



# **AEESP Converging COVID-19, environment, health, & equity conference**

## **Session 2 Transcript – October 23, 2020**

FROM OUR OWN PERSONAL DAILY DECISIONS ON WHETHER AND HOW TO SEND OUR SKIDS TO SCHOOLS OR PROTECT OUR LABORATORY WORRIES TO THE ACTIONS OF STATE AND NATIONAL AND GLOBAL LEADERS WHO MUST SECOND, ENSURING THAT EXPERTS WORK AND ACT IN PARTNERSHIP WITH OTHER STAKEHOLDERS AND WITH COMMUNITIES SO DECISION MAKERS AT ALL LEVELS CAN UNDERSTAND AND EVALUATE AND TRUST THE INFORMATION AVAILABLE TO MAKE ALL OF THOSE CHOICES.

FINALLY THE NEED TO CONSIDER EQUITY AND DISTRIBUTION OF IMPACT AMONG INDIVIDUALS AND AMONG GROUPS AND ALL OUR SOLUTION ADVANCES AND INTERACTIONS.

SO THE ROLE OF OUR AEESP COMMUNITY, IN OTHER WORDS ACADEMIC ENVIRONMENTAL ENGINEERS AND SCIENTISTS ARE MAN FOAL.

WE HAVE TRADITIONALLY CONTRIBUTED TO CONTINUE TO COME TRIBUTE TO ACKNOWLEDGING NEW APPROACHES AND TECHNOLOGIES AND DATA.

THAT ARE ASSESSED TO SCIENCE GAPS.

WE ALSO WORK AS INTEGRATORS AGAINST TECHNICAL AND SOCIAL NEEDLE TO DESIGN SOLUTIONS THAT CONSIDER THE COMPLEX INTERACTING HUMAN, NATURAL AND BUILT ENVIRONMENTAL SYSTEMS.

THE ACADEMY NOW CHALLENGE US TO BUILD NEW SKILLS THAT WILL ALLOW US TO GET MORE INVOLVED AND DIRECTLY INFORMING DECISIONS AND ACTS TO POLICY.

THIS INCLUDES DEVELOPING AND APPROVING DECISION SUPPORT TOOLS AND TECHNOLOGY ENABLED PLATFORMS THAT SYNTHESIZE OPERATION ACROSS FIELDS AND POLICY INTERACTION BUT ALSO FOR STAKEHOLDERS PARTICULARLY IN THOSE IN DESIGN TECHNOLOGY COMMUNITIES FOR APPROACHES IN UNDERSTANDING AND TRUST AND LEAD TO EFFECTIVE AND SUSTAINABLE SOLUTIONS AND POLICIES.

IN THE TALKS THAT WE HAVE HERE TODAY WE WILL BE HEARING FROM SEVERAL OF OUR MEMBERS WHO HAVE STEPPED UP TO THE CALL OF FOSTERING INFORMED DECISIONS AND ACTIONS RELATED TO THE COVID-19 PANDEMIC.

THIS INCLUDES WORK ON VIRUS AEROSOLIZATION AND HVAC SYSTEMS AND SYSTEMS BY MASKS AND IMPACTS OF SYSTEM CHARACTERISTIC AND FLOW DYNAMICS OF AEROSOLIZATION AND MINIMUM EXPOSURE DOSES AND RISKS.

OUR SPEAKERS TODAY WILL BE DISCUSSING THE FINDINGS BUT ALSO THE ASPECTS AT MULTIPLE LEVELING TO DIRECTLY THE ADAPTING THE ACADEMY'S CHALLENGE OF FOSTERING INFORMED SUGGESTIONS AND REACTS SO PLEASE WELCOME OUR SPEAKERS WHO ARE LINDSEY MARR, COLLEEN NAUGHTON, YANG WANG, SHAMIA HOQUE AND CHARLES HAAS.

WE WILL BE SPEAKING TO THEM AND HAVING LIVELY DISCUSSIONS AFTER THAT. LET'S GET STARTED.

LET'S START WITH DR. PROFESSOR MARR IS LOOKING THE THE VIRUS IN THE ATMOSPHERE. DURING THE IMPACT OF THE PANDEMIC, SHE HAS BEEN LOOKING AT SARS 2 AND OTHER PATHOGENS ARE ACTIVE IN THE AREA AND SHE IS CHOSE TONE DISSEMINATE HER KNOWLEDGE AND EXPERIENCE.

IN HAS INCLUDED A "NEW YORK TIMES" OPINION PIECE ON THE VIRUS' TRANSMISSION AND AN APR ON LOWER RISK TO TRANCE MIDDLE AS WELL AS MANY QUOTES.

PROFESSOR MARR STUDIED IN ENGINEERING.

SHE MOVED TO U OF C BERKELEY FOR ENVIRONMENTAL STUDIES AND JOINED MIT WORKING ALONGSIDE MARION MOLENA FOR HER MOST DOCTORAL WORK.

PLEASE WELCOME DR. MARR ABOUT WHAT HAPPENS WHEN YOU OPEN YOUR MOUTH.

>> THANK YOU VERY MUCH FOR THE INTRODUCTION.

I'M NOT ABLE TO START MY VIDEO.

I WILL GO AHEAD WITHOUT.

THAT I WILL BE TALKING ABOUT WHAT HAPPENS WHEN YOU OPEN YOUR MOUTH.

HERE WE GO WITH THE VIDEO.

GREAT.

NEXT SLIDE, PLEASE.

SO TO BEGIN WITH, WE KNOW THAT THE VIRUS IS BEING TRANSMITTED THROUGH THE AIR, AND IT'S IMPORTANT TO REALIZE THAT THE AIRBORNE VIRUS IS NOT NAKED.

WE DO NOT HAVE NAKED -- WITH ANY PATHOGEN, BACTERIA OR VIRUS OUT THERE ON THE AIR OR ON SURFACE.

THE VIRUS IS EMBEDDED IN A RESPIRATORY DROPLET WHICH CONTAINS ADDITIONAL THING BESIDES WATER WYLIE TALK ABOUT IN A MINUTE.

AND IT'S THE SIZE OF THIS DROPLET OR AEROSOL THAT DEFINES ITS TRANSPORT.

NOT THE SIZE OF THE VIRUS ITSELF.

SO THE VIRUS ITSELF IS POINT ONE MICRONS THAT RESPIRATORY FLUID DROPLET CARRYING IT CAN BE FROM OPINION 2 TO 100 MICRONS OR MORE.

NEXT.

THE IMAGES ON THE RIGHT SHOW WHAT DRIED RESPIRATORY DROPLETS LOOK LIKE.

THOSE ARE ELECTRO-MICROSCOPIC AND THE RING SHOWED THE ORIGINAL DIAMETER OF THE WATER EVAPORATED LEAVING BEHIND THE CRYSTAL AND SOLID WHICH CONTAINS CARBON AND SULFUR.

THING WE WOULD EXPECT TO SEE IN THE SALTS AND ORGANIC COMPONENTS DROPLET.

THE PIE CHART ON THE RIGHT SHOWS WHAT THE DROPLET -- WHAT THOSE NONVOLATILE SOLIDS ARE.

A LOT OF SODIUM CHLORIDE AND OTHER SALTS.

THERE IS PROTEIN THAN CAN BE FROM A QUARTER TO A MARRIAGE ACTIVE THOSE SOLIDS.

THERE IS SOME SORT OF FACTANT.

THE VIRUS ITSELF IS FAR LESS THAN 1% OF THE SOLIDS.

NEXT.

WHEN WE TALK WE PRODUCE AEROSOLS, SO WE KNOW WHEN WE COUGH WE REDUCE AEROSOLS BUT WHEN WE TALK WE PRODUCE A PLUME OF AEROSOLS.

THIS IS NICE WORK FROM SOMEONE IN AUSTRALIA SHOWING AEROSOLS IN LARGER DROPLETS WHEN ARE ARE LEASED SHOWN IN THE TALK PANEL AND WHEN WE COUGH SHOWN IN THE BOTTOM PANEL.

NOTICE THAT BOTH THE "X" AND "Y" AXIS IS SHOWN IN LOG SCALE.

AND THERE ARE TWO -- MORE LIKE THREE MODES.

FIRST -- THE SMALLEST TWO MODES ARE A KIND OF -- THEY OVERLAP.

SO IF WE LOOKING AT THE SPEAKING DISTRIBUTION, THE BLACK DASHED LINE, YOU CAN SEE THAT THERE'S A PEAK AROUND 1 TO 2 MICRONS.

THIS IS FOR THE DROPLETS AND AEROSOLS RIGHT AS THEY COME OUT OF OUR MOUTHS BEFORE THEY HAVE UNDERGONE ANY EVAPORATION. AND THERE'S A LITTLE BIT OF A SHOULDER OUT THERE TOWARDS MAYBE FOUR MICRONS OR SO.

AND THEN THERE'S A LARGER MODE OF THESE LARGER DROPLETS.

THESE ARE VISIBLE ONES THAT ARE CENTERED AROUND 100 TO 200 MICRONS.

THOSE ONLY MAKE UP 1% OF THE TOTAL NUMBER OF DROPLETS AND AEROSOLS THAT ARE RELEASED WHEREAS 99% OF THEM ARE IN THOSE SMALLER SIZES, LESS THAN -- MOSTLY LESS THAN 10 MICRONS.

NEXT.

NOW IF SOMEONE IS INFECTED THESE AEROSOLS MAY CONTAIN VIRUSES.

AND WHEN WE SPEAK AND WE SAY A PHRASE LIKE, HELLO, WORLD, WE RELEASE ABOUT 5 NANOLITERS WORTH OF LIQUID.

AND IF YOU HAVE AN AVERAGE LOAD OF VIRUSES IN YOUR RESPIRATORY FLUID, YOU MIGHT RELEASE 30 VIRUSES IN TERMS OF THE NUMBER OF RNA COPIES OF IT.

WHEN YOU COUGH YOU RELEASE A MUCH LARGER AMOUNT OF FLUID.

BECAUSE THERE ARE SOME LARGE DROPLETS.

THAT WOULD BE 125 NANOLITERS AND CLOSE TO 1,000 VIRAL RNA COPIES.

NEXT.

AND THIS IS WHY IT'S SO IMPORTANT FOR US TO COVER OUR MOUTHS.

SOURCE CONTROL MEANS -- JUST IN TRADITIONAL AIR POLLUTION TERMS OR WATER POLLUTION.

YOU GO BACK TO THE SOURCE AND REDUCE THE AMOUNT RELEASED INTO THE ENVIRONMENT.

IT'S ALWAYS EASIER TO DO THAT THAN TO TRY TO CLEAN SOMETHING UP OR REDUCE ITS CONCENTRATIONS AFTER IT'S BEEN RELEASED IN THE ENVIRONMENT.

SO PERSON HERE ON THE LEFT IS SPEAKING.

AND RELEASING MAYBE ONE LARGE DROPLET.

AND 100 TO 200 AEROSOLS SO THOSE LITTLE RED DOTS.

AND WHAT WE ARE GOING TO DO IS PUT A MASK ON HER.

NEXT.

ALL OF A SUDDEN WE HAVE BLOCKED THOSE LARGE DROPLETS AND AEROSOLS FROM GETTING OUT INTO THE AIR.

AND NOW THEY CAN NO LONGER SPREAD IN THE AIR OR BUILD UP IN THE AIR.

SO THAT IS WHY MASKS ARE IMPORTANT AND DR. WANG WILL BE TALKING ABOUT THAT AFTER ME.

NEXT.

SO I STARTED OPENING MY MOUTH ABOUT THIS TOPIC EARLY ON IN THE PANDEMIC.

BECAUSE I'VE STUDIED AIRBORNE TRANSMISSION OF VIRUSES FOR OVER TEN YEARS.

IT WAS EVIDENT TO ME THERE WOULD BE A LOT OF INACCURACIES ABOUT HOW PEOPLE TALK ABOUT AIRBORNE TRANSMISSION.

SO EARLY IN MARCH I TWEETED OUT LET'S TALK ABOUT AIRBORNE TRANSMISSION OF SARS, COFFEE T.

TO REDUCE FEAR ASSOCIATED WITH THE TERM.

BACK THEN I PROBABLY HAD ABOUT 1,000 FOLLOWERS AND I PULLED THIS SCREEN SHOT YESTERDAY.

IT LOOKS LIKE I HAVE OVER 26,000 FOLLOWERS.

THERE'S NOT A LOT OF PEOPLE WHO HAVE STUDIED THIS QUESTION FROM THE AEROSOL SCIENCE SIDE AND BEING ABLE TO UNDERSTAND WHAT SIZES ARE IMPORTANT AND HOW THEY MOVE IN THE ENVIRONMENT.

SO-SO COUNTER THE MISINFORMATION -- AND BECAUSE OF MY SPECIALIZED EXPERTISE REALIZED IT WAS REALLY IMPORTANT FOR ME TO GET OUT THERE AND PROVIDE THE CORRECT INFORMATION.

SO THAT'S WHAT HAS REALLY DRIVEN THIS.

TO PROVIDE CORRECT INFORMATION SO WE CAN USE THAT TO SLOW TRANSMISSION.

SO ONE OF MY -- THE MAIN THING I KEEP IN MIND WHEN COMMUNICATING SCIENCE TO THE PUBLIC IS KISS.

KEEP IT SIMPLE STUPID.

NOT TO IMPLY THAT PEOPLE ARE STUPID.

BUT TO TRY TO EXPLAIN THINGS IN AS CLEAR A WAY AS POSSIBLE USING EVERY DAY LANGUAGE, NO SPECIALIZED JARGON.

AND IF I DO, TO EXPLAIN THAT, AND TO TRY TO RELATE CONCEPT -- COMPLEX SCIENTIFIC CONCEPTS USING ANALOGIES THAT PEOPLE ENCOUNTER IN THEIR EVERY DAY LIVE.

LIKE CIGARETTE SMOKE.

WE CAN THINK OF THE VIRUS SPREADING IN AIR LIKE CIGARETTE SMOKE DOES.

AND THEN I LEARNED AN IMPORTANT LESSON EARLY ON FROM A PROFESSOR AT UCA SAN DIEGO IN NATIONAL ACADEMY OF SCIENCE AND ENGINEERING WHO HAS DONE AEROSOLS AND WHO DOES A LOT OF INFORMATION ON CLIMATE CHANGE.

THERE WERE -- YES, THERE ARE SOME UNCERTAINTIES AND NUANCES IN THIS.

BUT WE DO KNOW ENOUGH TO ACT.

SO I TOOK THAT MESSAGE TO HEART.

AND YES, WE COULD -- I COULD TALK FOR HOURS ABOUT THE NUANCES OF VARIOUS DIFFERENCES IN PEBBLINGS OF AIRBORNE TRANSMISSION.

BUT THE FACT IS IT'S HAPPENING AND WE KNOW HOW TO SLOW IT DOWN.

AND THEN DR. STUART MENTIONED THAT I HAVE AN OP-ED.

THEY ASKED ME TO WRITE SOMETHING AND IT WAS AN EDUCATIONAL EXPERIENCE FOR ME BECAUSE THE FIRST DRAFT WAS TERRIBLE ASK THEY ASKED ME TO COMPLETELY REWRITE. IT AND SO THEY ASKED ME TO SUBMIT A SECOND DRAFT AND THE EDITOR HAD RED INK EVERYWHERE AND IT CAME OUT HOPEFULLY ACCESSIBLE TO THE PUBLIC.

THANK YOU FOR YOUR ATTENTION.

>> THANK YOU, LINDSEY, THAT'S ACTUALLY REALLY INTERESTING TO HEAR ABOUT.

NEXT WE HAVE DR. COLLEEN NAUGHTON.

SHE HELPED TEACH ON THE GOOGLE SHEET AND THE AEESP WEBSITE IN TRANSITION INTO ONLINE LEARNING DURING THE PANDEMIC.

DR. NAUGHTON'S RESEARCH IS FOR SUSTAINABLE AND CULTURALLY FOOD, ENERGY AND WATER SYSTEMS.

SHE RECENTLY RECEIVED TWO COVID-19 EMERGENCY GRANTS TO CANUCK ON THE RICK ASSESSMENT OF SARS COVID2 AND TO STUDY THE INFLUENCE OF THE COVID-19 SHOCK.

AND DR. NAUGHTON HAS PUBLISHED A RESPECTIVE PIECE IN WASTE MANAGEMENT FOR COVID-19.

DR. GNAW SON RECEIVED ENVIRONMENTAL IN ENGINEERING AND AN MSHP WITH A CERTIFICATE IN WATER HEALTH AND SUSTAINALITY.

PROFESSOR NAUGHTON IS ALSO OUR CONFERENCE CO-CHAIR AND A CO--PI ON THE GRANT THAT MADE THIS CONFERENCE POSSIBLE.

SO PLEASE WELCOME DR. NAUGHTON TO TALK TO US ABOUT WHAT HAPPENS WHEN YOU PUBLISH THE TOILET.

>> HELLO, EVERYONE AND THANK YOU, DR. STUART FOR THE INTRODUCTION.

I'M HONORED TO PRESENT TO YOU WHAT HAPPENS WHEN YOU FLUSH THE TOILET.

AS MENTIONED THIS IS PART OF A SEED GRANT AND IT'S A TEAM EFFORT AND I'M HONORED TO PRESENT ON BEHALF OF MY TEAM MANY OF WHOM ARE ON THIS CALL TODAY.

NEXT SLIDE, PLEASE.

SO EMPTY YOU MAY BE IN CIVIL AND ENTREPRENEUR ENGINEERING AND KNOW ABOUT WASTE WATER TREATMENT.  
BUT PLEASE BEAR WITH ME.  
I KNOW THERE ARE SOME THAT DO NOT.  
AND BEFORE I GET STARTED ABOUT WHAT HAPPENS WHEN YOU FLUSH THE TOILET.  
IN ACCORDANCE WITH THE THEME OF EQUITY.  
NOT EVERYONE IN THE WORLD AND EVEN IN THE UNITED STATES HAVE ACCESS TO WASTE WATER TREATMENT OR SANITATION OR TOILETS, BILLIONS IN THE WORLD DO NOT HAVE ACCESS.  
BUT FOR THOSE OF YOU THAT ARE LUCKY TO HAVE ACCESS IN RUNNING WATER, IT STARTS WITH ONE, FLUSHING YOUR TOILET.  
YOU MAY HAVE A SQUAT TOILET AND NOT A SEATED TOILET.  
AND THEN IT GOES DOWN A PIPE.  
AND INTO YOUR PIPING SYSTEM AND YOUR HOUSE.  
AND NUMBER TWO, AND THEN GOES OUT TO A SEWER LINE OR INTO A SEPTIC TANK AND HOPEFULLY ARE YOU ONLY FLUSHING THE THREE PS, PEE, POOH AND PAPER.  
AND LIKE IN LOS ANGELES A LARGE WASTE WATER TREATMENT PLANT.  
AND THEN IT GOES THROUGH MANY STEPS TO BE TREATED TO PROTECT PUBLIC HEALTH AGAINST DISEASES SUCH AS SARS, COV-2 AND OTHER PATHOGENS SO IT GOES THROUGH CHEMICAL AND BIOLOGICAL TREATMENT AND DISINFECTION BEFORE IT'S DISCHARGED INTO THE ENVIRONMENT AND MEETS REGULATIONS SUCH AS IN THE OCEAN IN L.  
OR IN OTHER PLACES THAT MAY BE A RIVER OR A CREEK.  
NECK SLIDE.  
IN THE CONTEXT OF COVID-19 WE HAVE SEEN WASTE WATER BEING USED TO THROUGH WASTE WATER BASED EPIDEMIOLOGY.  
SO UP TO OVER 50% OF PEOPLE SHED SARS COV2 IN THEIR FECES, WHETHER THEY ARE SYSTEMIC OR ASIMIC AND CIVIL ENGINEERS OR SCIENTISTS CAN COLLECT IT AT THEIR SEWER SYSTEM OR WASTE WATER PLANTS AND THEY CAN SAMPLE LARGE POPULATIONS THROUGH ONE SAMPLE LIKE WASTE WATER TREATMENT FACILITIES SERVE HUNDREDS AND THOUSAND OF PEOPLE.  
AND YOU CAN FILTH THE SAMPLE AND QUANTIFY THE VIRUS OVER TIME.  
THERE ARE OF COURSE DIFFICULTIES IN THIS PROCESS.  
AND IT SHOULD NOT REPLACE REGULAR SIMILAR TESTS.  
NEXT, PLEASE.  
THIS IS NOT A NEW TECHNIQUE.  
EVEN IF THE NEWS MIGHT FEEL IT IS.  
IT'S BEEN USED FOR DECADES.  
IT'S BEEN USED FOR POLL JOE VIRUS AND OPIOID DETECTION.  
NEXT.  
AND IT'S BEING USED GLOBALLY SINCE THE BEGINNING OF THE PANDEMIC ALL OVER THE WORLD TO DETECT SARS COV-2 IN THE WASTE WATER.  
NEXT SLIDE, PLEASE.  
THIS IS YOUR QUIZ QUESTION IF YOU ARE TAKING THE QUIZ.  
SO PLEASE LISTEN IF YOU HAVEN'T BEFORE.  
SO SARS COV2 TESTING CAN BE USED AS AN EARLY WARNING PROCESS.  
PEOPLE WHO ARE ASIMIC ARE SHEDDING AND PEOPLE AT THE EARLY STAGES MAY BE SHEDDING IT.  
SO IT CAN BE ANYWHERE FROM 3 TO 14 DAYS BEFORE SHEDDING AND THIS IS AN EXAMPLE FROM YALE UNIVERSITY.  
AND THEY HAVE A GREAT WEBSITE.  
NEXT.

YOU MAY HAVE HEARD UNIVERSITY OF ARSON USED WASTE WATER TO DETECT AN OUTBREAK BEFORE IT STARTED.

AND NEXT.

CITIES, IN POT WHAT THERE'S BEEN A LOT OF TALK ON TWITTER ABOUT THE INCREASING CONCENTRATION IN OTTAWA'S.

IN PUBLIC HEALTH DEPARTMENTS AND THEY ARE BEING USED TO IMPLEMENT MEASURES AND SHUT DOWN SCHOOLS OR BARS OR RESTAURANTS TO KIND OF STOP THE SPREAD BEFORE IT GETS WORSE.

WORSE.

CAN YOU SEE THE CONCENTRATIONS INNING AS RED AND DECREASING AS GREEN AND OHIO IS THE CDC AND THEY HAVE TONS OF PLACES THEY ARE MONITORING THROUGHOUT THE STATE AND A LOT OF WEBSITES TO SHOW THE CONCENTRATIONS OVER TIME.

THIS ONE IS SHOWING -- WITH OUR THIRD SURGE THAT WE ARE SEEING IN THE UNITED STATES.

WE SEEING THAT IN WASTE WATER AS WELL, LIKE IN MASSACHUSETTS.

AND IN ARIZONA HAS A GREAT DASHBOARD AS WELL.

NEXT.

OUR GROUP IS TRYING TO FOSTER DECISIONS AND ACTIONS BY PUTTING THIS ALL IN ONE PLACE WE WERE INSPIRED BY THE JOHN HOPKINS UNIVERSITY DASHBOARD.

WE WANTED TO MAKE A SIMILAR ONE FOR WASTE WATER.

THEIR DASHBOARD IS ON COVID-19 CASES.

SO YOU CAN ZOOM IN ON AREAS OF THE MAP.

SEE IF WASTE WATER TESTING IS HAPPENING IN YOUR AREA.

VISIT THE DIFFERENT WEBSITES AND DASHBOARDS.

AND THIS IS PART OF A LARGER COVID-19 WASTE WATER BASED EPIDEMIOLOGY COLLABORATIVE.

THE WEBSITE IS ON THE BOTTOM RIGHT AND WE ALSO HAVE A TWITTER ACCOUNT AT COVID POOPS.

FIND OUT MORE ABOUT THAT FOR COVID-19 AND WASTE WATER.

SO THANKS FOR YOUR TIME.

AND I LOOK FORWARD TO QUESTIONS.

>> THANK YOU VERY MUCH, COLLEEN.

I HAVE TO CHECK WHAT WE HAVE IN FLORIDA HERE.

OUR NEXT SPEAKER IS DR. YANG WANG, WHO IS AN ASSISTANT PROFESSOR OF TECHNICAL ENVIRONMENTAL ENGINEERING AT THE UNIVERSITY OF -- HE FOCUSES ON AEROSOL CLOUD INTERACTION AND PARTICLE -- GIVEN THE URGENT NEED FOR MEDICAL MASKS PROFESSOR WANG'S RESEARCH MASK IS TESTING A WIDE RANGE OF HOUSEHOLD MATERIALS AND COMMON COMMERCIAL FABRICS THAT CAN BE USED TO MANUFACTURE MASKS.

THIS WORK HAS BEEN DISSEMINATED THROUGH A PUBLICLY AVAILABLE SPREADSHEET AND FEATURED IN LOCAL AND ONLINE NEWS ARTICLES.

DR. WANG RECEIVED A BS IN ENERGY, ENVIRONMENTAL AND CHEMICAL ENGINEERING AND A PHD BOTH FROM THE WASHINGTON UNIVERSITY IN ST. LEWIS.

NOTABLY IN 2018 PROFESSOR YANG WAS RECIPIENT OF THE GAEF, PHD AWARD BY THE EUROPEAN ASSOCIATION FOR AEROSOL RESEARCH FOR HIS WORK.

PLEASE WELCOME DR. WANG TO DISCUSS WHAT INFORMATION TO SHARE WITH PEOPLE ON MASK MAKING MATERIALS.

>> SHE LOW, EVERYONE.

DURING THIS TALK I'M GOING TO SHARE SOME INFORMATION ON MASK MAKING MATERIALS.

SO FIRST I WOULD LIKE TO THANK THE STUDENTS IN MY GROUP WHO HAVE BEEN WORKING TIRELESSLY TO PROVIDE THE DATA THAT IS SHOWN IN THIS PRESENTATION.

NEXT SLIDE, PLEASE.

DURING THE PANDEMIC, DUE TO THE SHORTAGE OF THE MEDICAL PPE, FOR EXAMPLE N-95 RESPIRATORS OR SURGICAL MASKS PEOPLE ARE ALWAYS LOOK FOR THE BEST MATERIAL FOR THEIR HOMEMADE MASKS BUT BEFORE WE IDENTIFY THESE BEST MATERIALS, WE NEED TO FIRST UNDERSTAND WHAT ARE THE CRITERIA FOR A GOOD MASK?

SO FDA AND CDC ACTUALLY GAVE THEIR RECOMMENDATIONS ON THESE CRITERIA. AND THEY INCLUDE FILTRATION EFFICIENCY, AND FLUID RESISTANCES AND FLUID MOBILITY.

SO AMONG THESE FOUR THE TOP TWO ARE VERY IMPORTANT BECAUSE NUTRITION DETERMINES HOW EFFECTIVE THE MASK IS IN REMOVING THE PARTICLES AND THE FREE RESISTANCES DETERMINES HOW EASY IT IS TO BREATHE THROUGH THE MASK.

AND AS FOR OUR MASKS WE ALSO NEED TO MAKE SURE THAT THEY ALSO SATISFY THESE CRITERIA OR AT LEAST THE TOP TWO CRITERIA.

AND HERE I HAVE TO MENTION THAT DURING THE EARLIER STAGES OF THE PANDEMIC, HE TEAMED UP WITH OUR LOCAL HOSPITAL, AND JOINED THE JOIN TASK FORCE TO EVALUATE A WIDE RANGE OF HOUSEHOLD MATERIALS IN FILTRATION EFFICIENCY OR FILTRATION PERFORMANCE.

AND I THINK THIS IS A VERY GOOD DEMONSTRATION OF ENGINEERS AND HOPE WITH OUR LOCAL COMMUNITY TO ALLEVIATE THE IMPACT OF THIS DISEASE.

NEXT SLIDE, PLEASE.

IN TERMS OF EVALUATING THE PERFORMANCE OF THESE MASKS, THEY GENERALLY INCLUDE TWO ASPECTS.

SO THE FIRST ASPECT IS ON THE MATERIALS TEST.

WHICH MEANS THAT WE NEED TO CUT THESE MATERIALS INTO DISKS AND FIT THEM INTO THE FUTURE CASSETTE AND WE CAN EVALUATE THE FILTRATION PERFORMANCE.

AND THE SECOND ASPECT IS THE FIT TEST WHICH MEANS WE NEED TO PERFORM THESE MATERIALS INTO THE ENTIRE MASK.

AND FURTHER EVALUATE ITS PERFORMANCE.

AND HERE I WANT TO MENTION THAT THE FIT TEST IS EQUALLY IMPORTANT AS THE MATERIAL FILTRATION TEST.

BECAUSE THE EARLY INDICATION MAY ALSO LEAD TO THE TRANSMISSION OF THE DISEASE. AND YOU CAN USE A WIDE RANGE OF AEROSOL STRUMS TO CONDUCT THESE MEASUREMENTS.

NEXT SLIDE, PLEASE.

SO THE GENERAL METHOD WE CAN USE IF WE KNOW THE CONCENTRATION UPSTREAM AND DOWNSTREAM OF THE MASKS OR THE MATERIALS, THEN WE CAN LOOK AT THE EFFICIENCY AND ALSO THE FILTRATION EFFICIENCY OF THESE MATERIALS.

THE FILTRATION EFFICIENCY IS A STRONG FUNCTION OF PARTICLE SIZE.

FOR EXAMPLE THE N-95 RESPIRATORS.

AND FOR THE COV-2 VIRUS, THESE VIRUSES ARE CARRIED BY LARGER DROPLETS THAN 1 MICRON.

THEREFORE THEIR FILTRATION EFFICIENCIES ARE STRONGLY DETERMINED ON THEIR DIFFERENT PARTICLE SIZE.

BUT IN GENERAL THESE EFFICIENCIES ARE POSITIVELY CORRELATED WITH EACH OTHER.

NEXT SLIDE ARE PLEASE.

AND HERE IT SHOWS A LIST OF FABRIC MATERIALS THAT WE HAVE IN TERMS OF THEIR FILTRATION PERFORMANCE AND I'M SHOWING THE FILTRATION EFFICIENCY AT .03 MICRO METERS AND THEY INCLUDE COTTON AND POLYESTER.

AND SILK AND WOOL.

SO THE DENSER FABRICS WOULD HAVE HIGHER EFFICIENCIES.  
IN THE FABRIC INDUSTRY PEOPLE NORMALLY USE GRAMS PER QUARTER METER OR GSM TO DETERMINE HOW DENSE THE FABRICS ARE.  
AND IT IS EASY FOR US TO DETERMINE HOW DENSE OUR MASK IS TO DETERMINE IF WE CAN SEE LIGHT THROUGH THE FAB RIG.  
IF WE CAN SEE THE LIGHT THROUGH THAT, MEANS THE FABRIC IS NOT DENSE ENOUGH.  
SO WE HAVE TO STACK MULTIPLE LAYERS TO BOOST UP THE FILTRATION EFFICIENCY.  
BUT WE ALSO NEED TO MAKE SURE THERE'S NO AIR LEAKAGE AND WE CAN TEST THAT BY CHECKING WHETHER WE WILL BLINK OR WHETHER THERE WILL BE FOG ON OUR GLASSES WHEN WE SCALE AS HARD AS WE CAN.  
NEXT SLIDE, PLEASE.  
PLEASE.

>> AND MATERIALS THAT ARE ELECTRIC INSIDE HAVE THE BEST PERFORMANCE AND THESE MATERIALS GENERALLY INCLUDE AIR FILTERS AND FURNACE FILTERS AND SO ON.  
SO ON THE LEFT IT SHOWS THE MATERIALS FILTRATION EFFICIENCY AS A FUNCTION OF THE FLUID RESISTANCES.  
IN GENERAL, THE BETTER MATERIALS WOULD HAVE A HIGHER FILTRATION EFFICIENCY.  
AND A LOWER FLOW RESISTANCES WHICH MEANS THAT THEIR DATA POINTS SHOULD BE ON THE LOWER RIGHT CORNER.  
YOU CAN SEE THAT A LOT OF THESE MATERIALS STARTS WITH THE LETTER H IN FRONT OF THEM.

WHICH MEANS THAT THEY ARE AIR FILTERS.  
SO THIS RESULT MEANS THAT WE CAN USE THE AIR FILTERS AS AN INSERT FOR THE MASKS BUT WE ALSO NEED TO MAKE SURE THE AIR GOES THROUGH THE FILTER AND WE DO NOT RECOMMEND WASHING OF THESE MASKS.  
SO FINALLY -- ONE SLIDE BEFORE.  
SO -- BY THE WAY IF YOU WEAR A FACE SHIELD WHEN YOU GO TO THE CLASSROOM, PLEASE ALSO MAKE SURE THAT YOU ALSO WEAR A MASK BECAUSE OUR STUDY ALSO FOUND THAT WHEN YOU WALK AROUND THE AREA DYNAMICS MIGHT WORK AGAINST YOU IN PUTTING MORE PARTICLES IN THE ZONE.  
NEXT SLIDE, PLEASE.

SO FINALLY I'M LISTING A FEW HELPFUL PUBLICATIONS AND WORKSHOPS TO FOLLOW.  
AND I THINK DURING THIS PANDEMIC YOU REALLY HAVE TO APPRECIATE THE ENGINEERS WHO ARE ACTUALLY SHARING THEIR RESEARCH RESULTS AND ALSO THEIR UNDERSTANDING OF THIS DISEASE.  
AND SPECIFIC FOR THIS TALK I WANT TO THANK -- THEM FOR THESE SLIDES.  
SO THANK YOU FOR YOUR ATTENTION.  
THAT'S ALL FOR MY PRESENTATION.  
>> THANK YOU.

I THINK YOUR FINDINGS ABOUT THE FACE SHIELD IS SOMETHING PEOPLE NEED TO HEAR.  
SO THE NEXT SPEAKER IS DR. SHAMIA SAYSHOGRBQUE FROM THE UNIVERSITY OF SOUTH CAROLINA.  
HER INTERESTS FOR MATHEMATICAL MODELS FOR FLUID FLOW AND DECONTAMINATION IN THE ENVIRONMENTAL SYSTEM.  
WITH THE OBJECTIVE OF INFORMING RISK ASSESSORS AND FIRST RESPONDERS.  
PROFESSOR HOQUE'S RESEARCH STUDIES INCLUDE ANALYSIS AND BIO AEROSOL TRANSPORT AND INACTIVATION IN INDOOR AREAS.  
PROFESSOR HOQUE'S WORK TO COVID-19 INFECTION WAS FEATURED FROM EARLY IN THE PANDEMIC.  
DR. HOQUE RECEIVED A PHD FROM THE UNIVERSITY OF SOUTH CAROLINA.



AND MASTERS OF APPLIED SCIENCE AND CHEMICAL ENGINEERING FROM THE UNIVERSITY OF TORONTO AND A BSC FROM BANGLADESH ENGINEERING AND TECHNOLOGY. PLEASE WELCOME DR. HOQUE TO SPEAK TO US ABOUT THE CHARACTERISTICS AND DYNAMICS OF SARS COV-2 TRANSMISSION.

>> THANK YOU VERY MUCH FOR THAT INTRODUCTION, AMY.

AND GOOD MORNING OR GOOD AFTERNOON FOR WHOEVER IS WATCHING, FROM WHEREVER YOU ARE.

THIS IS A COLLABORATIVE WORK ACROSS THE FIELD WITH PROFESSORS FROM THE DEPARTMENT OF CHEMISTRY AND BIOCHEM INDUSTRY AT USC AND IN COMBINATION WITH OHIO STATE UNIVERSITY.

NEXT SLIDE, PLEASE.

WE HAVE HEARD ABOUT AEROSOL TRANSMISSION AND IN THE ATMOSPHERE AND IN THE INDOOR SPACES.

I'M GOING TO FOCUS ON HOW WE CAN TAKE THOSE DECISIONS SO WE CAN BUILD SPACES WHICH ARE SAFE AND HEALTHY FOR US.

A VIRUS ONCE IT'S RELEASED IN A DROPLET OR RELEASED ON ITS OWN.

BUT WHEN IT'S RELEASED IT WILL TRAVEL IN THE AIR AND FIND ITS WAY SOMEHOW OR THE OTHER IN THE SURFACE INTO THE AIR BETWEEN THE BULK AIR AND THE SURFACE.

ONCE IT REACHES THE SURFACE IT WILL ENTERABLE DEPENDING ON THE PROPERTIES AND GENERALLY -- OR DEPENDING ON ACTIVITIES WHICH COULD CAUSE IT TO REBOUND BACK INTO THE BULK AIR.

NEXT SLIDE, PLEASE.

SO FIRST YOU ARE GOING TO TAKE A LOOK AT WHAT HAPPENS IF THERE FIRST YOU WILL LOOK AT WHAT HAPPENS WITH VIRUSES AND THE INTENT IS TO MOVE ON TO THE MODEL FOR SARS COV-2 AND THIS WORK HAS BEEN FUNDED BY THE USC EMERGENCY COVID-19 FUND. WE LOOKED AT WHAT WOULD HAPPEN IF YOU PAUSED THE VIRUS AND ALLOWED IT TO DEPOSIT ON DIFFERENT KINDS OF SURFACES USING A MICRO BALANCE.

AND SUBSEQUENTLY WE TRIED TO FIND OUT WHAT WOULD HAPPEN IF WE TRIED TO WASH OUT THAT VIRUS USING DIFFERENT FLUORIDES.

NEXT SLIDE, PLEASE.

SO THE EXPERIMENT WAS DONE WITH MULTIPLE SURFACES.

AND WE HAVE HERE, GOLD AND STAINLESS STEEL.

WE ARE CONTINUING WITH THE COVID VIRUS.

STAINLESS STEEL STANDS OUT WHEN IT COMES TO HAVING A HIGH MASS ABSORPTION ON TO THE SURFACE.

AND THEN WHEN YOU SUBSEQUENTLY TRY TO WASH IT OFF WE HAVE STAINLESS STEEL WHICH ACTUALLY HOLDS ON TO THE VIRUS OPPOSED TO GLASS WHICH ALLOWS THE MOST WASHUP FOLLOWED BY GOLD.

AND THE MICROSCOPE HAS SHOWN THAT THIS IS MAINLY DUE TO SURFACE CHARGES BELONGING TO THE VIRUS AS WELL AS THE STAINLESS STEEL.

SO WHAT THIS TELLS US, IS THAT AS WE GO THROUGH AND TRY TO UNDERSTAND HOW THIS TRANSMISSION HAPPENS IN OUR ENVIRONMENT, WE CAN LOOK AT DIFFERENT SURFACE PROPERTIES AND SEE HOW THEY INTERACT.

AND THIS GIVES US AN IDEA OF WHAT TO CHOOSE WHEN YOU GO AHEAD AND TRY TO DESIGN OR INFORM THE SPACES WE USE IN OUR DAY-TO-DAY LIFE AND SPACES.

PARTICULARLY -- PLEASE GO TO THE NEXT SLIDE.

PARTICULARLY IF YOU WILL NOW FOCUS ON BULK AIR FLOW.

SO CURRENTLY THIS PICTURE THAT WE JUST HAD LOOKED AT FACE SHIELDS.

RIGHT.

CURRENTLY ALL OF OUR CHILDREN ARE GOING TO SCHOOLS AND WE HAVE FACE SHIELD AS ONE OF THE PROTECTIVE MEASURES.

SO THE QUESTION THAT MAY COME IS THOSE FACE SHIELDS EFFECTIVE?  
AND WHAT WOULD MAKE THEM MORE EFFECTIVE OR WHETHER OR NOT WE NEED TO THINK ABOUT MATERIALS OR WHERE THEY ARE LOCATED.

NEXT SLIDE.

SO THESE ARE DYNAMIC RELATIONS WHICH LOOK AT DETAILED AIR FLOW ON WHERE THE AIR TRAVELS AND WHERE THE PARTICLE TRAVELS.

I HAD ONE FACE SHIELD AND TWO SOURCES OF.

IT ONE AT THE ADULT'S BREATHING MANUAL.

THE SECOND SHOWS DIFFERENT LOCATIONS IN HA ROOM ASK WHILE WE HAVE LOW VELOCITIES ACROSS THE ROOM, IF YOU NOTICE JUST BEHIND WHERE THE SHIELD IS LOCATED THERE IS A SLIGHTLY HIGHER VELOCITY COMPARED TO THE REST OF IT.

WHICH INDICATES --

WHICH WAS NOT THERE WHEN THE SHIELD WAS ABSENT.

WHICH INDICATES THAT THE PRESENCE OF THE SHIELD IMMEDIATELY MAKES CHANGES OR DISRUPTS THE PATTERN IN WHICH THE AIR FLOWS INTO THAT ROOM.

NEXT SLIDE, PLEASE.

SO WE ASSESSED WHAT SHOULD HAPPEN FOR AIR FLOW AND SNEEZE DIRECTION WERE ALTERED.

SO THE RED ARROW INDICATES THAT THE AIR FLOW IS IN THE OPTION DIRECTION OF THE SNEEZE AND THE BLACK LINE IS THE SNEEZE IS IN THE DIRECTION OF THE AIR FLOW.

SO IF YOU LOOK AT THE TWO PLOTS ON THE TOP WHERE WE HAVE THE FLOW OF THE SNEEZE IN THE OPPOSITE DIRECTION TO THE AIR FLOW.

INCORPORATING A PARTITION REDUCES THE TIME OF EFFECT POSSESS SURE OF THE TOTAL NUMBER OF PARTICLES INSIDE THE ROOM FROM AROUND 8% TO 3%.

THE GREEN LINE IS WHEN THE SNEEZE IS FROM THE ADULT AND THE SECOND LINE IS WHEN THE SNEEZE FROM THE CHILD.

NOW IF WE GO DOWN TO THE PLOTS BELOW THOSE TWO WHERE WE HAVE THE BLACK LINE, WHICH IS THE SNEEZE IS IN THE DIRECTION OF THE FLOW WILL YOU NOTICE THAT THE PRESENCE OF THE PARTITION ACTUALLY CAUSES MORE PARTICLES TO STAY INSIDE THE ROOM AS OPPOSED TO WHEN THIS IS NO PARTITION.

AND THE CASE GETS WORSE FOR THE CHILD WHO IS SNEEZING AND WHO HAS THE SHIELD IN FRONT OF HIM OR HER.

SO IT GOES FROM 0 TO 2% OR 3 TO 4% REMAINING AFTER AROUND ARE 15 MINUTES.

NEXT SLIDE, PLEASE.

SO WE FOCUSED THE WORST CASE SCENARIO TO TAKE A LOOK AT WHAT IS HAPPENING TO THE PARTICLES OVERALL AND TRACKED THEIR CHANGES OVER A 15-MINUTE PERIOD AND WITHOUT THE PARTITION AS YOU NOTICED.

MOST F PARTICLES HAVE MOVED AWAY AFTER 1 MINUTE WHICH HAS NOT HAPPENED IN THE CASE WHEN WE FIRST HAD PARTITION.

SO THIS REINFORCES THE FACT THAT WE HAVE TO TAKE INTO CONSIDERATION NOT ONLY THE FACT THAT SOMEONE IS SNEEZING BUT ALSO WHEN WE MAKE DESIGN CHOICES WHAT THE AIR FLOW CONDITIONS ARE WITHIN THE ROOM.

THAT WAY WE CAN MAKE AN INFORMED DECISION ON DESIGNING SO THAT WE ACTUALLY CONSIDER THE FACT THAT AIR FLOW WILL INFLUENCE THE PATTERN IN THE ROOM WOULD BE INFLUENCED DUE TO THE WAY WE HAVE DESIGNED OUR INDOOR SPACES.

THE SURFACE, ALSO, IF WE HAVE THE FACE SHIELD IN CERTAIN SURFACES WE COULD LEARN MORE ABOUT HOW DIFFERENT MATERIALS WOULD INFLUENCE THAT INTERACTION WITH THOSE DROPLETS WHICH ARE BEING REUSED AND POSSIBLY ENTER INTERACTING WITH THE SURFACE.

NEXT SLIDE.

SO HOWDIES PALESTINIANS MUST WORKING TO.

HOW THEY WORK WITH MULTIPLE DISCIPLINES.

IT'S NOT A ONE SIZE-FITS ALL APPROACH WE HAVE TO BE OPEN TO THE FACT THAT MULTIPLE DESIGNS -- WE HAVE TO LOOK AT THE WAY THING CAN MAKE CHANGES. ADDITIONAL WAYS DO NOT NEED TO BE EXPENSIVE.

WE JUST HAVE TO FIGURE OUT THE INFORMATION WE CAN GET FROM OUR RESEARCH. WHICH CAN TRANSFORM HOW WE DESIGN BUILDINGS AND THIS CAN LEAD US LEARNING HOW TO ACTUALLY DESIGN SAFE AND AFFORDABLE BUILDINGS THAT CAN SUPPORT DESIGN AND CONSTRUCTION.

THANK YOU.

>> THANK YOU.

SHAMIA, IT MAKES ME THINK TWICE ABOUT ALL THE FANCY STAINLESS STEEL APPLIANCES IN THE KITCHENS THESE DAYS.

THE FINAL SPEAKER IS DR. CHARLES HAAS.

DR. HAAS IS THE LD BETS PROFESSOR IN ARCHITECTURE ENVIRONMENTAL ENGINEERING AT DREXEL UNIVERSITY.

HIS RESEARCH FOCUSES ON DRINKING WATER.

SPECIFICALLY HE HAS STUDIED CHEMICAL PROCESSES AND EMERGING PATHOGENS BY DISINFECTIONS AND THE USE OF THROUGHOUT DYNAMICS FOR THE PROCESS OF MODELING.

DR. HAAS IS ALSO FROM RISK MANAGEMENT AND INDUSTRIAL WASTE TREATMENT.

PROFESSOR HAAS HAS AN ONLINE BLOG AS IT RELATES TO THE COVID-19 PANDEMIC.

HIS QUICK DEVELOPMENT AT THE BEGINNING F PANDEMIC WAS COVERED IN THE PRESS.

DR. HAAS RECEIVED A BS IN BIOLOGY AND AN MS IN ENVIRONMENTAL ENGINEERING FROM ILLINOIS INSTITUTE OF TECHNOLOGY.

AND A PHD AT ORVANA CHAMPAGNE.

NOTABLY IN 2017 DR. HAAS RECEIVED THE RICHARDSON ISSUE VINE CLARK PRIZE FOR EXCELLENCE N WATER RESEARCH. PLEASE WELCOME PROFESSOR HAAS.

>> THANK YOU.

AND THANK YOU ORGANIZERS FOR PUTTING THIS TOGETHER.

SO I WANT TO TAKE A HIGH LEVEL OVERVIEW OF THE PROBLEMS COVID-19 -- FROM A RISK ANALYSIS POINT.

VIEW.

AND POINT OUT THE CONNECTION WITH SOME VERY BASIC CONCEPTS THAT WE USE IN ENVIRONMENTAL ENGINEERING THROUGHOUT OUR REALM OF RESEARCH AND PRACTICE.

NEXT SLIDE.

SO ONE OF THE BROAD CONCEPTS THAT WE ARE USED TO DEALING WITH IS THE SOURCE TRANSPORT RECEPTOR PARADIGM.

THE IDEA THAT WE HAVE A SOURCE OF CONTAMINATION.

IN THIS CASE MICROORGANISMS LEAD INTO THE ENVIRONMENT, SUCH AS BY SPEAKING, COUGHING, OR SNEEZING AS PROFESSOR INDICATED AND WE TALKED ABOUT HOW THEY MOVE THROUGH THE ER.

PROFESSOR MARR COVERED SOME OF THIS.

HOW THEY SURVIVE AND HOW THEY BECOME EXPOSED EITHER BY TOUCHING A SURFACE THAT'S BEEN CONTAMINATED.

BY CLOSE CRACK WHERE A LARGE BALLISTIC PARTICLES IMPINGE ON THE NOSE, EYES OR MOUTH OF AN INDIVIDUAL OR BY INN HILL LAYING OF THE SMALLER PARTICLES VIA EAR-BORN INN HILL LAYING.

NEXT SLIDE.

INHALATION.

NEXT SLIDE.

SO THE BROAD FRAMEWORK FOR THESE AND OTHER PROBLEMS IS THE RISK ANALYSIS PARADIGM.

AND IT PROCEEDS FROM PROCEEDS FROM THE SAME CONSIDERATIONS FROM ANY CONTAMINANT.

WE DEFINE THE HAZARD AND LOOK AT THE RESPONSE RELATIONSHIP AND DEFINE THE EXPOSURE PERHAPS BY A SOURCE TRANSPORT, RECEPTOR MODEL.

WE COMBINE DOSE RESPONSE.

WE GET TO A RISK CHARACTERIZATION.

THAT LEADS US TO PROPOSALS FOR ACTION AFTER CONSIDERING OTHER FACTORS SUCH AS ECONOMICS POLITICAL CONCERN, SOCIAL CONCERNS OR OTHER TECHNICAL DATA.

NOW ONE KEY ASPECT -- ONE KEY PIECE OF INFORMATION WE DO NEED IS A DOSE RESPONSE RELATIONSHIP.

AND ON THE RIGHT-HAND SIDE, I JUST PUT UP -- FROM A PAPER THAT WE DID ABOUT A DECADE AGO ON THE FIRST SARS CORONAVIRUS OUTBREAK WHERE WE SHOWED WE COULD DEVELOP A DOSE RESPONSE RELATIONSHIP FOR THAT VIRUS.

AND AT THIS POINT, THESE DOSE RESPONSE ARE ONES THAT WE HAVE TO BASE OUR ANALYSIS OF RISK FOR SARS COV-2.

NOW JUST ONE EDITORIAL COMMENT ON THIS, FOR THOSE OF YOU WHO FOLLOW MY TWITTER FEED YOU SEE ONE OF MY PET PEEVES IS IN THE MICROBIOLOGY AND MEDICAL ENGINEERING IN PARTICULAR THERE IS STILL THIS OUTDATED CONCEPT AND MINIMUM INFECTIOUS DOSE.

AND THE BOP LINE IS, THERE IS NO POINT AT WHICH THE AVERAGE DOSE ADMINISTERED TO A POPULATION RESULTS IN A RISK OF ZERO.

SO THERE IS NO THRESHOLD.

THERE IS NO MINIMUM.

AND IN FACT ALL ORGANISMS INCLUDING THE CORONAVIRUS THAT WE HAVE LOOKED AT. THERE IS A DOSE LIMBING.

NEXT SLIDE.

SO IF WE CONSIDER HOW WE MIGHT CONTROL THE RISK OF COVID-19 ILLNESS, WE CAN TAKE A PAGE FROM THE INDUSTRIAL HYGIENE LITERATURE WHICH TALKS ABOUT THE CONCEPT OF HIERARCHY OF CONTROLS.

AND BY THE WAY, WE HAVE ALSO USED THE HAZARDOUS WASTE FIELDS IN A RELATED CONCEPT.

WE COULD ELIMINATE THE HAZARD -- IN THIS CASE, UNTIL WE GET AN EFFECTIVE VACCINATION.

ELIMINATION WAS OFF THE TABLE.

SUBSTITUTION IS NOT APPLICABLE BUT THERE ARE ENGINEERING CONTROLS THAT WE CAN EMPLOY SUCH AS VENTILATION, PHYSICAL BARRIERS, DESENSE FICTION OF ROOMS AND SO FORTH.

THERE ARE ADMINISTRATIVE CONTROLS WORKING FROM HOME.

STAGGERING SCHEDULES.

AND FINALLY AT THE BOTTOM, ALTHOUGH IMPORTANT, IT TEND TO BE THE OPTION OF LAST RESORT.

PERSONAL PROTECTIVE EQUIPMENT.

THE RESPIRATORS AND GLOVES.

AND WHAT HAS BECOME CLEAR IN THE CONTEXT OF COVID-19, IS SOMETHING ENVIRONMENTAL ENGINEERS HAVE KNOWN FOR A LONG TIME.

NEXT SLIDE, PLEASE.

SO AS THE INTRODUCTION SAID, I SPEND A LOT OF MY CAREER LOOKING IN DRINKING WATER QUALITY AND DRINKING WATER SAFETY AND WASTE WATER REUSE FOR POTABLE AND NON-POTABLE USES AND WE TALKED ABOUT THE USE OF MULTIPLE BARRIERS.

ANOTHER TERM THAT'S BEEN USED IS LAYERS PROTECTION.

BUT THIS WHICH IS CALLED THE SWISS CHEESE MODEL I THINK IS A GOOD COMMUNICATION TOOL FOR THE LAY PUBLIC WHICH EXPLAINS WHAT WE'RE TALKING ABOUT. SO THERE'S NO SINGLE THING WE CAN DO IN AND OF ITSELF THAT WOULD BE 100% EFFECTIVE.

BUT THE CONCEPT IS IF WE COMBINE MULTIPLE BARRIERS, MULTIPLE FACTORING TO MULTIPLE SLICES OF THE SWISS CHEESE, THE WHOLE WILL NOT OVERLAP. SO ULTIMATELY WE CAN GET HIGHLY EFFECTIVE PROTECTION BY COMBINING SUFFICIENT NUMBERS OF THESE RELATIVELY INDEPENDENT BARRIERS SUCH AS PHYSICAL DISTANCE, VENTILATION, MASKS, HAND HYGIENE, AND SO FORTH. NEXT SLIDE.

NOW THE REAL CHALLENGE -- AND THIS IS MY LAST SLIDE, IS HOW DO WE GET THE POPULATION TO EMPLOY MULTIPLE BARRIERS?

AND I THINK THIS IS THE CHALLENGE WHERE ENVIRONMENTAL ENGINEERS NEED MORE INFORMATION FROM SOCIAL SCIENCE.

HOW DO WE GET ADAPTATION?

HOW DO WE COMMUNICATE HOW TO REDUCE THE RISK?

AND ACTUALLY THERE IS EXPERTISE IN THIS AREA, AND THERE ARE A VARIETY OF ELEGANT TECHNIQUES TO TRY TO BRIDGE THE DISCONNECT BETWEEN WHAT WE KNOW TECHNICALLY ABOUT RISK REDUCTION AND WHAT THE PUBLIC CAN COMPREHEND AND CAN OPERATIONAL-WISE WITH RESPECT TO PUTTING THOSE FACTORS BACK INTO PLAY. AND I THINK THIS AREA OF COVID-19 IS SOMETHING WE NEED MORE INFORMATION ON. SO WITH THAT, THAT'S MY LAST SLIDE.

AND I LOOK FORWARD TO THE QUESTIONS.

>> THANK YOU, CHUCK.

THAT'S A GOOD REMINDER OF THE MULTIFACTOR CONTROL BEING VERY IMPORTANT.

SO NOW I WANT -- WE WANT TO HAVE A DISCUSSION REELED TO THE THEME.

PARTICULARLY OF FOSTERING INFORMED DECISIONS AND ACTIONS.

I WILL START WITH THE ENTIRE CONFERENCE SERIES.

SO THESE QUESTIONS ARE FOR ANY OF YOU TO POP IN AND ANSWER.

I WILL LET YOU DO THAT.

IF THERE'S A BLANK SPACE I WILL CALL ON INDIVIDUALS.

SO THE FIRST QUESTION IS WHAT ROLE DOES EQUITY PLAY IN YOUR RESEARCH IN TEACHING?

AND HOW DO YOU INCORPORATE EQUITY IN YOUR RESEARCH AND TEACHING?

>> SO IN THE RISK CONTEXT, WE ALWAYS TALK ABOUT SENSITIVE OR SUSCEPTIBLE SUB POPULATIONS AND THOSE COULD BE BY VIRTUAL DIFFERENTIAL EXPOSURE OR DIFFERENTIAL INHERENT SENSITIVITY.

FOR COVID-19 WE DON'T KNOW A LOT YET ABOUT INTRINSIC SENSITIVITY.

ALTHOUGH THERE ARE SOME SPECULATIVE THREADS, PARTICULARLY IN THE PREPANDEMIC LITERATURE.

BUT WE DO KNOW ABOUT VENUES THAT MAY RESULT IN HIGHER EXPOSURE.

SO YOU KNOW WE NEED TO UNDERSTAND HOW TO CHARACTERIZE THEM BETTER.

AND I SHOULD SAY VENUES AND THE ACTIVITIES.

>> THANK YOU.

LINDSEY?

HAVE YOU THOUGHT ABOUT THIS ISSUE IN YOUR WORK AT ALL?

>> CERTAINLY IN MY TEACHINGS WE -- IN THE DEVELOPING WORLD WE SEE THE HIGHER LEVELS OF POLLUTION AND IN INDUSTRIAL AREAS IN THE U.S. NEAR ROADWAYS AND INDOORS WHERE, FOR EXAMPLE THE BUILDINGS HAVE MOLD PROBLEMS.

>> I KNOW COLLEEN YOU DO A LOT WITH EQUITY IN YOUR WORK.

>> YES -- GO AHEAD.

FOR OUR RESEARCH WE DEFINITELY TRY TO INCORPORATE EQUITY AS MUCH AS POSSIBLE FOR THE WASTE WATER RESEARCH.

THE DOCTOR AT USC DAVIS IS DOING MORE FOR UCLA.

THANK YOU FOR THAT.

AND WE ARE DOING A SURVEY FOR WASTE WATER TREATMENT WORKERS AND SEEING WHAT THEIR UNDERLYING HEALTH CONDITIONS ARE.

PRE-EXISTING CONDITIONS SINCE THEY ARE EXPOSED TO CONTAMINANTS NOT TO SCARE ANYONE FROM WASTE WATER.

THAT IS A MINIMAL EXPOSURE ROUTE BUT FOR PEOPLE MORE EXPOSED WE NEED TO CONSIDER IT.

AND ALSO WE ARE LOOKING AT COMMUNITIES CLOSE TO WASTE WATER TREATMENT PLANTS.

AND WE HAVE SEEN IN OTHER LITERATURE THAT LANDFILLS OR OTHER TOXIC WEBSITE ARE IN LOWER INCOME COMMUNITIES SO WE ARE SEEING IF THAT'S THE SAME FOR WASTE WATER TREATMENT PLANTS FOR KAL CAM.

NOT FINDING IT OVERALL FOR THE STATE BUT IN URBAN AREAS THEY DO TEND TO BE IN MORE DISADVANTAGED COMMUNITIES.

AND I DO TRY TO INCORPORATE EQUITY A LOT IN MY TEACHING.

JUST DOING DIFFERENT MODES OF TEACHING AND ACTIVE LEARNING AND FLIPPED CLASSROOMS.

SINCE EVERYONE IS A DIFFERENT TYPE OF LEARNER.

IT'S A LITTLE CHALLENGES FOR VIRTUAL ENVIRONMENT.

BUT I SHARE MY PRONOUNS AND MY NAME TO RESPECT DIFFERENT GENDER IDENTITIES.

BUT STILL TRYING TO LEARN -- DEFINITELY ACKNOWLEDGING MY WHITE PRIVILEGED --

AND WITH THE KILLING OF GEORGE FLOYD AND TRYING TO ADDRESS MY IMPLICIT BIASES AND LEARN AS MUCH AS I CAN TO BE AS INCLUSIVE TO THE STUDENTS.

>> THANK YOU.

>> I JUST WANTED TO FOLLOW UP WITH WHAT LINSEY AND COLLEEN HAVE ANY.

WHEN I'M TEACHING STUDENTS IN CLASS WE HAVE A LOT OF DISCUSSION ON AIR POLLUTION AND HOW IT'S DIFFERENT ACROSS COUNTRIES TO THOSE WHO HAVE STRINGENT AIR EQUAL MEASURES THAT WE HAVE IN PLACE IN THE U.S. OPPOSED TO COUNTRIES WHICH DON'T HAVE IT.

AND ULTIMATE RESULTS OF THAT.

WE HAD SOME WORK DONE AT WASTE WATER TREATMENT PLANT MEASURING THE POLLUTION FROM THE WASTE WATER TREATMENT PLANT AND THE FOCUS WAS ON A SCHOOL VENEER TO IT.

WHICH IS LOCATED RIGHT AT THE BOTTOM OF THAT WASTE WATER TREATMENT PLAN AND THE SEQUENCES WERE THE STUDENTS WERE SO CLOSE TO IT.

AND WE CAN FIGURE OUT THE DEMOCRAT FROM AIFY OF THE STUDENTS IN THAT LOCATION TO THAT WASTE WATER.

SO I GUESS DURING RESEARCH AND TEACHING AS WE COLLECTLY ADDRESS WHAT WE END UP SEEING IN OUR DAY-TO-DAY WORK, I GUESS.

>> SO MAYBE I CAN MENTION SOMETHING ABOUT THE RESEARCH, ESPECIALLY ON THE EXPERIMENTS THAT WE DID.

SO I WOULD SAY THAT IT'S LOCATED IN THE CENTRAL MISSOURI AND I THINK THERE'S DEFINITELY SOME DIFFERENCES FROM THE RURAL TO URBAN AREAS AND ALSO WHEN COVID HIT, THERE WAS A BREAK OF SUPPLY CHAIN FOR THESE MEDICAL PPE -- I THINK THE RURAL AREAS WERE AFFECTED SIMPLY.

TO SOLVE THESE ISSUES, TO TRY TO ALLEVIATE THE IMPACT, I THINK THE APPROACHES FOR DIFFERENT AREAS ARE ALSO QUITE DIFFERENT.

FOR EXAMPLE, WHEN WE DID THE JOIN TASK FORCE.

OR TRYING TO USE THE 3D PRINTING WHICH IS THE MOST DIRECTION WAY TO GENERATE THESE NON- PPE AND ALSO LOOKING AT THE MATERIALS AVAILABLE IN THESE AREAS AND TRY TO LOOK AT THE ISSUE.

>> THANK YOU.

I THINK IT'S A CHALLENGE.

IT'S IMPORTANT FOR ALL OF OUR RESEARCH BUT ALSO A CHALLENGE.

SO THE SECOND QUESTION RELATED TO THE CONFERENCE -- RELATED TO THE CONFERENCE THEME OF CONVERGENCE OR INTEGRATING KNOWLEDGE AND EXPERTISE FROM DIFFERENT DISCIPLINES OR USING NOVEL FRAMEWORK FOR SCIENCE AND INNOVATION.

SO AFTER HEARING THE PRESENTATIONS OF THE OTHERS ON THIS PANEL, HOW COULD WE MAKE OUR RESEARCH MORE CONVERGENT?

>> I CAN GO.

CONVERGENCE IS REALLY IMPORTANT FOR MY RESEARCH AS I DO FOOD, WATER SYSTEMS. AFTER THIS PANEL I LEARNED A LOT OF JUST CONSTANTLY LEARNING FROM DR. HOQUE AND DR. WANG AND MARR.

THE STUDENT DOING THE RESEARCH IS LOOKING AT BIO AEROSOLS AND THE SPREAD FROM THE WASTE WATER TREATMENT PLANT SO WE HAVE TO LOOK AT THE AIR LITERATURE AND I'M INTERESTED WITH DR. HOQUE A RESEARCH WITH THE PLANTS AND THERE'S A LOT OF STAINLESS STEEL THERE.

SO AFTER LISTENING WE ARE CONSTANTLY TRYING TO LEARN AND INCORPORATE THE DIFFERENT AREAS OF ENVIRONMENTAL ENGINEERING AND SCIENCE INTO OUR RESEARCH AND TEACHING.

>> WELL, THE IDEA THAT WE HAD AN INTERESTING STUDY THAT OCCURRED WITH RESPECT TO COVID, WHICH I KNOW LINSEY MARR WAS A PART OF AS WELL.

THERE WERE PEOPLE WHO MET ON TWITTER, PROBABLY 20 OR 30 AND ONE OF THE GROUPS SAID WHY DON'T WE PUTTING TO AN FAQ ON GOOGLE DOCS.

I HAVE WRITTEN A TINY PIECE OF IT.

AND LINSEY HAS DONE A LOT.

SHOWING A NUMBER OF OTHER PEOPLE AS WELL.

AND THAT IS A GOOD ILLUSTRATION OF THE POWER OF SOCIAL MEDIA BRINGING TO PEOPLE FROM DIFFERENT SPHERES TO A COMMON PURPOSE THAT I THINK HAS BEEN GOOD FOR WIDE POPULATION.

>> YEAH, I THINK DR. HAAS POINTS OUT A REALLY EXCELLENT EXAMPLE OF CONVERGENT RESEARCH AND DISSEMINATION AND BROADER IMPACTS.

BECAUSE THIS DOCUMENT COVERS SO MANY DIFFERENT ASPECTS OF TRANSMISSION OF COVID-19.

NO ONE PERSON WOULD BE ABLE TO ADDRESS ALL OF QUESTIONS IN THERE.

AND WE ALSO OPENED IT UP -- WE TAKE FEEDBACK FROM PEOPLE, THE GENERAL PUBLIC IF THERE'S A QUESTION THEY WANT US TO TRY TO ADDRESS.

THEY CAN SUBMIT IT.

AND THOSE KIND OF GET COMPILED TOGETHER AND JOSE HUMANAS WAS STRUMAL AND IF THERE ARE QUESTIONS THAT COME IN THAT SOMEONE ELSE IS BETTER SUITED TO ANSWER HE FARMS THOSE OUT AND WE FIND ALL THE RIGHT --

THE EXPERTISE TO ADDRESS THESE.

AND AGAIN, YOU KNOW IT'S THIS DOCUMENT, THIS REALLY VALUABLE RESOURCE WHERE IT'S BROUGHT TO A LOT OF DIFFERENT PEOPLE AND EXPERTISE AND PERSPECTIVES WHERE THERE'S NO WAY ONE PERSON COULD HAVE DONE THAT.

>> SO I DURING THE PANDEMIC, THIS IS ALSO A TIME THAT FOR THE ENVIRONMENTAL ENGINEERS, SIMILAR FABRIC TO WORK TOGETHER.

SO BECAUSE FOR A LOT OF SAMPLING, THE DIFFERENT AEROSOL SAMPLING, PEOPLE CAN GETTING TO AND COME UP WITH THE SAME SET OF MEASUREMENT PROTOCOLS THERE.

AND JUST APPLY THEM IN DIFFERENT INSTITUTIONS OR DIFFERENT OCCASIONS OR DIFFERENT LOCATIONS THERE.

THEN WE CAN GET MORE CONSISTENT RESULTS ACROSS THE COUNTRY.

AND GET MORE GENERAL UNDERSTANDING OF THESE MEASUREMENTS.

>> I WILL JUST FOLLOW UP WITH SAYING THAT SO MUCH OF MY WORK IS ON LOOKING AT FUNDAMENTAL PRINCIPALS AND FUNDAMENTAL MECHANISMS.

BUT IN THE RECENT YEARS I HAVE WORKED WITH PEOPLE FROM CHEMISTRY, PUBLIC HEALTH, SOCIAL DESIGNS AND LOOKING AT PERSPECTIVES FROM DIFFERENT PEOPLE ACTUALLY AND YOU ANSWER QUESTIONS YOU WEREN'T REALLY ANTICIPATING.

AND HAVING WORKED WITH DR. HAAS AS MY ADVISER, I ALSO LEARNED THAT MY FUNDAMENTAL MECHANISM INFORMED THOSE RISK ANALYSIS EXPOSURE ANALYSIS SO IT CAN BE DISSEMINATED TO GENERAL PEOPLE AND WE CAN ACTUALLY USE THOSE FOR DECISION MAKING SO THAT NEED TO BE RAISED AND DURING THIS PANDEMIC WE ARE LEARNING MORE AND MORE HOW TO LEARN THOSE.

>> THANK YOU.

BEFORE WE MOVE ON TO THE QUESTIONS THAT HAVE COME IN FROM THE AUDIENCE.

I WANT TO INDULGE YOU WITH A QUESTION OF MY OWN.

IN YOUR WORK HERE, WHAT IS THE GREATEST SURPRISE IN REACHING OUT TO SHARE YOUR EXPERTISE ABOUT COVID-19 WITH THE PUBLIC AND WITH THE DECISION MAKERS?

LINSEY TOLD US ABOUT HER DECISIONS ABOUT THE EDITORS FOR THE NEW YORK TIMES WHICH I FOUND INTERESTING.

>> ANOTHER THING I LEARNED IS PUBLIC HEALTH OFFICIALS HAVE ALWAYS ASSOCIATED THE IDEA OF AIRBORNE TRANSMISSION WITH PUBLIC PANIC.

BUT WE PRESENTED IT IN A WAY THAT I THINK -- WHERE WE EXPLAIN HOW IT WORKS AND HOW YOU -- WHAT STEPS YOU CAN DO TO GREATLY REDUCE YOUR RISK.

I HAVEN'T DETECTED ANY PANIC, IN FACT.

SO THERE'S THIS MANTRA IN PUBLIC HEALTH THAT, OH, THE PANIC ITSELF COULD BE WORSE THAN THE DISEASE.

BUT I HAVE SEEN NO SIGNS OF THAT AT ALL.

IN FACT IT'S GONE THE OTHER WAY AROUND WHERE I THINK INITIALLY OFFICIALS WERE NOT PROVIDING THE COMPLETE INFORMATION TO THE PUBLIC.

AND THEN THE PUBLIC FELT MISLED.

SO THAT'S ONE THING THAT HAS BEEN -- YOU KNOW AN EYE OPENING -- JUST PROVIDE -- AS COLLEAGUE DYLAN MOORE SAYS.

GIVE THE INFORMATION TO THE PUBLIC AND TREAT THEM LIKE ADULTS.

>> I WILL JUST POINT OUT THE COMMUNICATION IS NOT ONLY AN ISSUE WITH THE PUBLIC. BUT -- YOU KNOW IN THIS PARTICULAR PROBLEM, THERE ARE MULTIPLE DISCIPLINES THAT HAVE COME TO THE TABLE.

AND I THINK ONE THING THAT HAS EMERGED IS TRIGGER WORDS THAT ARE SECOND NATURE TO US IN ENGINEERING.

AND ALSO FOLKS IN AEROSOL SCIENCE THAT ARE REALLY VERY INFLAMMATORY IN OTHER DISCIPLINES.

AND WE HAVE HAD -- YOU KNOW A LOT OF TWEET WARS OVER THE PAST FEW MONTHS OVER THE WORD "AIRBORNE."

AND THE CONCEPT OF AIRBORNE IN THE MEDICAL AND HEALTH CARE WORKER PROTECTION FIELD IS REALLY A VERY INFLAMMATORY CONCEPT.

MY SENSE IS -- AND I DON'T KNOW HOW YOU FEEL, LINSEY.

I THINK WE HAVE STARTED SO SLOWLY DIFFUSE THAT DEGREE OF PANIC IN THAT POPULATION.

>> YEAH, I COULD AGREE.



AND BECAUSE TO THE GENERAL PUBLIC, AIRBORNE IS SOMETHING THAT IS IN THE AIR AND IF YOU EXPLAIN HOW IT WORKS AND EVERYTHING PEOPLE ARE CAPABLE OF UNDERSTANDING HOW CIGARETTE SMOKE MOVES SO THEY CAN ENVISION HOW A VIRUS MIGHT MOVE IN THE AIR AND HOW TO AVOID IT.

>> COLLEEN YOU HAD SOMETHING TO ADD?

>> SORRY, DR. HAAS.

ONE OF THE THING I'M SURPRISED AT SEEING MAYORS AND GOVERNORS TALKING ABOUT WASTE WATER TREATMENT AND GETTING ALL EXCITED ABOUT MONITORING SARS COV2. AND HOPEFULLY IT STAYS THAT WAY AND WE STAY GOD IN THE INFRASTRUCTURE. THAT'S GOOD TO SEE.

IT'S NOT LIKE A HYPE CYCLE AND GOING DOWN WITH THE UNIVERSITIES AND COLLABORATIONS.

SO I GET SURPRISED WHEN I TALK TO RANDOM PEOPLE AND THEY DON'T KNOW ABOUT THE MONITORING BECAUSE OUR GROUP IS SO FOCUSED ON IT.

BECAUSE THERE'S SO MANY ARTICLES SO THAT IS ALSO INTERESTING TO GET OUTSIDE OF MY BUBBLE AND SEE THAT NOT EVERYONE HAS HEARD ABOUT IT YET.

>> WITH MY INTERACTION WITH TEACHERS AND STUDENTS HERE AT THE DIFFERENT SCHOOL DISTRICTS AND WHEN WE TALK ABOUT AIR FLOW OR GENERAL DESIGN, I GUESS I'M REALLY, REALLY IMPRESSED AND EXCITED WHEN WE SEE THE HIGH SCHOOL STUDENTS AND HOW THEY INTERACTION WHEN THEY HEAR ABOUT ENGINEERING AND THE CONTEXT OF SOCIETAL IMPACTS AND HOW WE CAN LEARN ABOUT IT.

ESPECIALLY FOR SARS COV-2 HOW WE CAN COME IN AND HELP IN THE WAYS THAT I DON'T THINK HIGH SCHOOL STUDENTS OR ENGINEERING STUDENTS CAN DO IT IN THAT WAY.

SO GETTING HELPED WITH IN A ENTHUSIASM AND GETTING TEACHERS INTERESTED IN IT.

AND AS DR. HAAS MENTIONED, BECAUSE OF THIS PANDEMIC WE HAVE GOT IN TOUCH WITH STAKEHOLDERS.

AND IT HAS INFORMED OUR RESEARCH IN WAYS WE MAY NOT HAVE THOUGHT ABOUT.

>> SO MY BIGGEST SURPRISE IS -- SO I CAN FIND THAT MY RESEARCH CAN BE TRANSFERABLE TO OTHER AREAS.

BECAUSE LITERALLY BEFORE THIS PANDEMIC MY RESEARCH WAS MAINLY ABOUT COMBUSTION AEROSOLS BURNING AND WITH THIS PREVIOUS WORK WITH THE PERFORMANCE COLLECTING THESE AEROSOLS.

AND THEN I THINK BECAUSE OF THE ACTIVITY THAT WE ARE TRYING TO EVALUATE, WE ARE PLANNING TO EVALUATE THESE HOUSEHOLD MATERIALS WE CAN JUST USE A SIMILAR SETUP, AND THEN SUPPLY DIFFERENT MATERIALS THAT WE ARE INTERESTED IN.

AND THE GENERAL PUBLIC IS VERY, VERY INTERESTED IN THE DATA.

AND I THINK WE SHOULD ALWAYS TRY TO THINK HOW THE RESEARCH CAN BE TRANSFERABLE OR COMMUNICATED TO THE GENERAL PUBLIC.

>> THANK YOU.

ALRIGHT I WILL TURN IT OVER TO MAYA FOR ONE OF THE QUESTIONS FROM THE Q&A.

>> SURE.

WE HAVE QUITE A FEW.

SO THIS COMBINES I THINK A FEW OF THEM AND FOLLOWS YOU.

THROUGHOUT THE ENTIRE PANDEMIC A MAJOR CHALLENGE HAS BEEN EFFICIENTLY COMMUNICATING WITH THE GENERAL PUBLIC AND POLITICIANS AND DECISION MAKERS AND HOW CAN WE REACH A BORDER AUDIENCE?

THIS IS FROM LUCIA H AND I THINK JANE MCCRAY WAS ALONG THE SIGN LINES WHAT DO YOU HAVE TO EFFECTIVELY COMMUNICATE YOUR WORK TO THE GENERAL AUDIENCE?

>> TWITTER HAS BEEN A BOOM FOR NOT JUST US, REALLY FOR ALL SCIENTISTS TO COMMUNICATE WITH THE PUBLIC AND TO GET RESULTS OUT THERE ON A TIME SCALE THAT

IS FASTER THAN THE KIND OF RESEARCH PUBLICATION WHICH TAKES AT LEAST SIX MONTHS.

AND THINGS ARE URGENT NOW.

IT DOES MEAN THERE'S LESS EQUAL REVIEW BUT IF YOU FIND EXPERTS ON TWITTER YOU CAN LEARN A LOT ABOUT WHAT IS HAPPENING WITH THE LATEST KNOWLEDGE ON THING. SO THAT'S BEEN AN EYE OPENING FOR ME TO SEE HOW MUCH SCIENCE GOOD AND BAD IS HAPPENING AND BEING DISSEMINATED ON TWITTER.

>> I WOULD ALSO ADD THAT -- YOU KNOW FOR ANY OF THE PROFESSORS IN THE AUDIENCE, IF YOU GET A CALL FROM YOUR LOCAL MEDIA, AND IN THE AREA THAT IS PERTINENT TO YOUR EXPERTISE, TAKE ADVANTAGE OF THAT TO COMMUNICATE.

BECAUSE OBVIOUSLY THEY ARE TRUSTED INTERMEDIATES TO THE GENERAL POPULATION.

>> YEAH, AND TO HAVE THE BIGGEST IMPACT MAKE SURE YOU -- YOU KNOW EXPLAIN IT LIKE YOU WOULD EXPLAIN IT TO YOUR PARENTS.

SOME PEOPLE SAY TO A KINDERGARTENER.

SO IF YOU DON'T HAVE -- PARENT OR KINDERGARTENER OR A FRIEND OF YOURS WHO IS AN ENGLISH MAJOR, LET'S SAY.

THAT WILL BE THE MOST EFFECTIVE WAY TO GET THE MESSAGE ACROSS.

IT'S EASY.

I'VE SEEN IT FOR A REPORTER TO TALK TO SOMEONE.

AN EXPERT.

AND THE EXPERT TO REALLY DEVIL INTO THE DETAILS AND THE JARGON.

AND IT ALL GETS LOST AND THE REPORTER IS NOT SURE WHAT TO MAKE OF IT.

>> YEAH, SO DO I AGREE.

SO I DID MEET A FEW MISUNDERSTANDINGS OF MY RESULTS.

SO PEOPLE WERE SAYING THAT N-95 AT .3 MICRO METER.

THEY WERE SAYING IT DOESN'T FIGURE OUT PARTICLES BELOW.

THAT BUT THAT IS WRONG.

SO TYPICALLY -- .3 MICROMETERS TYPICALLY THE LOWEST EFFICIENCY IN TERSE F SIZE WINDOW.

BUT N-95 MASKS ARE MORE EFFECTIVE IF YOU ARE TRYING TO REMOVE SMALLER PARTICLES.

SO I DID ALSO SEE A FEW VIDEOS, NICE STRETCH.

TRYING TO EXPLAIN THE MECHANISMS IN THERE.

I THINK IN THE RESEARCH WE DIDN'T NEED THE INTERPRETERS TO TRANSFER THE TERMINOLOGIES INTO SOMETHING THAT PEOPLE CAN UNDERSTAND.

>> I THINK FOR SCIENCE COMMUNICATION FOR A PLUG FOR SPACIAL MAPPING.

THAT'S BEEN A WAY FOR PEOPLE TO COMMUNICATE AND PLAY WITH THE DATA.

AND I'VE HAD TO SIT THROUGH A LOT OF THEIR TRAINING VIDEOS AS DR. MARR SAID TO KEEP IT SIMPLE STUPID.

SO JUST MAKING SURE IT'S NOT -- YOU DON'T WANT TO CREATE A DASHBOARD THAT IS ALL CLUTTERED AND UGLY AND PEOPLE DON'T KNOW WHERE TO LOOK.

SO THAT'S PRETTY CHALLENGING.

>> YEAH.

AND I WILL FOLLOW UP WITH WHAT SHE JUST MENTIONED WITH TALKING WITH THE MEDIA. I HAD THE OPPORTUNITY TO TALK TO THE MEDIA IN COLUMBIA.

AND IT'S TRUE WHEN WE ARE TALKING TO THE REPORTERS THEY ACTUALLY GUIDE YOU THROUGH THE QUESTIONS.

SO THAT YOU STOP TALKING JARGON TO THE POINT THAT THE AUDIENCE WILL UNDERSTAND.

SO IT'S REALLY A GOOD OPPORTUNITY AND I THINK IT ALSO POINTS OUT HOW TO PRESENT IT TO THE PEOPLE TO THE GENERAL PUBLIC SO THEY DON'T GET BORED LISTENING TO THE SCIENCE YOU HAVE DONE BUT GET TO THE RESULTS RIGHT AWAY.

AND AS YANG MENTIONED HAVE YOU TO BE CAREFUL ABOUT WHAT YOU SAY OTHERWISE YOU CAN GET MISINTERPRETED OR ELSE IT CAN BECOME A PROBLEM.

THAT'S WHY I THINK THE REPORTER WHO YOU ARE TALKING TO CAN COME INTO PLAY TO MAKE SURE THAT THE COMMUNICATION IS RIGHT.

>> OFTEN THE REPORTERS CAN ACTUALLY BE VERY WELL INFORMED SO IT CAN BE A DIFFERENT EXPERIENCE THAN WORKING WITH THE COMMUNITIES AND INVOLVING THEM AS WELL.

MAYA DO WE HAVE ANOTHER QUESTION FROM THE Q&A?

>> SURE.

HOW RISKY IS THE FULL MITE ROUTE RATHER TO OTHER TRANSMISSION ROUTES.

THAT WAS FOR DR. HOQUE OR ANYONE ELSE IT CAME IN DURING DR. HOQUE'S PRESENTATION?

>> I THINK IT DEPEND TO THE TYPE OF FOR MITE.

IN THIS PARTICULAR INDICATE WE HAVE TO REALIZE THAT IT'S IN THE AIR AND IT HAS TO GET TO THE FOR MITE.

SO I GUESS I WILL PASS IT ON TO A RISK ESTIMATOR BUT WE HAVE TO UNDERSTAND THAT ALL OF THESE ROUTES PLAY A ROLE AND UNTIL WE CAN SPECIFY THAT ONE PARTICULAR PART ACTUALLY DOMINATES.

>> SO THERE HAVE BEEN VERY, VERY FEW INSTANCES REPORTED THAT COULD BE ATTRIBUTABLE TO FULL MITE TRANSMISSION.

I CAME OUT WITH A TWITTER STREAM MAYBE A COUPLE OF WEEKS AGO ON THIS.

I THINK THE INHALATION ROUTE IS MUCH MORE THOROUGHLY DOCUMENTED IN THE HEALTH CARE SETTING.

THE BALLISTIC IMPACT ROUTE IS CERTAINLY DOCUMENTED.

BUT AT BEST WE ONLY HAVE TWO OR THREE CASE REPORTS OR INCIDENT REPORTS THAT ANTICIPATE TO BE FULL MITE CONNECTED.

, SO IT'S CERTAINLY NOT ZERO BUT VERY, VERY SMALL COMPARED TO THE OTHER ROUTES.

>> I SEE A QUESTION HERE THAT MAKES ME SERIOUS AS WELL.

MANY PEOPLE HAVE MASKS THAT COVER THEIR MOUTH BUT NOT THEIR NOSE.

IN TERMS OF AEROSOLIZATION, IS THERE ANY INFORMATION AT HOW EFFECTIVE THIS IS IN GETTING THE VIRUS?

>> THAT'S A GOOD QUESTION.

WE DON'T KNOW.

I CAN SAY THAT WHEN PEOPLE ARE JUST BREATHING THEY PRODUCE TEN TIMES FEWER AEROSOLS ON AVERAGE THAN WHEN THEY ARE TALKING.

SO SOME OF THAT BREATHING COULD BE HAPPENING THROUGH THE NOSE.

I WOULD SAY YES, SOME OF THE AEROSOLS ARE GENERATED WHEN WE ARE TALKING FROM OUR LIPS COMING TOGETHER AND THE FILM BREAKING AND BURSTING, A FILM OF SALIVA.

SO OBVIOUSLY IF YOU ARE BREATHING THROUGH THE NOSE THEN THAT'S NOT HAPPENING BUT OF COURSE IF YOU ARE BREATHING THROUGH A NOSE AND NOT WEARING A MASK THEN YOU ARE NOT GETTING ANY PROTECT.

IT CERTAINLY HELPS BLOCK AEROSOLS THAT MAY BE GENERATE WHEN YOU TALK AND MAYBE A SMALLER A.M. THAT COMES OUT OF YOUR NOSE FROM BREATHING BUT YOU KNOW IF YOU ARE WEARING IT DOWN -- HAVE YOU YOUR NOSE HANGING OUT THEN YOU ARE PROBABLY BREATHING THROUGH YOUR NOSE CAN AGAIN YOU ARE NOT GETTING THE PROTECTION.

SO IT'S SUBOPTIMAL.

SO AS A RESULT IN ALL OF MY INTERVIEWS NOW, FOR THE PAST COUPLE MONTHS I'VE BEEN SAY -- WHENEVER I SAY WEAR A MASK I SAY WEAR A MASK COVERING YOUR NOSE AND MOUTH.

>> YEAH, I THINK IF THE MASK ONLY COVERS THE MOUTH AREA MAYBE THERE WILL BE MORE LEAKAGE AS WELL IF YOU ARE TRYING TO INHALE WITH YOUR MOUTH.

>> THANK YOU.

MYIA.

DO WE HAVE ANOTHER QUESTION FROM THE LIST?

>> SURE WE HAVE ONE ASKING ABOUT THE SEWAGE.

GOING IN THE MANHOLES HOW RISKY IS THAT FOR YOUR EXPOSURE TO COVID-19. AND SIMILARLY FOR STORM SEWERS.

AND THEN A FOLLOWUP QUESTION TOO FOR DR. NAUGHTON, WHAT DOES THE RESEARCH SHOW IN TERMS OF COVID-19 AND WASTE WATER AND THE POTENTIAL EXPOSURE.

>> I THINK DR. HAAS CAN GO FIRST.

>> THERE HAS YET TO BE ANY REPORT OF A VIABLE VIRUS IN WASTE WATER.

AND AT THIS POINT, THE RECOMMENDATIONS -- THERE WAS JUST A WATER ENVIRONMENT FEDERATION BLUE RIBBON COMMITTEE REPORT ON THIS.

THE RECOMMENDATION IS THAT THE ORDINARY PPE THAT WASTE WATER TREATMENT OPERATORS AND SEWER WORKERS USE ARE SUFFICIENT FOR PROTECTION.

BUT LIKE ANY OTHER AREAS OF SCIENCE THIS MAY CHANGE IF THE ISOLATION OF THE VIRUS IS FOUND TO OCCUR.

>> YEAH, BUT WHAT DR. HAAS SAID, THERE HAVE BEEN STUDIES IN CHINA FINDING INFECTION IN THE STOOL BUT SARS COV-2 IS RAPIDLY DEGRADED BY -- BY THE TIME IT GOES THROUGH THE SEWER PIPE.

SO MINIMAL EXPOSURE.

BUT PEOPLE COLLECTING SAMPLES WHERE PROPER PPE AND SOME UNIVERSITIES ARE REQUIRING EVEN THE SUITS OR THING WHEN THEY ARE COLLECTING THE SAMPLE AND SAME WITH THE TREATMENT WORKERS, MAKING SURE THAT THEY ARE PROTECTED WHEN THEY ARE WORKING IN DIFFERENT STAGES OF THE TREATMENT:

SO THERE HAS BEEN PREVIOUS STUDIES WITH SARS COV-1 AND EVEN SARS COV-2 ABOUT SOME ISSUES WHEN YOU DON'T HAVE VERY GOOD PLUMBING IN YOUR BUILDING AND THE TOILET AEROSOLS ARE COMING UP AND AMWAY GARDENS WAS A BIG STUDY.

BUT AGAIN IT'S VERY MINIMAL COMPARED TO THE AEROSOL ROUTE AND WHAT DR. MARR HAS BEEN FOCUSING ON.

SO -- BUT PLEASE, CLOSE THE LID ON YOUR TOILET WHEN YOU FLUSH.

NOT JUST FOR SARS COV-2 BUT FOR OTHER PATHOGENS IT'S JUST BETTER THAT WAY.

>> I THINK WE HAVE TIME FOR ONE MORE QUESTION.

SO THERE'S ONE HERE I SEE THAT -- IT SEEMS LIKE A WAY TO CLOSE HERE.

SO NOT BECAUSE THE SCIENCE IS NOT VALID BUT DUE TO SKEPTICISM AND LACK OF TRUST OF SCIENCE I THINK THAT THIS IS A CRISIS THAT -- FOR MANY SCIENTISTS OF DIFFERENT BACKGROUND.

SO HOW DO WE KNOW HOW WELL WE ARE REACHING THE PUBLIC GIVEN THAT THERE'S SO MUCH SKEPTICISM AND LACK OF TRUST THAT EXISTS OUT THERE FOR SCIENCE?

>> SO AGAIN, I WILL PLUG THE ENTIRE FIELD OF RISK COMMUNICATION.

I CERTAINLY HAVE NO EXPERTISE.

IN BUT I'M AWARE OF THE FIELD.

THERE IS A LITERATURE ON BARRIERS TO PEOPLE ACTING BASED ON SCIENTIFIC INFORMATION AND OTHER CONTEXTS AND WE REALLY NEED MORE DETAILED RISK COMMUNICATION STUDIES TO UNDERSTAND THOSE BARRIERS IN THE CONTEXT OF SARS COV-2.

SO THAT QUESTION ITSELF CAN BE APPROACHED DESIGN ACTIVECALLY.

AND I THINK IT'S RIPE TO DO SO OBVIOUSLY IN COLLABORATION WITH OTHER EXPERTS OUTSIDE THE AWSP COMMUNITY.

>> WELL I THINK IT'S TIME THAT WE BROUGHT THIS TO A CLOSE. THAT'S PART OF OUR JOB HERE TO MAKE SURE WE END ON TIME. SO TODAY WE HEARD --

>> I THINK WE STILL HAVE TIME FOR ANOTHER QUESTION.

>> SURE.

>> I DIDN'T CUE ONE UP BUT THERE HAVE BEEN QUESTIONS ON THE MASK. SO ARE THERE ANY MATERIALS BEING DEVELOPED THAT ARE AFFORDABLE THAT ARE MORE -- EASIER FOR HEARD THROUGH AND THEN ALSO IN TERMS OF DISPOSAL OF MASKS. PEOPLE ARE SEEING THEM WARRING UP ON BEACHES AND SO ON. SO COULD YOU COMMENT ON THAT.

I THINK FOR THE NEW MATERIALS FOR MASKS IN TERMS OF MAXIMIZING THE VOICE THROUGH THE MASK I THINK IT MIGHT -- YOU MIGHT WANT TO -- PEOPLE MAY WANT TO CONSIDER -- IN TERMS OF THE CLOTH MASKS, PEOPLE CAN WASH THEM.

SO THAT'S EFFICIENT.

IN TERMS OF THE N-95.

THESE DISPOSALS HAVE TO BE CLEANED.

AND I WOULD SAY THAT THE PROCESSING WOULD BE QUITE SIMILAR TO THE COMMON AIR FILTHS OR THE FURNACE FILTERS BECAUSE THEY USE SIMILAR MATERIALS IN OF THERE. SO IT IS DEFINITELY GOING TO BE AN ISSUE POST PANDEMIC.

BECAUSE PEOPLE CONSUME A LOT OF THESE SURGICAL MASKS DURING THIS TIME.

>> THINK WE HAVE ANOTHER QUESTION WE CAN TAKE AND THERE WAS A QUESTION ABOUT WHAT ARE YOUR RECOMMENDATIONS FOR OPENING UP, SINCE MANY OF US ARE GOING BACK OR HAVE BEEN STILL AT WORK.

SO WHAT WOULD YOU RECOMMEND AS SOME OF THE BEST WAYS TO BE SAFE?

>> I WOULD SAY LOOK AT THAT SWISS CHEESE MODEL AND PRACTICE AS MANY OF THOSE LAYERS AS YOU POSSIBLY CAN IN YOUR ACTIVITIES.

>> THANKS, DR. HAAS.

DR. STUART, OVER TO YOU.

>> THANK YOU.

SO IN CLOSING.

TODAY WE HAVE HEARD SOME VERY INTERESTING WORK RELATED TO VIRUS AEROSOLIZATION AND TRANSMISSION AND FROM THE SOURCE OF EVERY DAY ACTIVITIES AND THE PROTECTION AND CONTROL MEASURES WE INDIVIDUALLY AND COLLECTIVELY TAKE.

WE ALSO SAW HOW DOCTORS MARR, WANG, NAUGHTON AND HOQUEE AND HAAS WERE ABLE TO TRANSMIT THE URGENT NEEDS FOR THE COVID-19 PAN.

AND FURTHERMORE THEY HAVE PROVIDED US WITH EXAMPLES OF WAYS WE CAN DISSEMINATE KNOWLEDGE TO THE PUBLIC AND INFORM DECISIONS AND ACTIONS AT MANY LEFTS SO LET ME SAY THANK YOU DEPEND TO ALL OUR SPEAKERS FOR THE WORK THAT YOU DO AND FOR GRACIOUSLY AGREEING TO SHARE YOUR EXPERIENCES AND YOUR INSIGHTS WITH ALL OF US TODAY.

I WILL CONCLUDE WITH A CHALLENGE AND A QUOTE RELATED TO FOSTERING INFORMED DECISIONS AND ACTS.

SO THE CHALLENGE TO US ALL IS THE FOLLOWING:

AS WE CONTINUE LEARNING AND PUSHING THE BOUNDARIES OF SCIENCE AND TECHNOLOGY WE MUST ALSO CONTINUALLY TRY TO FIND NEW WAYS OF INVOLVING STAKEHOLDERS AND THE PUBLIC IN A TWO-WAY COMMUNICATION.

THAT IS ULTIMATELY NEEDED TO ENSURE THAT THE SOLUTIONS WE DEVELOP CAN TRULY ENABLE MORE IMPACTFUL AND EQUITABLE AND WISE DECISIONS.

AND MY FINAL QUOTE FROM A WISE SCIENTIST AND TEACHER.  
OR AT LEAST ATTRIBUTED TO GALILEO WHICH I HAVE SLIGHTLY UPDATED FOR TIMES IS  
YOU CANNOT TEACH PEOPLE ANYTHING.  
YOU CAN ONLY HELP THEM DISCOVER IT IN THEMSELVES.  
THANK YOU AND WITH THAT I WILL TURN IT OVER TO MAYA FOR FINAL WORDS.  
>> THANK YOU, DR. STUART AND THANK YOU TO EVERYONE WHO HAS PARTICIPATED AND  
PRESENTED AND WATCHED AND SENT QUESTIONS IN.  
SO JUST FOLLOWUP THAT WE DO HAVE A QUIZ ASSOCIATED WITH EACH SESSION.  
AND YOU CAN GO ON OUR WEBSITE OR SCAN THAT QR CODE TO TAKE IT.  
THERE'S A CERTIFICATE THAT YOU CAN GET AT THE END OF ALL SIX QUIZES.  
AND FOR THOSE OF YOU WHO ARE ENVISIONING EMVSPS THIS COUNTS AS CONTINUING  
ENVISION EDUCATION CREDITS.  
SO DO SEND AN EMAIL TO US THAT YOU HAVE COMPLETED.  
FOR NEXT WEEK'S SESSION WE GO TONIGHT SESSION THREE.  
AND IT'S ABOUT COVID-19 AND THE CREATION OF EFFICIENT, HEALTHY AND RESILIENT  
CITIES.  
I WOULD LIKE TO SAY THANK YOU FOR ATTENDING.  
WE HAVE A LARGE GROUP OF FOLKS WHO ARE BEHIND THE SCENES HERE.  
STUDENTS AT BOTH.  
UNIVERSITY OF SOUTH FLORIDA AND AT UC MERCED AND THE STRONG COASTS PROGRAM  
SO THANK YOU TO OUR SPONSORS AND EVERYONE WHO HAS BEEN INVOLVED TODAY.