UNC | BOARD OF TRUSTEES

STRATEGIC FRAMEWORK COMMITTEE

May 30, 2018, 4:30PM
Chancellor's Ballroom East, Carolina Inn

OPEN SESSION

FOR INFORMATION ONLY
(No formal action is requested at this time)

1. Interprofessional Education
   Meg Zomorodi, Clinical Associate Professor, School of Nursing & Assistant Provost for Interprofessional Education

2. MoyoMedical Technologies
   Denali Dahl, Ph.D. candidate, Joint Department of Biomedical Engineering

3. Sustainable Access to Safe Water
   Theo Dingemans, Professor, Applied Physical Sciences

COMMITTEE MEMBERS
Julia Sprunt Grumbles, Chair
Kelly Matthews Hopkins, Vice Chair
Jefferson W. Brown
W. Lowry Caudill
Allie Ray McCullen
Hari H. Nath

Administrative Liaison:
Bob Blouin, Executive Vice Chancellor and Provost
Judith Cone, Vice Chancellor for Innovation, Entrepreneurship, & Economic Development

IPE4UNC: Transforming interprofessional collaboration at UNC

MEG ZOMORODI PHD RN CNL

UNC SCHOOL OF NURSING

First things first…a little about me

Harvard Macy Institute
VE RI TAS
est. 1994

American Association of Colleges of Nursing
QSEN
Education Consortium

JOSIAH MACY JR FOUNDATION
MACY FACULTY SCHOLARS


TIMES SQUARE
MARY POPPINS
DISNEY


TIMES SQUARE
MARY POPPINS
DISNEY
Bank of
AMERICAN EAGLE OUTFITTERS
7V37

Why now?

Alignment with UNC Academic/Strategic Plan

Blueprint for NEXT

Curricular Revision

Workforce needs

Interprofessional Clinical Learning Environment

Partnership with Health Professions, School of Business, Education

Office located in HSL, next to CHIP

Who we are
Office of IPEP:

- Meg Zomorodi PhD, RN (Assistant Provost & Director of IPEP)
- Faculty from Health Professional Schools + Business, Education
- Sarah Smithson: Medicine
- Judy Schmidt: Allied Health
- Markus Saba: Business
- Kate Ciarrocca: Dentistry
- Laura Cohen-Vogel: Education
- Carol Durham: Nursing
- TBD: Pharmacy
- Lorraine Alexander: Public Health
- Lisa Zerden: Social Work
- **Office located 3rd floor HSL

Goal 1: Be recognized as a leader for IPE and IPP

Clarion

STUDENT CLUBS AND ORGANIZATIONS

Learning Together at the Nexus: Provocative Ideas for Practical IPE
NATIONAL CENTER SUMMIT
AUGUST 20-23, 2017, MINNEAPOLIS

Train-the-Trainer (T3)
Interprofessional Faculty Development Program

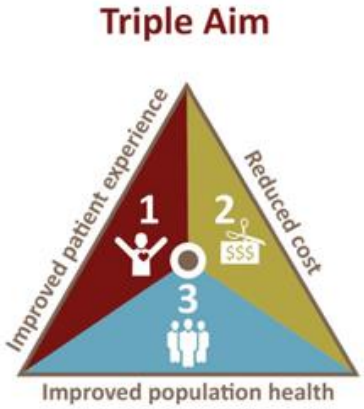
Goal 2: Produce a new workforce that is trained in IPE and IPP

TeamSTEPPS®
Team Strategies & Tools to Enhance Performance & Patient Safety

BOOTCAMP

Goal 3: Address whole health through the Clinical learning environment

RIPHI



Source: Institute for Healthcare Improvement

CREATE change agents

Goal 4: Develop scholarship in IPE and IPP to maximize collaboration across disciplines

What does IPE4UNC want to be 'known' for?

Transformation of education, practice, and research

A new model in academia where collaboration is expected because it is an essential component of promotion and tenure

Create IPE leaders focused on the development of a new workforce where teamwork is the norm rather than the exception and patient care thrives

Increased enrollment of high quality candidates; maintaining of top ranking programs; and employers/residency seeking out UNC graduates because of interprofessional collaboration

What opportunities do you see?

What is your vision for where we want to be in 5 years with IPE4UNC?

Email:
UNC_IPE@unc.edu
Twitter: ipe4unc

EPED: Early Preeclampsia Detection Strip

Denali Dahl
CEO/Co-Founder

MoyoMedical Technologies

Bringing healthcare, home.

EPED: Early Preeclampsia Detection Strip

pronounced /'epid/

A home-based early detection test for preeclampsia

LOW-COST

RELIABLE

SAFE

POINT-OF-CARE

Our Team

Denali Dahl

PhD Student, Biomedical Engineering
Joint Department UNC Chapel Hill & NC State University
M.S. Global Health, Duke University
B.S. Nanoengineering, UC San Diego

Zoe Sekyonda

B.S. Biomedical Engineering
Makerere University (Kampala, Uganda)

Brian Matovu

B.S. Biomedical Engineering
Makerere University (Kampala, Uganda)

Elizabeth Ndichu

M.S. Candidate Global Health
& Clinical Management, Duke University
MBCh.B. Medicine & Surgery
University of Nairobi (Nairobi, Kenya)

Duke
BIOMEDICAL
ENGINEERING

MAKERERE UNIVERSITY

MULAGO
HOSPITAL

START-UP VENTURES CLINIC
DUKE LAW

Kenan Biddle
PARTNERSHIP

Development Plan

The following 1-year timeline will be carried out to achieve a functioning prototype by June 2018.

Ideation

JANUARY
2016

***Makerere and Duke University students partner together for a biomedical engineering class project: idea forms.

Funding

APRIL
2017

Team receives first grant.
1. Big Ideas @Berkeley
2. Duke Changeworks

Research and Design

SUMMER
2017

Began prototype development and pilot clinical study at Mulago National Referral Hospital.

Product Development

FALL
2017

Currently in product research and development phase. Seeking funding and partnerships.

Future Steps

SPRING
2018

Prototype complete - begin beta testing.

Duke
INNOVATION &
ENTREPRENEURSHIP

Rudd Family Foundation
BIG IDEAS
@BERKELEY

launch chapel hill

UNC | INNOVATE CAROLINA

Current Work

1) Background Clinical Work (Uganda)

- Concluded biomarker study at Mulago Hospital (n=80)
- Conducting higher powered biomarker study (n=400)
- Define threshold values

2) Prototype and Business Development (U.S.)

- Adaptation of lateral flow immunoassay technology
- Patent pending
- Regulatory pathway

3) Market Validation and Concept Testing (Uganda & U.S.)

- Interviewing key stakeholders
- Commercial potential of EPED strip
- Understanding context for use cases

Next Steps

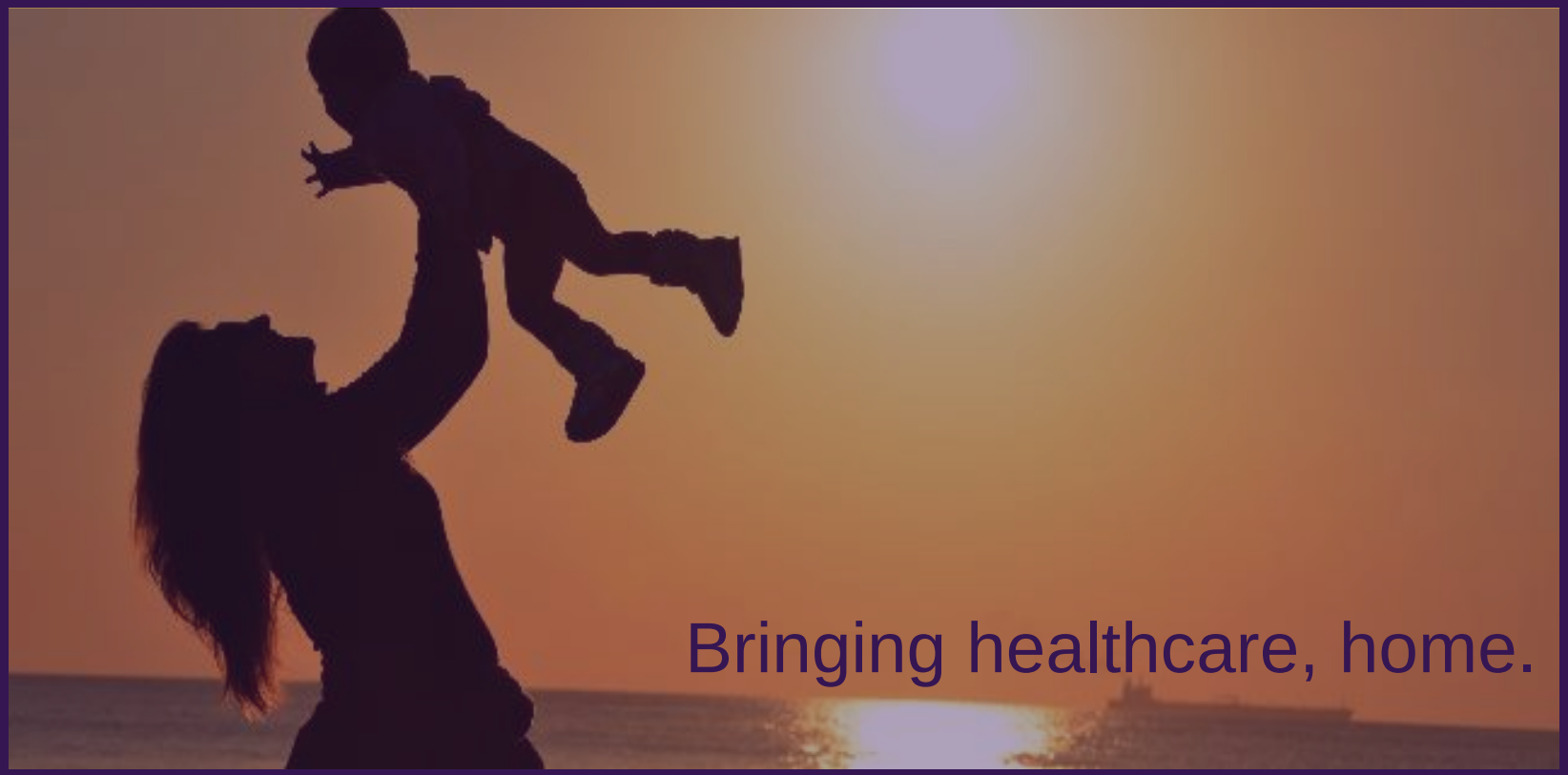
- Business model development
- Funding for prototype R&D
- Strategic partnerships

INCREASING THE NUMBER OF WOMEN SELF-DIAGNOSED

REDUCING MATERNAL AND INFANT MORTALITY RATES

INCREASING THE NUMBER OF WOMEN WHO SEEK PRENATAL CARE FOR PREECLAMPSIA

MoyoMedical Technologies

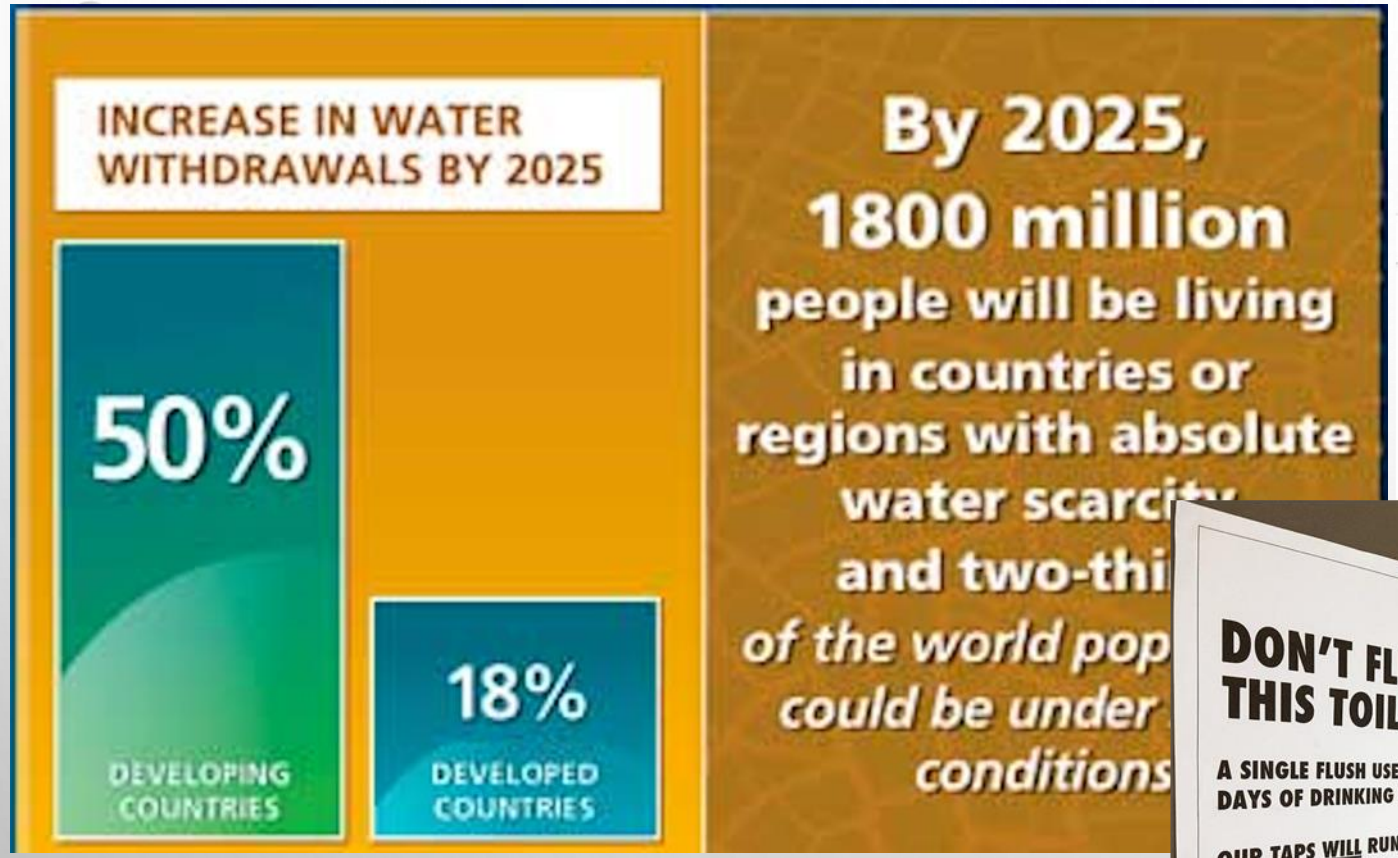


Denali Dahl
moyomedical@gmail.com
www.MoyoMedical.com

SUSTAINABLE ACCESS TO SAFE WATER:

GRAPHENE-POLYMER NANOCOMPOSITE MEMBRANES FOR WATER PURIFICATION

A *GLOBAL* PROBLEM



UN-Water fact sheet on water securi

The New York Times

Dangerously Low on Water, Cape Town Now Faces 'Day Zero'

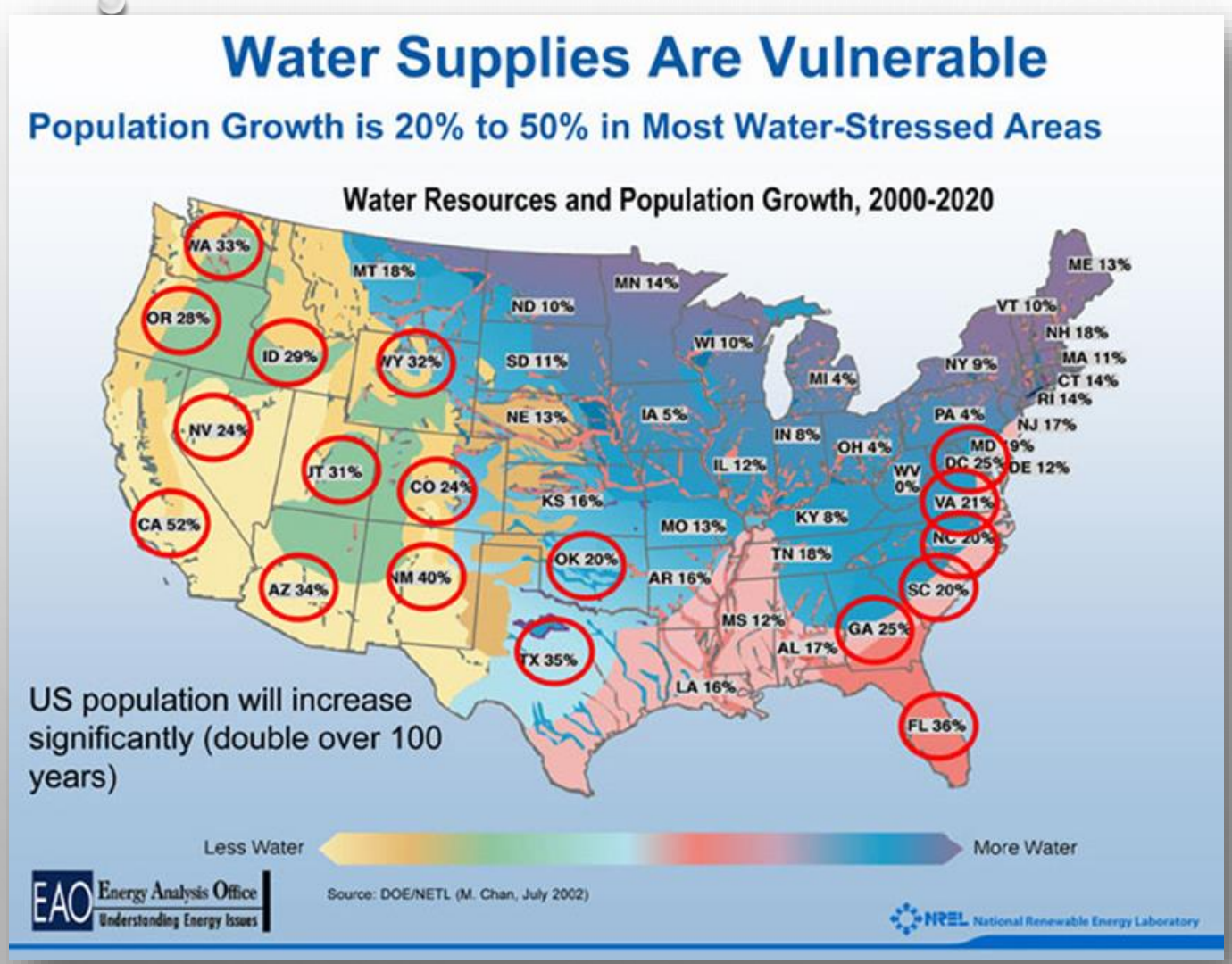
Leer en español

By NORIMITSU ONISHI and SOMINI SENGUPTA JAN. 30, 2018

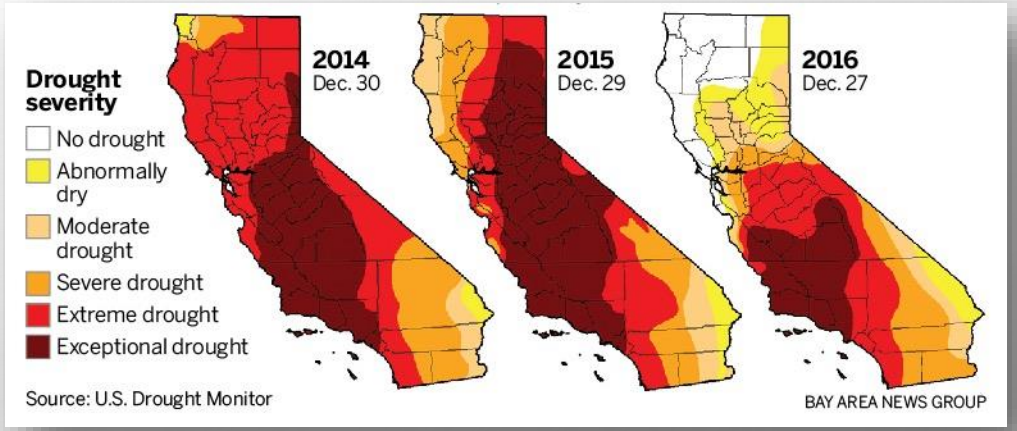
An advisory for the water crisis at Cape Town International Airport. Lisa Scriven

Cape Town residents wait to collect water from the city's natural springs. AP Photo/Bram Janssen

A *NATIONAL* PROBLEM



- Water shortages are becoming more common in the US
- 2014 drought in California cost over $2.2 billion

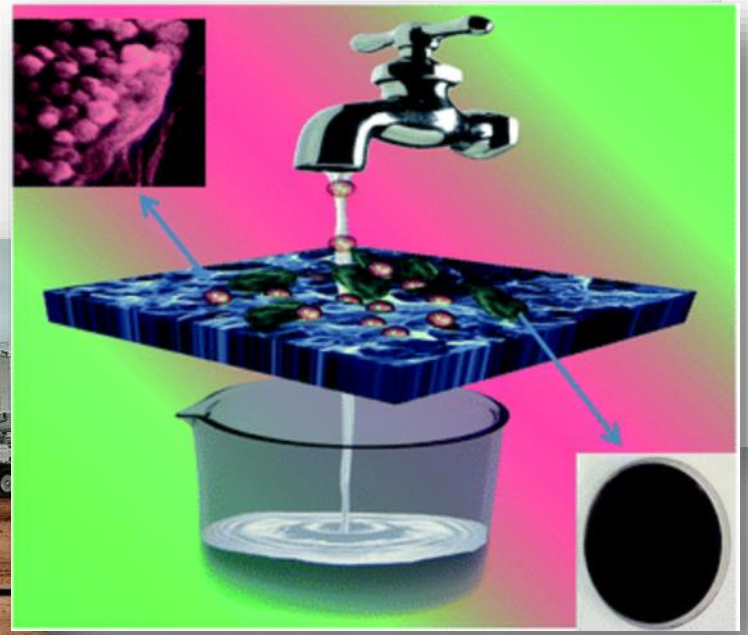


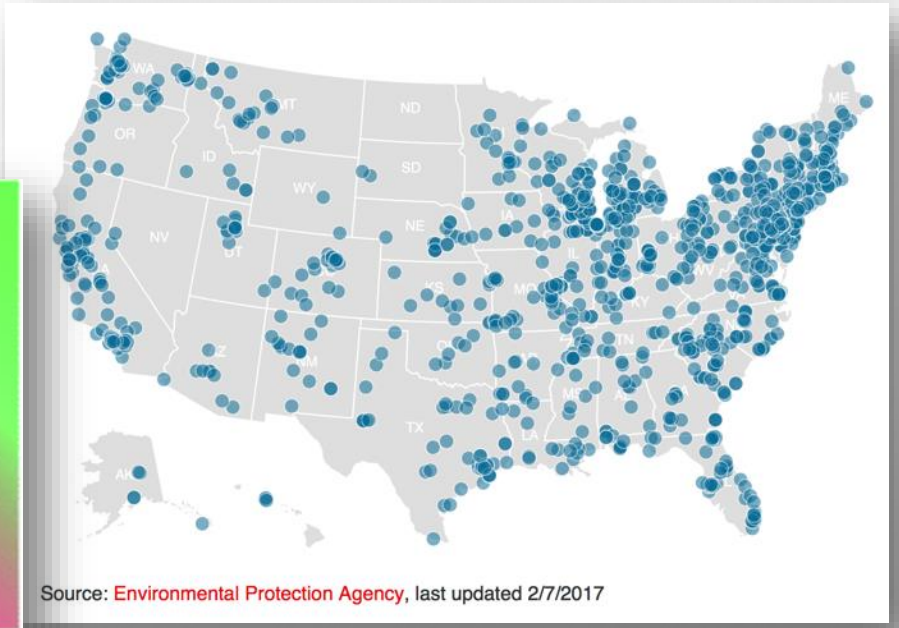
- Southeastern US fluctuating between drought and flooding

A *DIVERSE* PROBLEM

Oil-water separation

Heavy metal pollution:
Removal = mining!





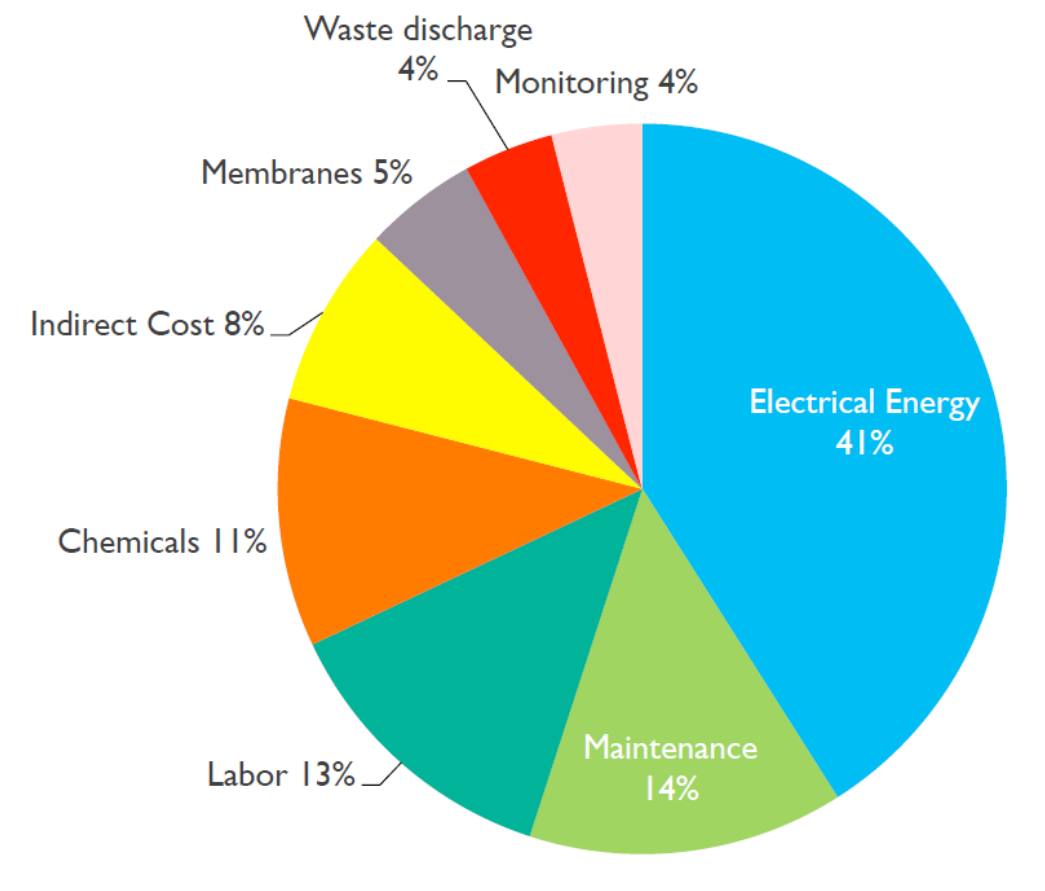
Hazardous waste sites
or Superfund sites

Pathogen removal

Produced water treatment
Oil & gas industry

Water desalination!

WATER DESALINATION: THE CHALLENGE



Source: Alma Water Solutions

- Cost of membrane desalination for seawater: ~1 US$/260 Gal
- ~41% of power consumption due to membrane separation process
- Improved membranes should reduce:
  - ✓energy costs (41%)
  - ✓maintenance costs (38%)

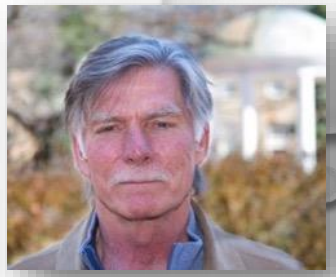
GOAL AND OBJECTIVES

Goal: develop an innovative class of membranes to markedly ***reduce the operating cost of water desalination***.

Our near term (2 year) objectives:

- Develop a novel class of bio-inspired nanocomposite membranes
- Characterize engineering performance of our membranes
- Develop mathematical tools to guide the design process
- Demonstrate that our membranes can be scaled-up and implemented

THE TEAM

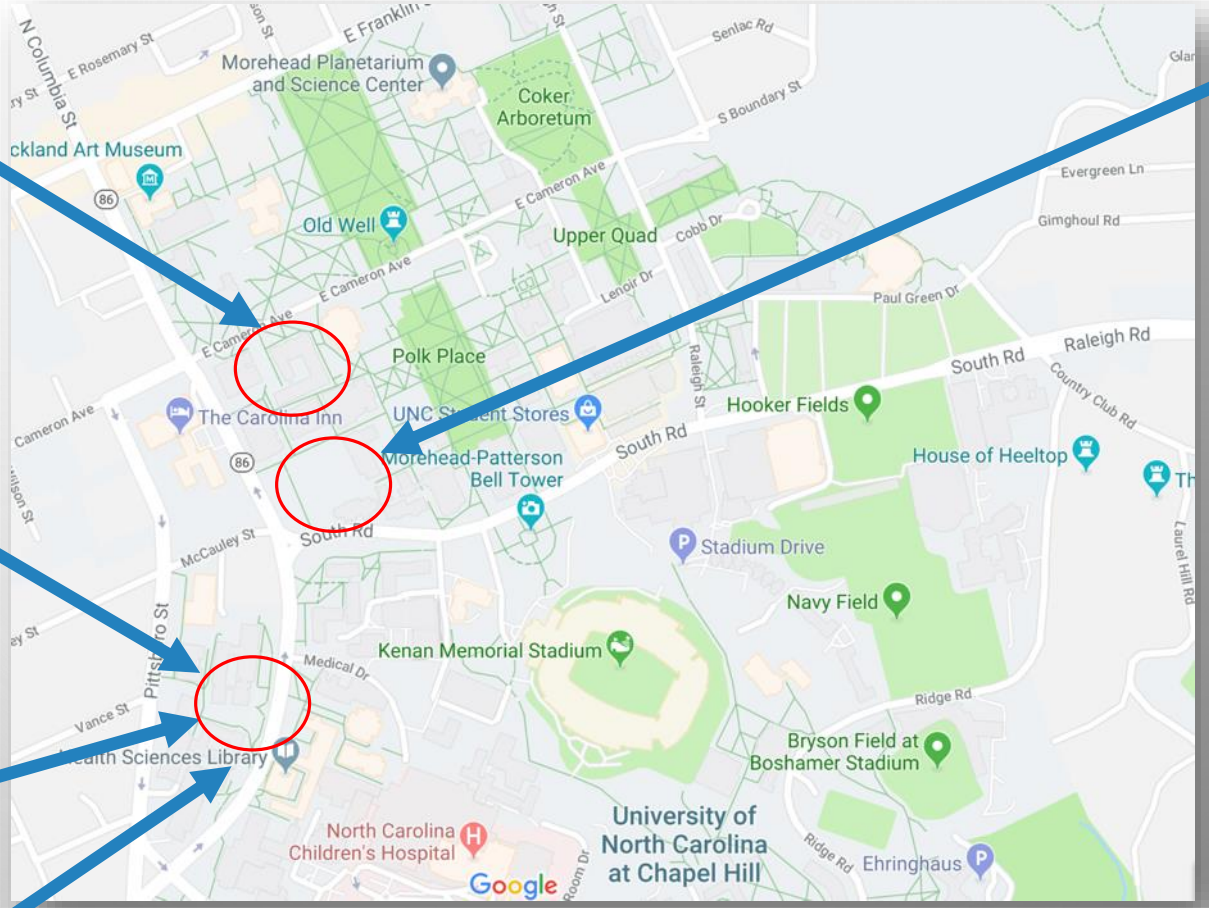


Greg Forest,
Mathematics

Casey Miller,
Gillings School of
Global Public Health

Jill Stewart,
Gillings School of
Global Public Health

Orlando Coronell,
Gillings School of
Global Public Health

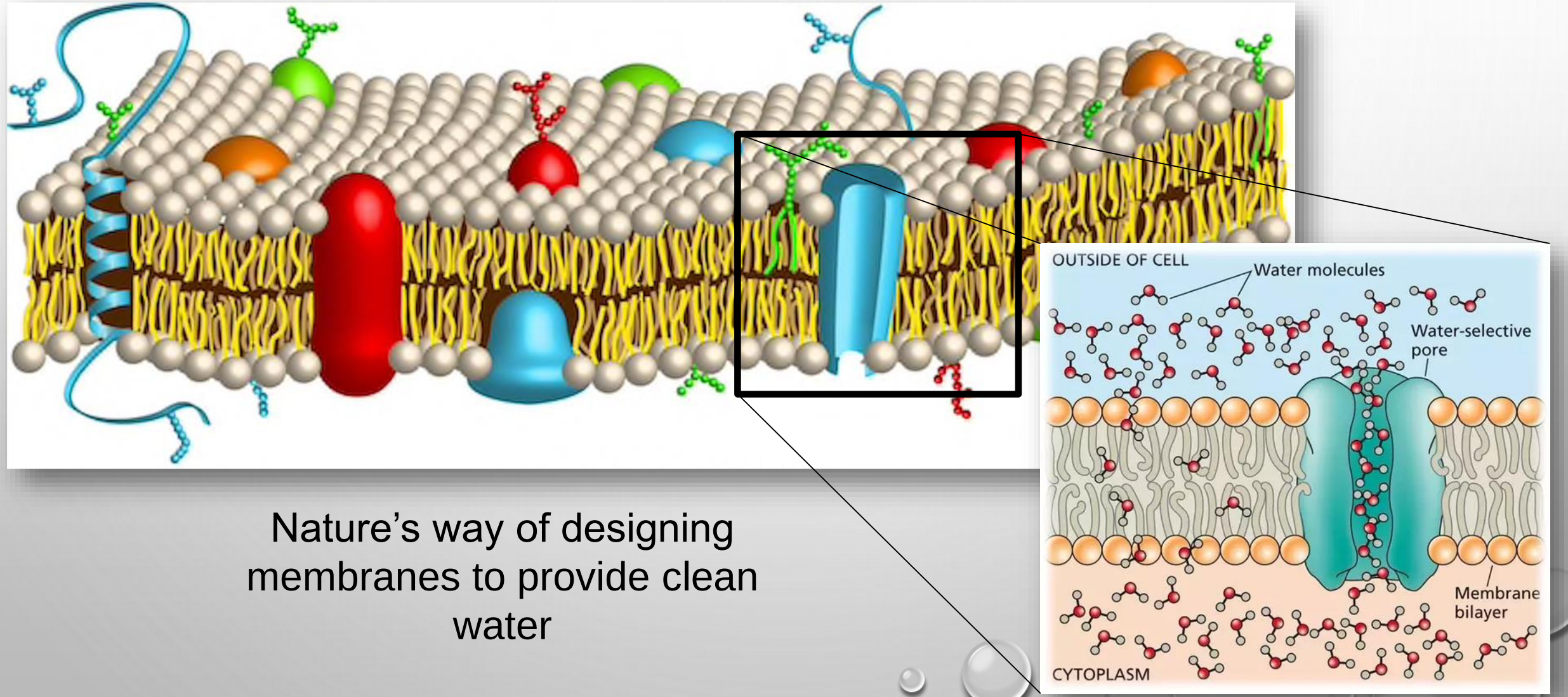


Theo Dingemans,
Applied Physical
Sciences

Benny Freeman,
UT Austin

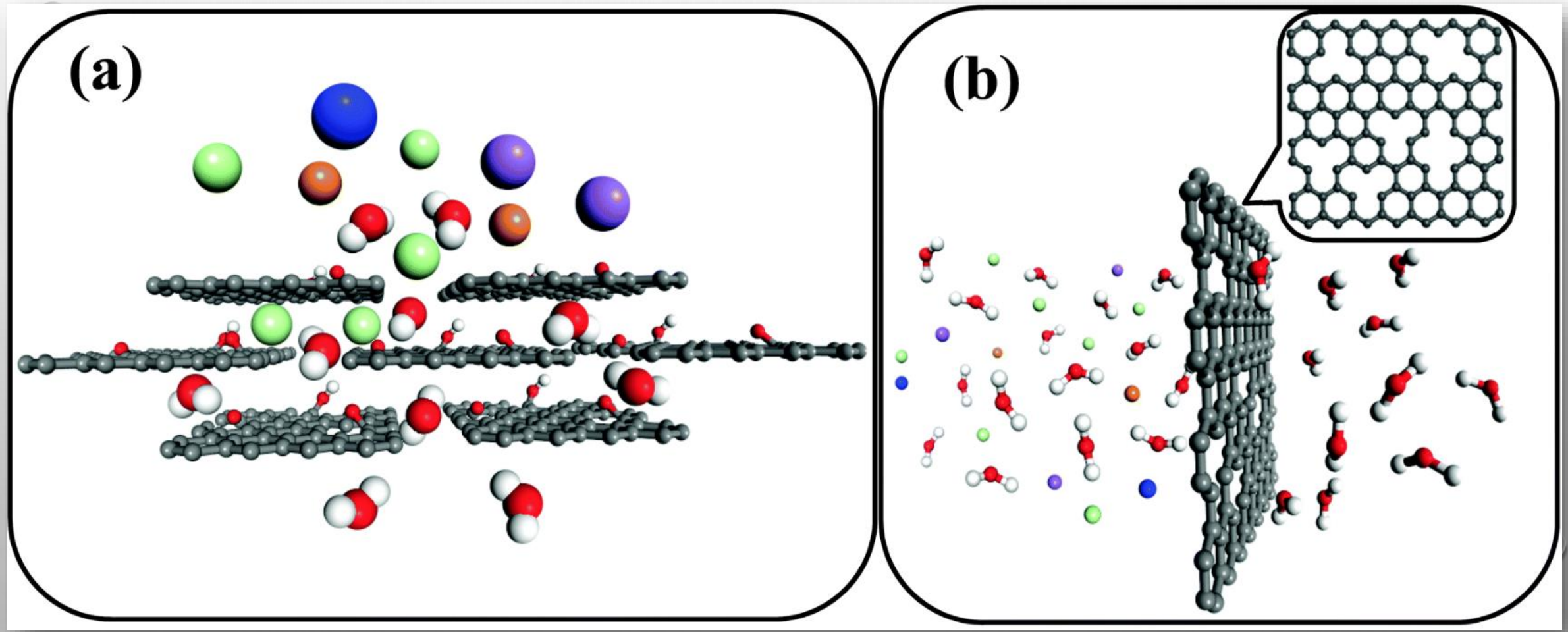
~1300 miles

OUR NATURE INSPIRED INNOVATION



Nature’s way of designing membranes to provide clean water

GRAPHENE OXIDE AND WATER DESALINATION



Source: Nanoscale, 2016, **8**, 117-119.

OUR SOLUTION

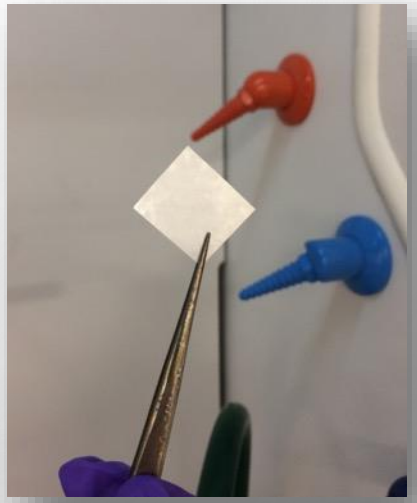
We have developed a unique method to blend **graphene oxide** (GO) and a **polyme**
and obtain a ultra strong nanocomposite desalination membrane

Graphene oxide

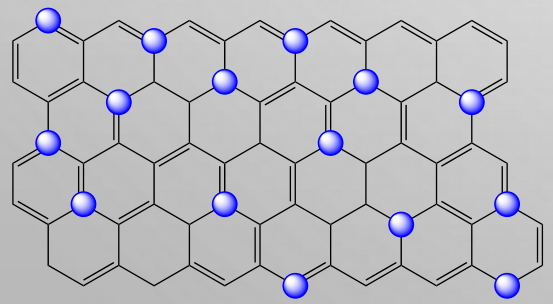
+

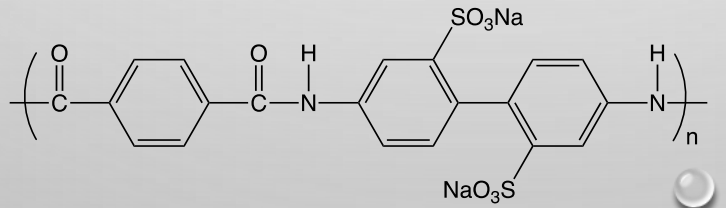
Polymer

water



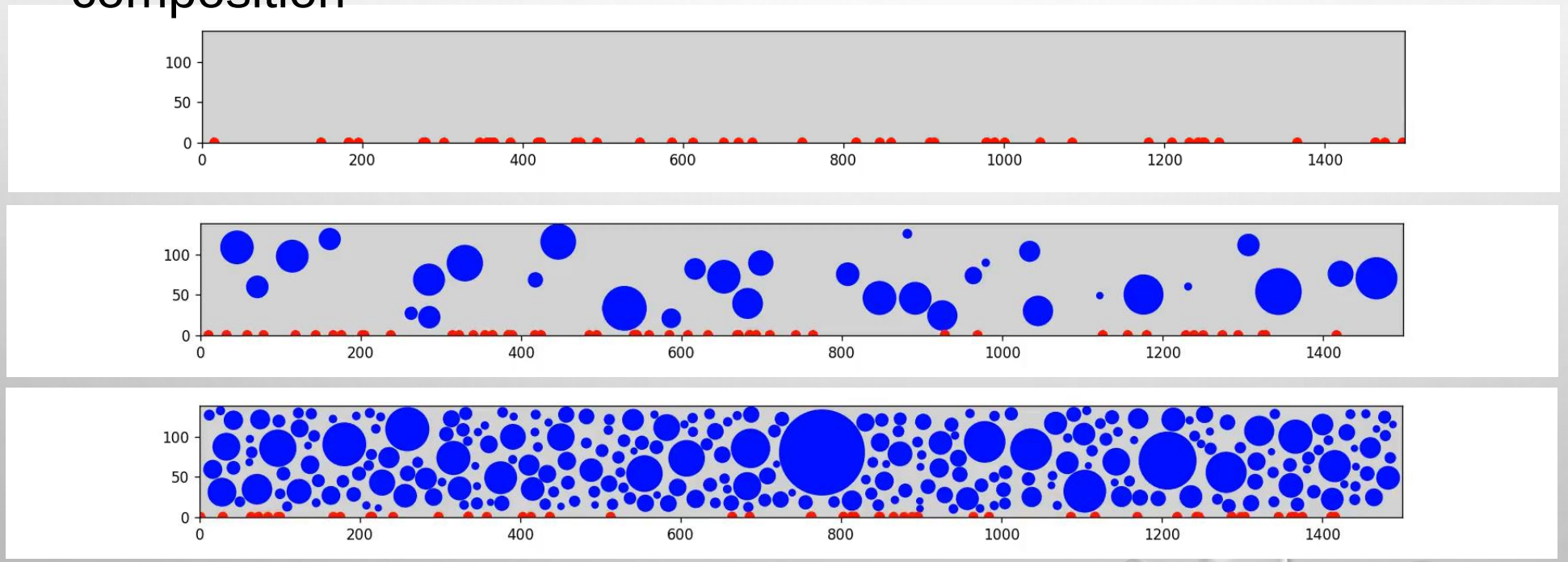
Membrane

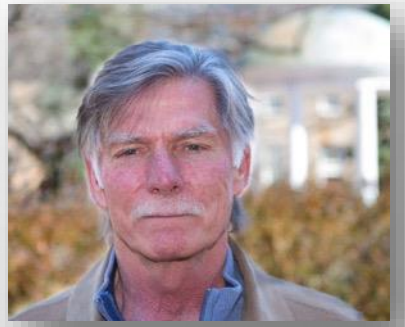




DESIGN GUIDANCE/OPTIMIZATION THROUGH MATHEMATICAL AND COMPUTATIONAL MODELING

- Design space exceeds experimental capabilities
- Models generate 3D realizations of the membrane pore structure
- Iterate feedback between modeling predictions ⇔ membrane composition





Greg Forest, Mathematics, APS, BM

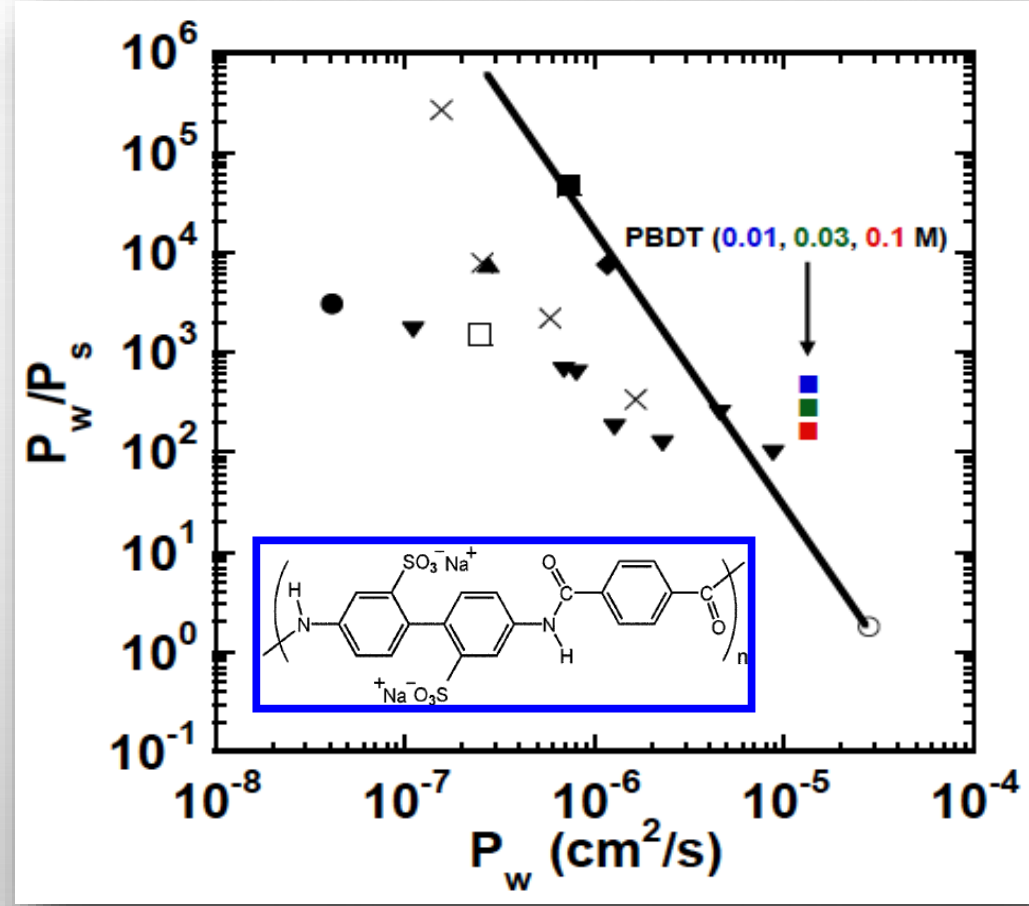
Casey Miller, ESE

HOW WE USED $5,000

An Investment in Proposal Development

1- Discuss our approach with experts in the field: Prof. Jeffrey Grossman at MIT

2- Perform ***proof-of-concept*** experiments



Ryan Kingsbury
UNC

Sujan Dai
UNC

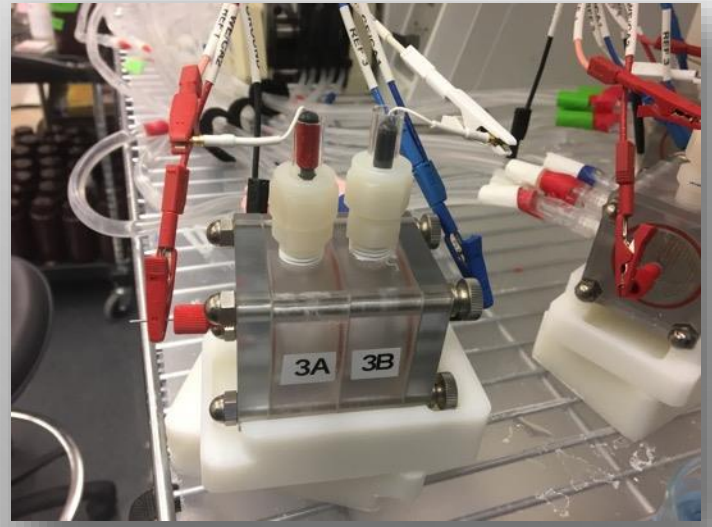
Anna Fraser
UNC

Rahul
UT Austin

LAB-SCALE PROOF OF CONCEPT

Jill Stewart, Gillings
School of Global Public Health

Orlando Coronell, Gillings
School of Global Public Health



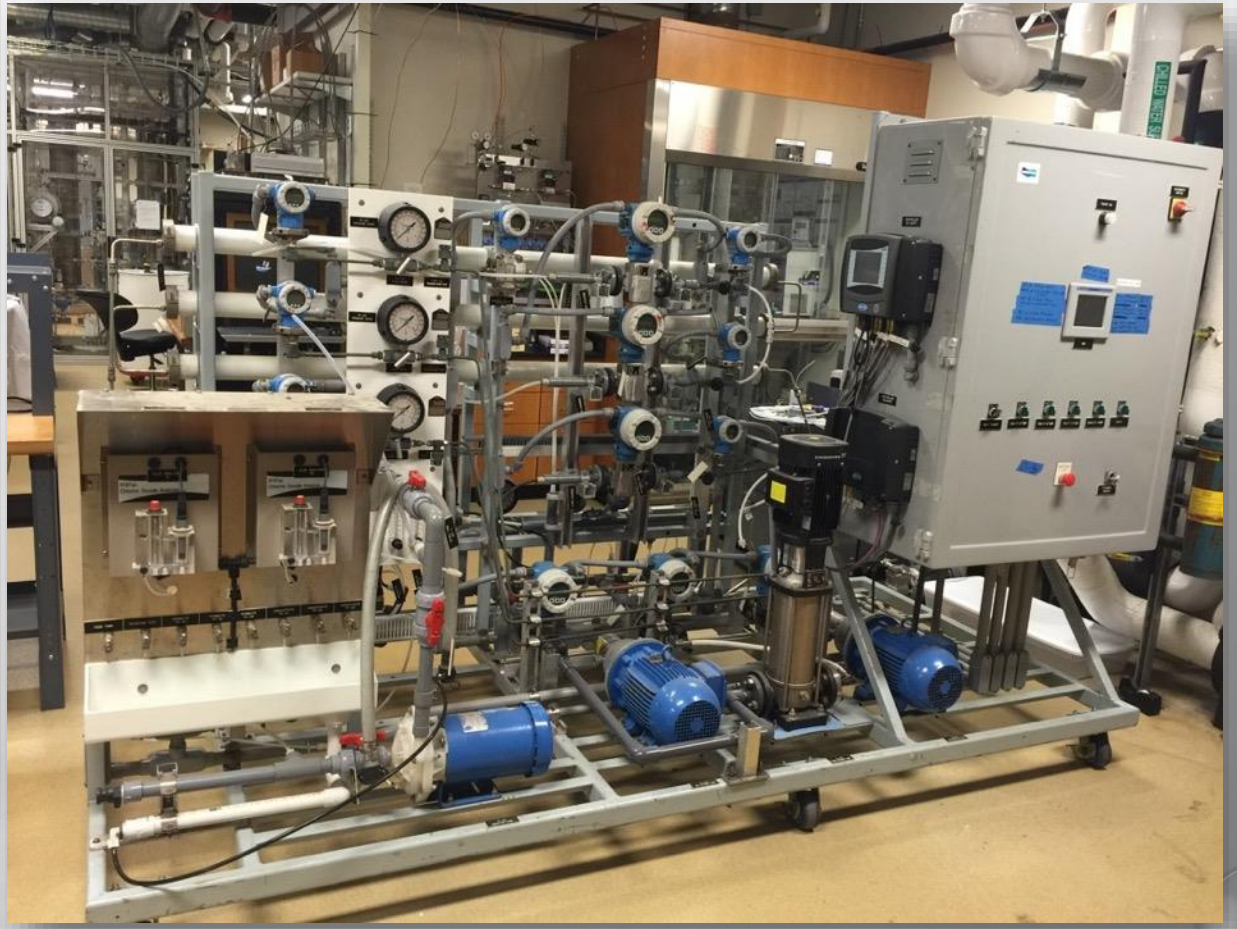
Membrane characterization

- ✓ ionic conductivity
- ✓ water permeability
- ✓ permselectivity
- ✓ water-swelling degree
- ✓ water and solute partitioning
- ✓ water and solute diffusion

Benny Freeman, UT Austin

REAL-LIFE PROOF OF CONCEPT

20 L scale-up facility at APS



Pilot-scale performance testing mimicking operationally realistic conditions at RTI

DESIRED OUTCOME

Creativity Hubs funding will be used to build and test ***energy efficient and affordable water purification membranes:***

- ***Proof-of-concept*** on a laboratory and pilot scale
- **Secure intellectual property** (IP)
- **Secure funding from other sources** (e.g. DOE, NSF-INFEWS, DOD-SERDP, ARPA-E)
- **Expand team and scope**: CO_2 capture, sequestration and conversion,
  Heavy metal removal (= mining!),
  Produced water treatment,
  Policy and technology implementation

LONG TERM VISION

Creativity Hubs becomes a stepping stone towards a

UNC Membrane Center

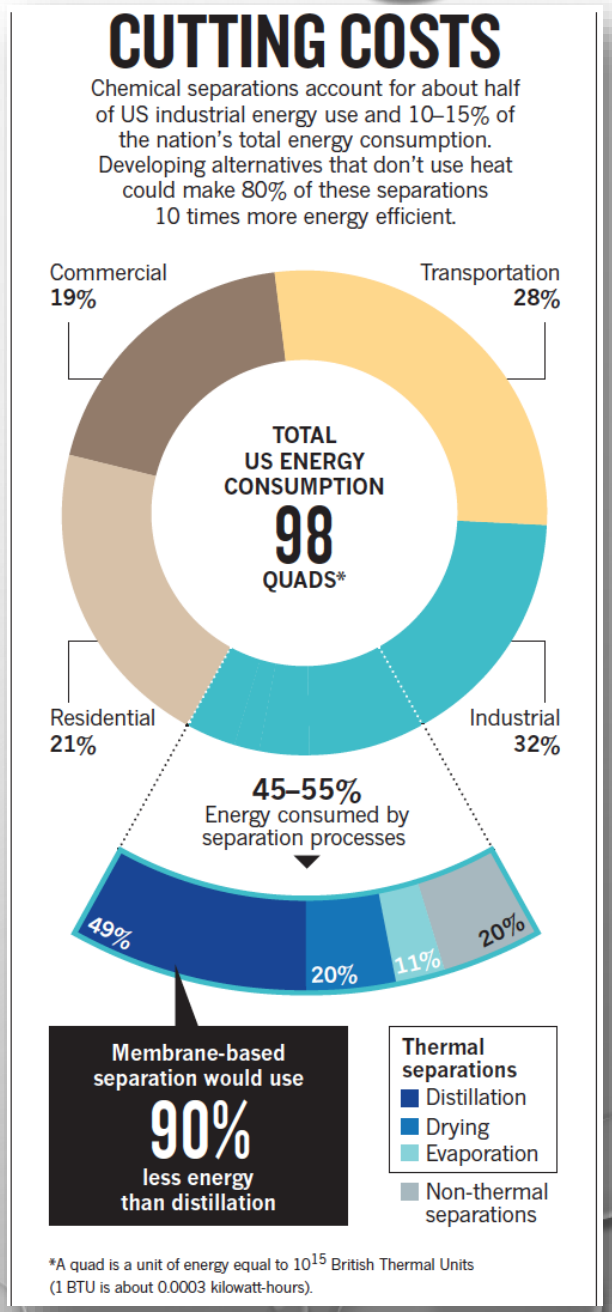
at the Water-Energy Nexus and

The Next Generation of Industrial Membranes

Seven chemical separations to change the world

Purifying mixtures without using heat would lower global energy use, emissions and pollution — and open up new routes to resources, say **David S. Sholl** and **Ryan P. Lively**.

28 April 2016 | VOL 432 | NATURE | 435



QUESTIONS?