED.

BUT MY HUSBAND, WHO IS THE BEST REPORTER

AND WRITER, IS HERE; AND HE DIDN'T MAKE IT HERE ALL DAY YESTERDAY, BUT HE WAS HERE ALL DAY TODAY AND ALL DAY MONDAY, AND HE WILL COVER IT, AND I CAN HELP FILL IN THE PARTS THAT HE MISSED ON TUESDAY.

SO I WANTED TO CLARIFY FOR YOU THAT WE DID DO OUR BEST TO GET GREAT PRESS COVERAGE, AND WE DIDN'T GET EVERYBODY WE WANTED, BUT CLINT IS HERE.

NOW, I HAVE A QUESTION OF CLARIFICATION FOR SUSAN. NUMBER FIVE ON THE LIST HERE IS COMMUNICATING OUTSIDE THE SCIENTIFIC COMMUNITY. WHAT IS THE ROLE OF SCIENTISTS IN HELPING THE PUBLIC UNDERSTAND THE CRITICAL NATURE, I BELIEVE, OF THE STATE OF CLIMATE CHANGE?

I THINK YOU SAID EARLIER THIS WEEK THAT THE ADVOCACY POSITIONS BELONG TO PEOPLE LIKE GREENPEACE AND NRDC.

AND THEN YOU MENTIONED THE DEVASTATING EFFECT THAT SOME NONPROFIT ENVIRONMENTAL GROUP HAD BY EXAGGERATING RIGHT BEFORE THE KYOTO PROTOCOL WAS PROPOSED, AND SOMEBODY AT ONE OF THE GREEN ORGANIZATIONS SAID: IF WE DON'T SUPPORT KYOTO, WE'RE ALL GOING TO HAVE MALARIA ALL OVER THE UNITED STATES.

CLIMATE CHANGE IS SUCH A COMPLICATED ISSUE. IT SEEMS TO ME IT NEEDS PEOPLE WHO REALLY UNDERSTAND IT, THE SCIENTISTS THEMSELVES TO BE PRESENTING IT TO

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THE PUBLIC, BECAUSE, OTHERWISE, YOU END UP WITH PEOPLE WHO ARE ILL-QUALIFIED TO DO SO, AND EXAGGERATIONS AND INACCURACIES ARE PRESENTED.

CAN YOU PLEASE HELP ME UNDERSTAND WHAT YOUR SUGGESTION IS? WHO SHOULD COMMUNICATE TO THE PUBLIC ABOUT WHAT'S REALLY GOING ON AND WHAT THE REAL POSSIBILITIES ARE?

DR. SOLOMON: WELL, I MEAN THAT'S NOT A JOB THAT IS UNIQUE TO SCIENTISTS. IT'S ALSO A JOB THAT'S SHARED BY SCIENCE TEACHERS. I DON'T REALLY THINK THAT BEING ACCURATE NECESSARILY REQUIRES HAVING A PH.D. IT JUST MEANS THAT WE, AS SCIENTISTS, HAVE TO FACILITATE ACCESS TO THE BEST POSSIBLE, CAREFULLY VETTED INFORMATION. THAT, IN MY OPINION, IS WHAT IPCC IS ALL ABOUT. I FEEL LIKE CHRIS FIELD PUT IT VERY WELL. YOU KNOW, YOU CAN LOOK AT THE IPCC REPORTS, AND YOU KNOW WHAT EVEN THE MOST SKEPTICAL GOVERNMENTS IN THE WORLD HAVE AGREED TO LINE-BY-LINE AND WORD-BY-WORD. BY THE WAY, YOU ALSO KNOW WHAT THE LEAST SKEPTICAL AND MOST LEFT-WING ENVIRONMENTAL GOVERNMENTS HAVE AGREED TO LINE-BY-LINE AND WORD-BY-WORD.

SO I THINK, YOU KNOW, THE ASSESSMENT PROCESS THAT WE GO THROUGH IS VERY HELPFUL; BUT, YOU KNOW, I THINK THAT AT THAT POINT IT DOES BECOME A

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COLLECTIVE CONVERSATION. I'M NOT A BELIEVER IN CENSORSHIP. I THINK I HAVE NEVER SAID THAT. I THINK IT IS PART OF OUR LIFE IN A FREE SOCIETY, WHETHER YOU LIVE IN NEW HAMPSHIRE OR ELSEWHERE, THAT THERE WILL BE INFORMATION OUT THERE THAT WILL FLY IN LOTS OF

DIFFERENT DIRECTIONS.

AGAIN, IT'S THE RIGHT OF EVERYONE TO SPEAK, BUT IT'S THE REQUIREMENT OF BEING A CITIZEN IN A FREE SOCIETY TO SORT THROUGH IT. SO I'M NOT GOING TO TELL YOU, YOU KNOW, WE'RE GOING TO START A MARCHING ARMY OF SCIENTISTS WHOSE JOB IT IS TO PREACH. THAT'S NOT WHAT I'M SAYING. WE CAN DO OUR JOBS VERY CAREFULLY; AND AS LONG AS WE DO THAT AND WORK WITH OTHERS, THE CITIZEN HAS TO TAKE SOME RESPONSIBILITY, TOO, TO EDUCATE HIM OR HERSELF. THAT'S MY VIEW.

DR. WEISS: I'D LIKE TO SAY THAT I KNEW THAT WE HAD TRIED TO GET PEOPLE FROM THE PRESS, BUT I DIDN'T KNOW THE DETAILS AS WELL AS MELINDA DOES. NO ONE KNOWS THE DETAILS AS WELL AS SHE DOES. SO I REALLY APPRECIATE YOUR SPREADING THOSE OUT.

MR. DIAMOND: HI, I'M HOWARD DIAMOND. I'M WITH NOAA'S NATIONAL CLIMATIC DATA CENTER.

MY PRIMARY JOB IS DEALING AS THE GLOBAL CLIMATE OBSERVING SYSTEM PROGRAM MANAGER FOR THE U.S. AS SUCH, THE KEELING PROBLEM IS SOMETHING THAT I DEAL

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WITH EVERY DAY IN TRYING TO KEEP A SUSTAINED CLIMATE OBSERVING SYSTEM GOING, PRIMARILY LOOKING AT SUPPORTING THINGS IN DEVELOPING COUNTRIES, BUT AS WELL AS TRYING TO PUT THINGS HERE IN THE U.S., AND IT IS A MAJOR STRUGGLE. THERE HAVE BEEN NO END OF REPORTS, NRC REPORTS, THINGS THAT HAVE COME OUT FROM THE CLIMATE CHANGE SCIENCE PROGRAM, OTHER THINGS, THE THINGS WE'VE TALKED ABOUT HERE FOR THE PAST THREE DAYS ABOUT THE REAL IMPORTANCE OF SUSTAINED OBSERVING; THAT OBSERVING FORMS THE BASIS FOR EVERYTHING. YET I FIND IT HARDER AND HARDER TO GET ANY RESOURCES TO DO ANY OF THIS.

AND I DON'T KNOW, THIS IS REALLY MORE OF JUST A PLEA. BUT IT SEEMS TO FIT INTO AN OVERALL LACK OF INTEREST IN INFRASTRUCTURE IN THE COUNTRY OVERALL. I MEAN, WE HAVE, YOU KNOW, THE I-35 BRIDGE COLLAPSES IN MINNEAPOLIS, AND THAT IS JUST THE TIP OF THE ICEBERG AS FAR AS THOUSANDS AND THOUSANDS OF BRIDGES THAT ARE GOING TO GO. BUT WHEN IT COMES TO DOING THE INFRASTRUCTURE TO DO THE KIND OF OBSERVING THAT IS IN THE KEELING PROBLEM, IT IS JUST A REAL CHALLENGE. AND I DON'T KNOW WHERE WE GO FROM THERE. BUT IF WE DON'T KEEP THESE SUSTAINED OBSERVATIONS AND HAVE THE DATA THERE FOR THE NEXT 30, 40, 50 YEARS, I DON'T KNOW WHAT WE'RE GOING TO DO. THIS IS REALLY A

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COMMENT TO THIS WHOLE THING.

THIS HAS BEEN A GREAT CONFERENCE BECAUSE WE HAVE BEEN ABLE TO LOOK AT THE SCIENCE THAT HAS BEEN THE RESULT OF 50 YEARS OF DATA. AND ONE OF THE THINGS I'M TRYING TO DO WITH THE CLIMATE REFERENCE NETWORK SYSTEM IS HAVE A REFERENCE NETWORK SYSTEM OF TEMPERATURE AND PRECIP DATA THAT WILL BE OUT FOR THE NEXT 50 OR 100 YEARS, BUT IT'S A REAL STRUGGLE. SO I BRING THAT UP AS A POINT OF DISCUSSION.

DR. WEISS: I THINK WE'RE TRYING TO FINISH

UP IN ABOUT 15 MINUTES, SO I WOULD ENCOURAGE YOU TO TRY TO BE TERSE IN YOUR POINTS AND FOR US TO TRY TO BE TERSE IN OUR RESPONSES; OTHERWISE, THOSE POOR PEOPLE STANDING AT THE BACK OF THE LINE WON'T BE ABLE TO GET TO THE FRONT OF THE LINE.

DR. SOMERVILLE: I'M RICHARD SOMERVILLE FROM SCRIPPS.

AND I WANTED TO COMMENT VERY TERSELY AND BRIEFLY ON BRUCE BRAINE'S AND MIKE WALSH'S AND RALPH CICERONE'S COMMENTS ON THE NEED FOR COMMUNICATION, WITH WHICH I COMPLETELY AGREE. AND I WOULD LIKE TO REITERATE AND PERHAPS CLARIFY SOMETHING I SAID ON THE FIRST DAY, WHICH HAS TO DO WITH COMMUNICATING THE IPCC REPORT. I FIND NO FAULT WITH WHAT THE IPCC DID. I'M PROUD TO HAVE BEEN PART OF IT FOR THE LAST THREE

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YEARS, BUT THE IPCC WORKS UNDER RIGID CONSTRAINTS, ON A VERY TIGHT DEADLINE, AND THOSE 152 LEAD OFFICERS IN WORKING GROUP I DIDN'T GET PAID A PENNY FOR THEIR WORK, AND THEY SACRIFICED TIME AWAY FROM THEIR RESEARCH AND FAMILIES AND GRAD STUDENTS. AND I THINK IT IS A LITTLE SHORT OF MIRACULOUS THAT THEY PRODUCED OVER-A-THOUSAND-PAGE REPORT THAT IS SO GOOD THAT THE SKEPTICS AND CONTRARIANS HAVE BEEN EXTRAORDINARILY SILENT ABOUT IT. THE THREATS BEFORE ITS ISSUANCE TO FIGHT IT AND TO HAVE ANTI-IPCC PRESS CONFERENCES AND HOSTILE REVIEWS DIDN'T MATERIALIZE.

IT IS NOT IPCC'S JOB TO PRODUCE MOVIES, CURRICULUM, DEVELOPMENT MATERIALS, TEXTBOOKS, POSTERS, MAGAZINE ARTICLES. IT CAN'T DO THAT. THAT'S NOT WHAT A BUNCH OF ACADEMICS ARE GOOD AT. BUT IT HAS CREATED SOMETHING THAT IS A HUGE RESOURCE, AS I SAID, UNMINED ORE THAT COULD BE REFINED AND MACHINED INTO ALL THOSE KINDS OF THINGS. AND THAT WON'T HAPPEN FAST; THAT'S GOING TO BE A CONTINUING EFFORT, IN THE SAME WAY THAT IT TOOK PROBABLY 50 YEARS BEFORE THE FIRST PAPERS LINKING SMOKING AND HEALTH EFFECTS WERE MATERIALIZED INTO A PUBLIC RELATIONS CAMPAIGN THAT ACTUALLY DID IT WITH MOVIE STARS, THE SURGEON GENERAL, AND THE PUBLIC TV ADVERTISING, THAT DID REALLY REDUCE THE INCIDENCE OF

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SMOKING AND SMOKING-RELATED DISEASES.

IT'S A HUGE JOB. I THINK WHAT WE CAN ALL DO IS ENCOURAGE IT, AS SUSAN SAID. WE CAN DO ALL WE CAN TO FACILITATE TRANSFORMING THIS GREAT RESEARCH JOB, THIS THOUSAND-PAGE BOOK, WHICH FRANKLY IS NOT GOING TO BE A BEST-SELLER, INTO THINGS THAT WILL INFLUENCE THINGS.

AND THEN, FINALLY, I WANTED TO SAY A WORD, MY ANSWER TO RAY'S QUESTION OF WHO SHOULD BE HERE THAT ISN'T HERE. THIS IS A WONDERFUL MEETING. I'VE ENJOYED ALL OF IT, AND IT'S A REMARKABLE BRINGING TOGETHER OF PEOPLE FROM VERY DIFFERENT PERSPECTIVES AND FIELDS. BUT SOMETHING LIKE THIS THAT WAS ALSO INTERNATIONAL WOULD BE, I THINK, VERY WELCOME. I THINK WE DO HAVE A U.S. FOCUS. THAT'S PERFECTLY

NORMAL AND FITTING. BUT OTHER COUNTRIES HAVE TAKEN OTHER ATTITUDES TOWARDS MANY OF THE ISSUES WE'VE DISCUSSED, FROM NUCLEAR POWER TO CARBON TAXES. THERE ARE COUNTRIES THAT HAVE LOTS OF EXPERIENCE WITH BOTH. AND I THINK IT WOULD BE REALLY VALUABLE TO HAVE MORE MEETINGS LIKE THIS IN WHICH WE HEARD FROM SOME OF THOSE PEOPLE, THE OTHER 95 PERCENT OF THE POPULATION.

THE U.S. HAS TO LEAD IN THIS. I'M GOING TO BALI TOMORROW MORNING. MY EXPERIENCE IN MEETINGS LIKE BALI IS THAT THE SCIENCE DOESN'T GET VERY MUCH

0903

MENTIONED. IT KIND OF DISAPPEARS, AND THEY MIGHT BE NEGOTIATING PORK BELLIES OR SOMETHING ELSE. AND THAT'S A CHALLENGE FOR ALL OF US.

DR. FIELD: CHRIS FIELD, CARNEGIE INSTITUTION.

A GREAT LIST, RAY, AND I THINK THE COMMENTS ABOUT IT HAVE BEEN REALLY TERRIFIC.

I WANT TO ADD A COMPONENT, THOUGH, THAT I FEEL HAS BEEN MISSING FROM THIS MEETING. THE BASIC PROBLEM IS THAT, WHETHER YOU HAVE A GOOD PROJECTION OF THE FUTURE DEPENDS ON WHETHER YOU DRAW YOUR SYSTEM BOUNDARIES RIGHT; AND I THINK OUR COMMUNITY HAS TENDED TO BE VERY CONSERVATIVE FOR A LOT OF APPROPRIATE REASONS ABOUT CONSTRAINING THE SYSTEM THAT WE ANALYZED TO THE FRAMEWORK THAT WE UNDERSTAND REALLY WELL. AND I THINK WHAT WE'RE SEEING IS THAT THE SURPRISES COME BECAUSE OF THE THINGS THAT ARE IMPORTANT AND BIG AND REALLY HAPPENING ARE JUST OUTSIDE THE BOUNDARIES OF THE SYSTEM.

I WANT TO MENTION THREE SPECIFIC THINGS THAT I REALLY THINK NEED TO BE A CORE PART OF THE RESEARCH AGENDA AS WE TRY AND PUSH THE SYSTEM BOUNDARY OUT SO THAT THE OBSERVATIONAL FRAMEWORK AND THE MODELING FRAMEWORK INCORPORATE THESE REALLY CRITICAL PROCESSES.

0904

LET ME JUST START BY SAYING THAT THE FIGURE THAT I SHOWED AND THAT WOUTER SHOWED INDICATING THAT OUR SCENARIOS DIDN'T EVEN CAPTURE THE GENUINE RANGE OF EMISSIONS FOR HALF A DECADE WHEN WE'RE TALKING ABOUT CENTURY-SCALE PREDICTIONS IS DEEPLY EMBARRASSING, AND I THINK IT REALLY INDICATES HOW BADLY WE'RE DEALING WITH CRITICAL PARTS OF THE SYSTEM.

AND THE THREE PARTS OF THE SYSTEM THAT I THINK WE NEED TO DO A LOT BETTER JOB OF INCORPORATING ARE, FIRST OF ALL, THE HUMAN FACTORS. WE'RE THINKING A LOT ABOUT HOW TROPICAL FORESTS RESPOND TO FUTURE CLIMATE CHANGES. WHAT WE'RE NOT THINKING ABOUT, WHAT THE PEOPLE DO WHEN THEY MOVE INTO THOSE FORESTS. ARE WE GOING TO SEE MORE EMPHASIS ON FIRE SUPPRESSION AT HIGHER LATITUDES? ARE WE GOING TO SEE MORE DEFORESTATION OF THE LOWER LATITUDES?

IT IS ALSO REALLY CRITICAL THAT WE CONTINUE TO MAKE PROGRESS ON INCORPORATION OF THE FEEDBACKS THAT INEZ WAS TALKING ABOUT AND THAT TED SCHUUR

TALKED ABOUT EARLIER.
AND THEN, FINALLY, I THINK THAT WE HAVEN'T REALLY SEEN ANY DISCUSSION IN THE MEETING SO FAR ABOUT THE INTERACTIONS BETWEEN SOME OF THE THINGS THAT WE MIGHT DO IN RESPONSE TO THE CLIMATE CHANGES

0905

AND THE RESPONSES OF THE CLIMATE SYSTEM. SO, FOR EXAMPLE, WHAT HAPPENS TO THE CLIMATE WHEN YOU SEE MASSIVE-SCALE DEPLOYMENT OF BIOFUEL DEVELOPMENT OR MASSIVE-SCALE DEPLOYMENT OF WIND, AND I THINK WE WANT TO MAKE SURE THAT WE'RE NOT SOLVING THE PROBLEM WITH TECHNIQUES THAT ARE ACTUALLY MAKING IT WORSE.

DR. WEISS: THAT'S A VERY GOOD POINT, CHRIS. I'M THINKING OF PAUL KIRSHEN'S PAPERS ABOUT NITROUS OXIDE EMISSIONS FROM CORN.

DR. LOBELL: DAVE LOBELL FROM LIVERMORE LAB.

I WAS HAPPY TO SEE YOUR LAST POINT, RAY, ABOUT PLANNING FOR SUCCESSION SINCE I'M A YOUNG SCIENTIST, AND THERE IS A LOT OF GRAY HAIR IN THE ROOM. I DIDN'T HEAR MUCH ABOUT THAT. SO I WANTED PUSH YOU GUYS A LITTLE FURTHER AND TAKE THE OPPORTUNITY TO ASK, YOU KNOW, SOME OF THE BEST MINDS ABOUT WHAT SPECIFICALLY DO YOU THINK NEEDS TO BE DONE TO THE SCIENCE SYSTEM IN THIS COUNTRY TO PROMOTE THE PARTICULAR KIND OF SCIENTISTS WE'LL NEED TO SOLVE THESE PROBLEMS.

DR. WEISS: I'M GOING TO GIVE A VERY QUICK ANSWER IN ORDER TO SAVE TIME, AT LEAST FROM MY PERSPECTIVE; AND THE ANSWER IS THAT THERE HAS TO BE SECURE SUPPORT FOR MAKING A CAREER IN THIS AREA FOR

0906

THE SMARTEST PEOPLE.

ANYBODY ELSE HAVE ANYTHING TO ADD TO DAVID'S VERY COGENT QUESTION?

DR. FUNG: I WOULD LIKE TO ALSO ADD THAT ONE HAS TO BE EDUCATED TO BE AN EXPERT IN A PARTICULAR FIELD SO THAT YOU UNDERSTAND THE SYSTEM TO THE NERDIEST LEVEL, SO THAT YOU CAN MAKE CHANGES. I THINK THAT A LOT OF WHAT IS IN FASHION NOW, I'M NOT A FAN OF, WHERE YOU LEARN A LOT OF BROAD INTERDISCIPLINARY, MULTIDISCIPLINARY EDUCATION WITHOUT DEPTH, ALLOWS YOU TO TALK ABOUT A LOT OF THINGS, BUT IT DOESN'T ALLOW YOU TO GET INTO ANY ONE SYSTEM TO WORK ON SOLUTIONS. SO TO WORK ON SOLUTIONS, ONE HAS TO HAVE THE BROAD EXPOSURE BUT ALSO TO BE EXPERT IN SOMETHING, WHICHEVER ARENA WE'VE TALKED ABOUT, THE PORTFOLIO OF APPROACHES. YOU HAVE TO WORK ON SOLUTIONS. YOU HAVE TO KNOW SOMETHING VERY WELL.

DR. TANS: I WOULD LIKE TO ADD SOMETHING.

I THINK NOW THAT THERE HAS BEEN MUCH MORE WIDESPREAD PERCEPTION THAT THIS IS A PROBLEM, I DON'T THINK THERE WILL BE ANY SHORTAGE OF POTENTIAL STUDENTS WHO ARE INTERESTED IN BASICALLY GOING INTO THIS FIELD. THE PROBLEM WILL BE CAN WE MUSTER THE RESOURCES TO REALLY TRAIN THEM AND GET THEM GOING.

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MS. DECKER: HI, CYNTHIA DECKER FROM NOAA.
ALL I WANTED TO DO IS TO SORT OF SPEAK TO THE IDEA OF WHAT'S MISSING FROM THIS DIALOGUE, AND THIS IS NOT INTENDED AS A CRITICISM OF THE ORGANIZERS, WHOM I THINK DID A WONDERFUL JOB, BUT I THINK THAT THE SECTOR THAT IS MISSING IS WHAT WAS MENTIONED EARLIER, THE HUMAN FACTOR, AND I THINK WHAT'S MISSING ARE THE SOCIAL SCIENTISTS FROM THAT FIELD; AND BY THAT, I DON'T JUST MEAN ECONOMISTS, BUT I ALSO MEAN PEOPLE LIKE SOCIOLOGISTS AND PSYCHOLOGISTS AND ENVIRONMENTAL HISTORIANS WHO TRY TO GIVE US AN UNDERSTANDING OF HOW PEOPLE REACT AND HOW PEOPLE MANAGE RISK IN THEIR OWN MINDS AND HOW THEY REACT TO THE SCIENCE.
I WORKED AS A REGULATOR IN THE STATE OF NEW YORK, AND I QUICKLY LEARNED THAT YOU DON'T NECESSARILY APPEAL TO PEOPLE ON THE LEVEL OF SCIENCE. IT'S GREAT TO TELL THEM WHAT THE SCIENCE IS, IT'S GREAT TO TELL THEM WHAT THE FACTS ARE, BUT THEY TEND TO REACT TO THINGS EMOTIONALLY, AND YOU REALLY NEED TO TRY TO UNDERSTAND WHAT IS IT THAT'S GOING TO PUSH THEIR BUTTONS AND WHAT IS IT THAT IS GOING TO MAKE THE CONVINCING CASE. A LOT OF THAT IS COMMUNICATION, A LOT OF THAT IS UNDERSTANDING. ACTUALLY, THE SCIENCE OF PEOPLE AND THE SCIENCE OF SOCIOLOGY.
0908
SO I JUST WANTED TO SAY THAT IN THE FUTURE, WHEN WE HAVE DIALOGUES LIKE THIS, THAT THOSE COMMUNITIES SHOULD BE INCLUDED IN THIS.
THANKS.
DR. WEISS: I SEE A LOT OF HEADS NODDING IN THE VERTICAL DIRECTION. I THINK WE ALL AGREE WITH THAT IMPORTANT POINT.
MS. ANATTA: I DO MEDIA RELATIONS FOR NOAA.
I WOULD LIKE TO MAKE A COUPLE OF POINTS. ONE OF THEM IS A LITTLE MORE INFORMATION ABOUT WHO IS COVERING THE CONFERENCE. THE WALL STREET JOURNAL AND THE BBC, NATURE, AND THE AP ARE WRITING ABOUT THE CO2 ANNIVERSARY AND THE CONFERENCE, AS MUCH AS THEY CAN. THE AP STRINGER HERE IN HAWAII HAS ATTENDED TWO DAYS OF THE CONFERENCE AND IS WRITING TWO STORIES. PLUS THE LOCAL PRESS WAS HERE.
HOWEVER, I HAVE A MUCH BROADER POINT; AND THAT IS, NEWSPAPERS ARE REALLY SUFFERING AROUND THE COUNTRY. THAT CAME UP. SCIENCE WRITERS ARE GETTING LAID OFF RIGHT AND LEFT. SCIENCE SECTIONS ARE BEING DECIMATED. TOM FRIEDMAN IS A GOOD CASE IN POINT. HE WAS FIRED OR LET GO FROM THE DALLAS MORNING NEWS. THAT SCIENCE SECTION DOESN'T EXIST ANYMORE.
SO I WANT TO ENCOURAGE ALL SCIENTISTS, WHEN YOU'RE PLANNING EVENTS AND YOU'D LIKE MEDIA COVERAGE,
0909
THINK OF IT AT THE BEGINNING OF THE PLANNING PROCESS, NOT AT THE END, AS AN AFTERTHOUGHT. AND ALSO, MAKE IT EASY FOR THE PRESS TO ATTEND. AN ISLAND IN THE MIDDLE OF THE PACIFIC IS NOT THE EASIEST PLACE. NEW

YORK CITY, WASHINGTON, L.A., THINK OF THOSE LOCATIONS. IN THIS CASE, IT MADE PERFECT SENSE BECAUSE OF MAUNA LOA.

BUT I THINK IT IS CONTINUALLY TRUE THAT GETTING MEDIA COVERAGE IS NOT CONSIDERED AT THE POINT IN THE PLANNING PROCESS WHERE IT NEEDS TO BE CONSIDERED.

THANK YOU.

DR. WEISS: I THINK THOSE ARE ALSO WELL TAKEN POINTS. THE CO2 RECORD, THE GLOBAL RECORD, ACTUALLY BEGAN AT THE SOUTH POLE.

(LAUGHTER)

DR. WEISS: SO WE TOOK SECOND BEST.

(LAUGHTER)

SO I THINK UNLESS ANY OF THE PANELISTS WOULD LIKE TO MAKE ANY REMARKS -- OH, WE HAVE ONE OF OUR TWO OR THREE INTERNATIONAL REPRESENTATIVES WHO HAVE STEPPED UP TO THE MIKE.

DR. LOWE: DAVE LOWE FROM THE SOUTHERN PART OF THE PLANET.

COMMUNICATING OUTSIDE THE SCIENTIFIC

0910

COMMUNITY, EINSTEIN ONCE MADE THE COMMENT: "EVERYTHING SHOULD BE AS SIMPLE AS POSSIBLE BUT NO SIMPLER."

AND I THINK IT IS COMPLETELY POSSIBLE FOR US, AS SCIENTISTS, TO EMPOWER THE LAY PUBLIC. I THINK IT IS A COP-OUT TO SAY THAT YOU DUMB DOWN YOUR SCIENCE, AND I THINK IT'S REALLY OUR ROLE TO GET OUT THERE AND TALK TO PEOPLE AND EMPOWER THEM.

THANK YOU.

DR. WEISS: THANK YOU, DAVE.

DO ANY MEMBERS OF THE PANEL WANT TO MAKE ANY CLOSING REMARKS?

WE'RE ACTUALLY ON TIME, AS I HAVE JUST HAD WHISPERED IN MY EAR. SO I WOULD LIKE TO THANK YOU ALL FOR PARTICIPATING IN THIS PROCESS AND LISTENING.

THANK YOU VERY MUCH.