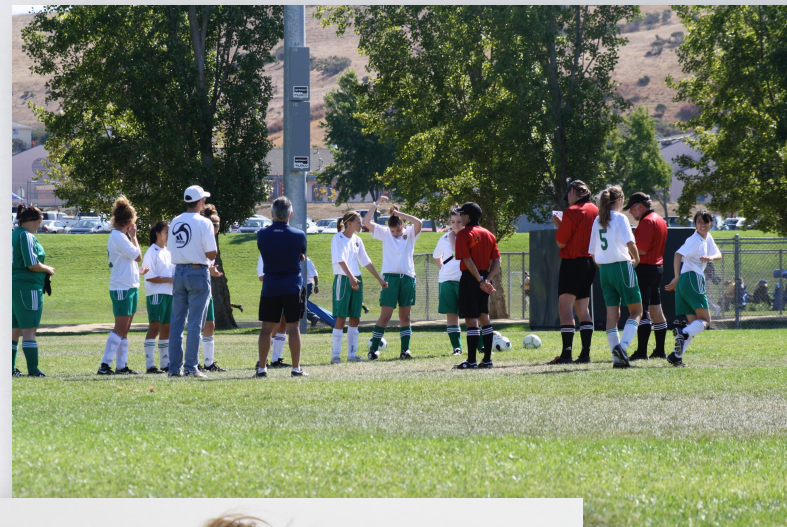


AN ACCIDENTAL MATHEMATICIAN:
STORIES OF A JOURNEY THROUGH
STEM-LAND AS A MINORITY

JUAN C. MEZA
PROFESSOR, APPLIED MATHEMATICS
<https://juancmeza.com>

DEDICATED TO RACHEL AND JEREMY



ACT I

PAN COMIDO
(PIECE OF CAKE)

A LITTLE ABOUT ME



A LITTLE MORE ABOUT ME



ON THE MORE FUN SIDE



ACT II

SEEDS OF DOUBT

FACTORS ASSOCIATED WITH TEST SCORES

	FACTOR	YES	NO
	HIGHLY EDUCATED PARENTS		x
	HIGH SOCIOECONOMIC STATUS		x
	MOTHER OVER 30 AT TIME OF 1 ST CHILD		x
	PARENTS SPEAK ENGLISH AT HOME		x
	NORMAL BIRTH WEIGHT	x	
	CHILD NOT ADOPTED	x	
	PARENTS INVOLVED IN PTA		x
	MANY BOOKS IN HOME		x

SO HOW EXACTLY DID I GET HERE?

- BY ALMOST ANY PREDICTIVE MEASURE I SHOULDN'T HAVE FINISHED COLLEGE
- MUCH LESS GOTTEN A PHD
- OR BE A PROFESSOR AT THE UNIVERSITY OF CALIFORNIA ...

COMBINATION OF SKILLS & FORTUNATE EVENTS

- STARTED WITH PARENTS
- HARD WORK
- COMMUNICATION SKILLS
- GREAT MENTORSHIP
- SOME LUCKY BREAKS



CARMEN MEZA

MILBY HIGH SCHOOL



FIRST BIG BREAK



- ADMITTED TO RICE – ONE OF TWO STUDENTS FROM MILBY
- STARTED IN ELECTRICAL ENGINEERING
- EVENTUALLY SWITCHED TO MATH IN GRADUATE SCHOOL

SEEDS OF DOUBT CYCLE

- YOU'RE THE ONLY URM IN THE GROUP/DEPT/COMPANY
- YOU START TO FEEL THAT EVERYBODY IS WATCHING YOU
- DON'T TAKE **ANY** CHANCE THAT MIGHT LEAD TO FAILURE



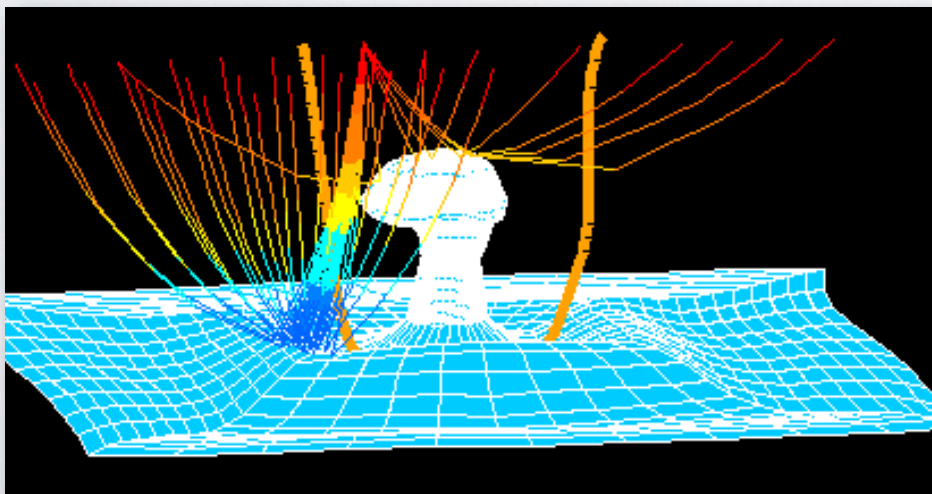
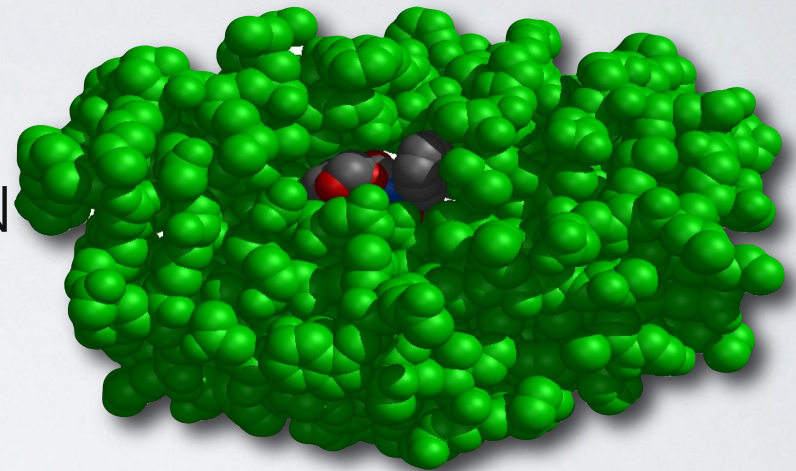
ACT III

THE REAL WORLD

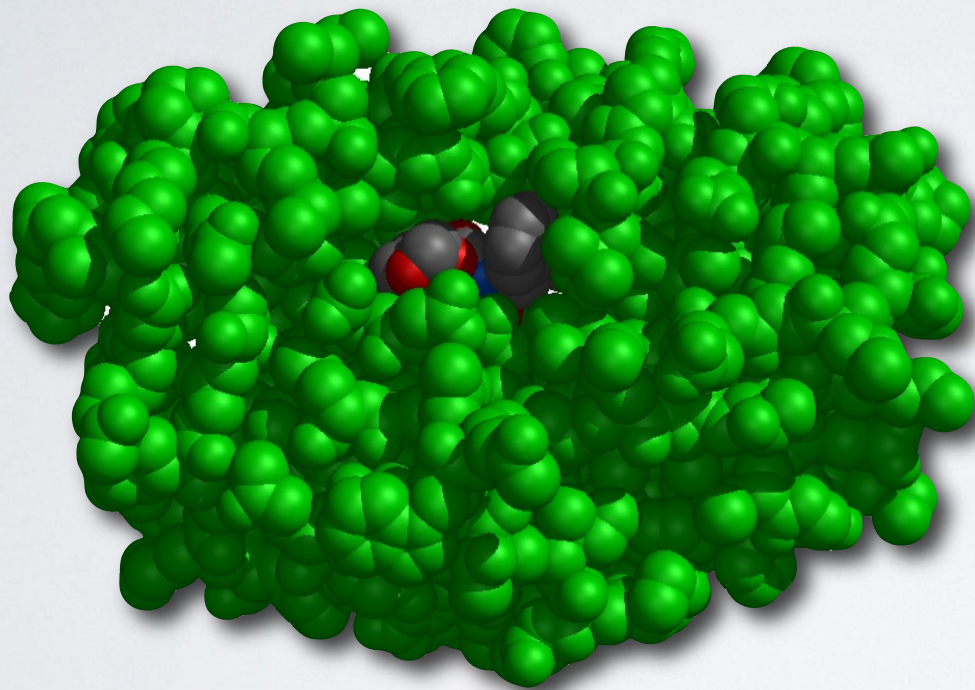
*IN THEORY THERE IS NO DIFFERENCE BETWEEN THEORY AND
PRACTICE – BUT IN PRACTICE THERE IS!*

LEARNING TO OPTIMIZE REAL-WORLD PROBLEMS

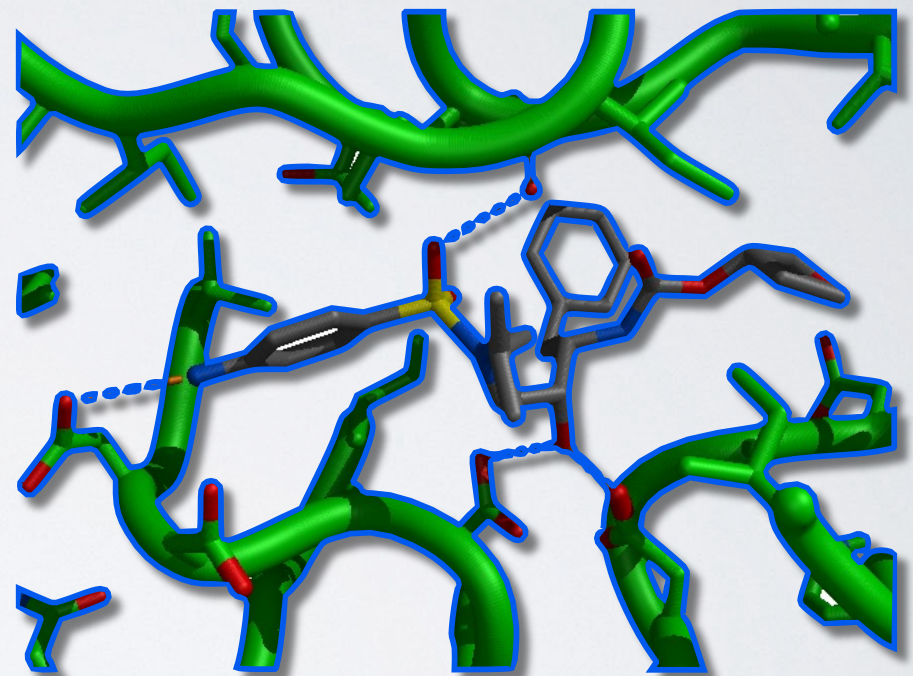
- RAY TRACING
- MOLECULAR CONFORMATION PROBLEMS
- CVD OPTIMIZATION



OPTIMIZATION METHODS CAN BE USED TO HELP IN DRUG DESIGN



DRUGS ARE TYPICALLY SMALL
MOLECULES THAT BIND TO AND
INHIBIT A TARGET RECEPTOR

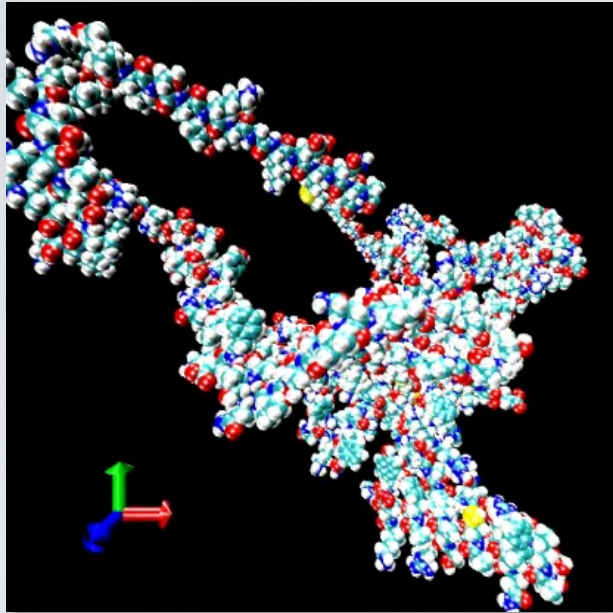


*HIV-1 Protease Complexed with
Vertex drug VX-478*

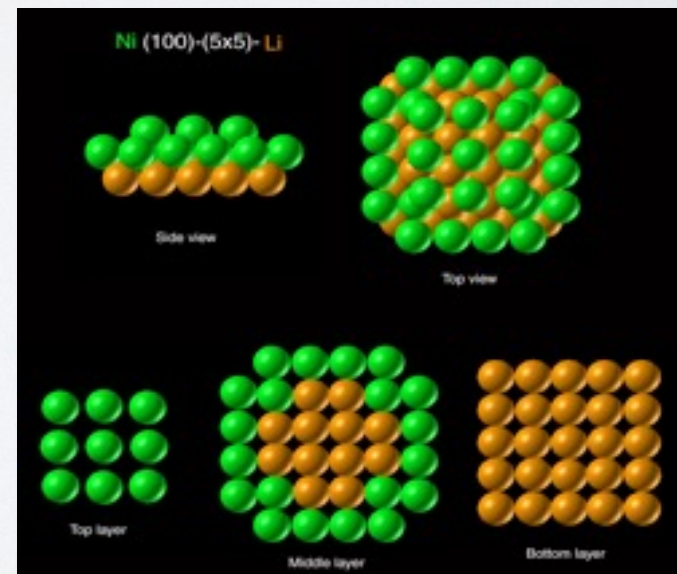
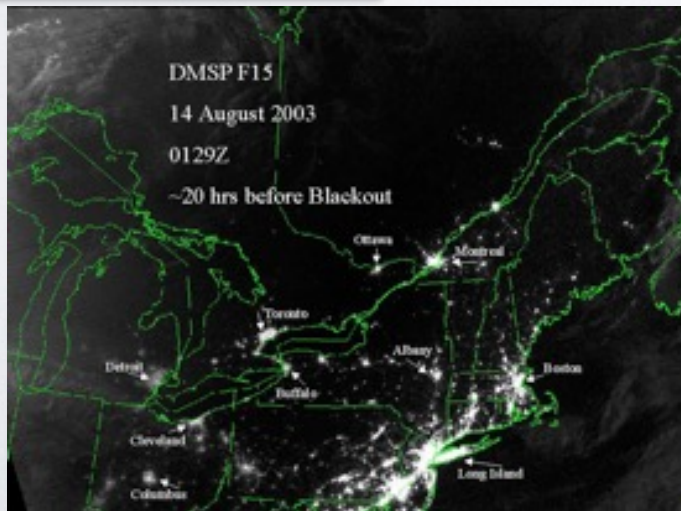
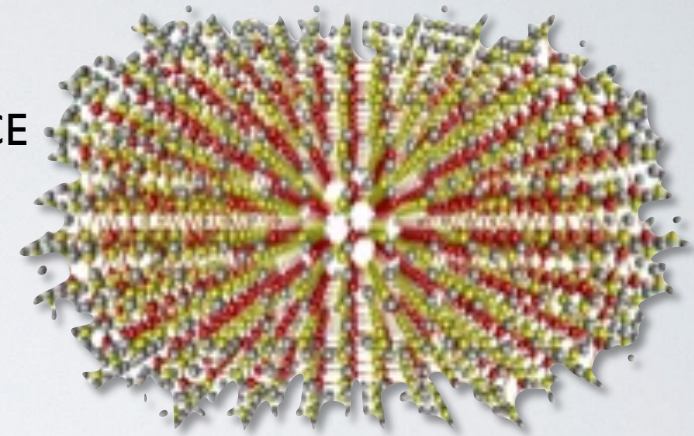
**MOVING TO BERKELEY:
2002-2008**

**TRADING IN MY TIE FOR SOME
BIRKENSTOCKS**

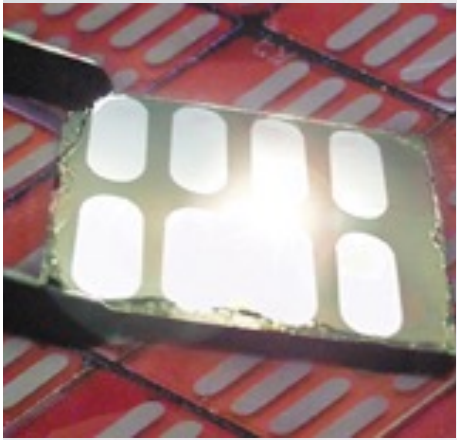
THE MOVE TO SCIENCE APPLICATIONS



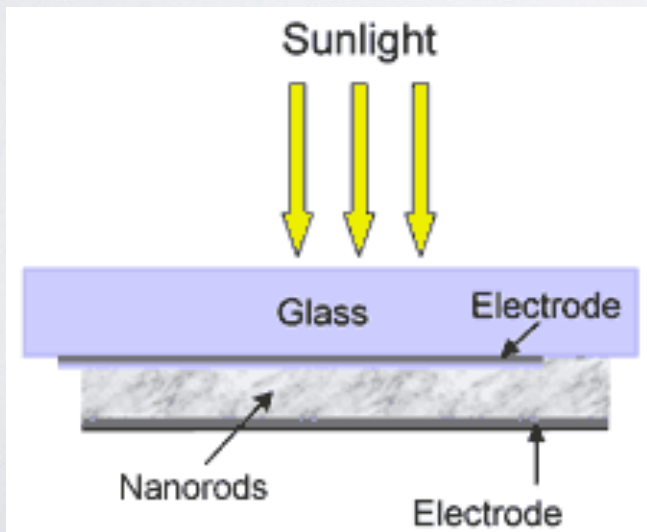
- PROTEIN FOLDING
- NANOSTRUCTURE SURFACE DETERMINATION
- DETECTING VULNERABILITIES IN THE POWER GRID
- COMPUTING PROPERTIES OF NANOSTRUCTURES



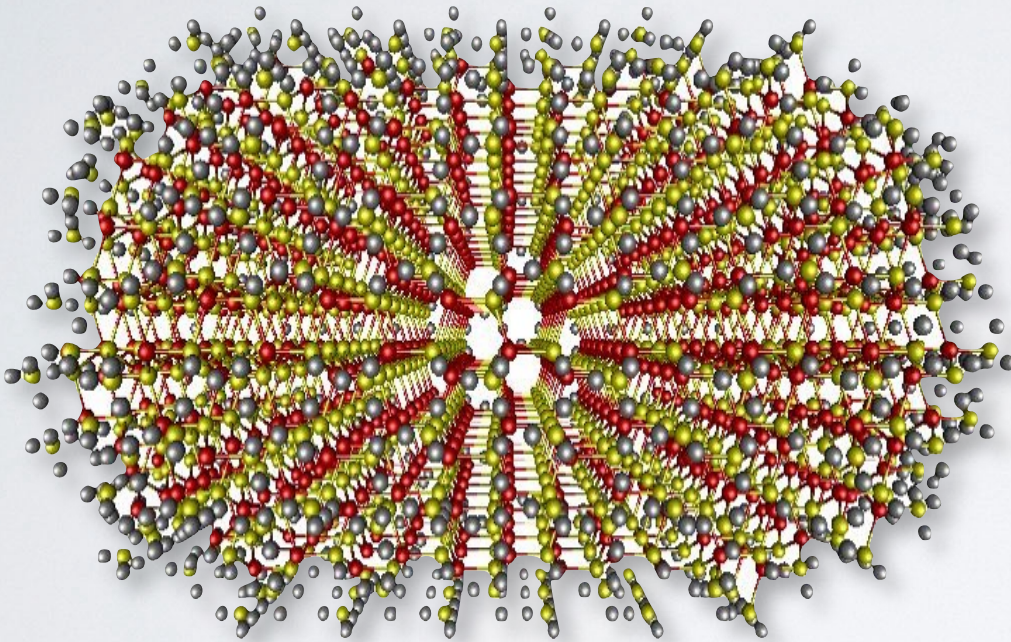
PHOTOVOLTAIC SOLAR CELLS



- SOLAR CELLS BASED ON INORGANIC NANORODS AND SEMICONDUCTING POLYMERS
- NANORODS CAN BE MADE OF CdSe, A SEMICONDUCTING MATERIAL
- NANORODS ACT LIKE WIRES, ABSORBING LIGHT AND GENERATING HOLE-ELECTRON PAIRS
- BIGGEST CHALLENGE IS COST, ~30 CENTS/KWH



DIPOLE MOMENT CALCULATION



- EXPERIMENTS SHOW THAT THESE STRUCTURES SHOULD NOT HAVE A DIPOLE MOMENT
- THE CALCULATED DIPOLE MOMENT OF A 2633 ATOM CDSE QUANTUM ROD, $\text{Cd}_{961}\text{Se}_{724}\text{H}_{948}$
- USING 2560 PROCESSORS AT NERSC THE CALCULATION TOOK ABOUT 30 HOURS.

DENSITY FUNCTIONAL THEORY AND THE KOHN-SHAM EQUATIONS

$$E_{total}[\{\psi_i\}] = \frac{1}{2} \sum_{i=1}^{n_e} \int_{\Omega} |\nabla \psi_i|^2 + \int_{\Omega} V_{ext} \rho$$
$$+ \frac{1}{2} \int_{\Omega} \frac{\rho(r)\rho(r')}{|r-r'|} dr dr' + E_{xc}(\rho),$$

$$\rho = \sum_{i=1}^{n_e} |\psi_i(r)|^2, \int_{\Omega} \psi_i \psi_j = \delta_{i,j}$$

$$\left[-\frac{1}{2} \nabla^2 + V_{ext}(r) + \int \frac{\rho}{|r-r'|} + V_{xc}(\rho) \right] \psi_i = \epsilon_i \psi_i$$

ACT IV

THE (NOT SO) CHANGING LANDSCAPE

THE CHANGING LANDSCAPE

California Latinos surpass whites in freshman UC admission offers



California high school seniors faced a tougher time winning a freshman spot at most of the UC campuses for the fall, with their chances at UCLA and UC Berkeley now fewer than one in five. UC Berkeley's Wheeler Hall is pictured. (Francine Orr / Los Angeles Times)

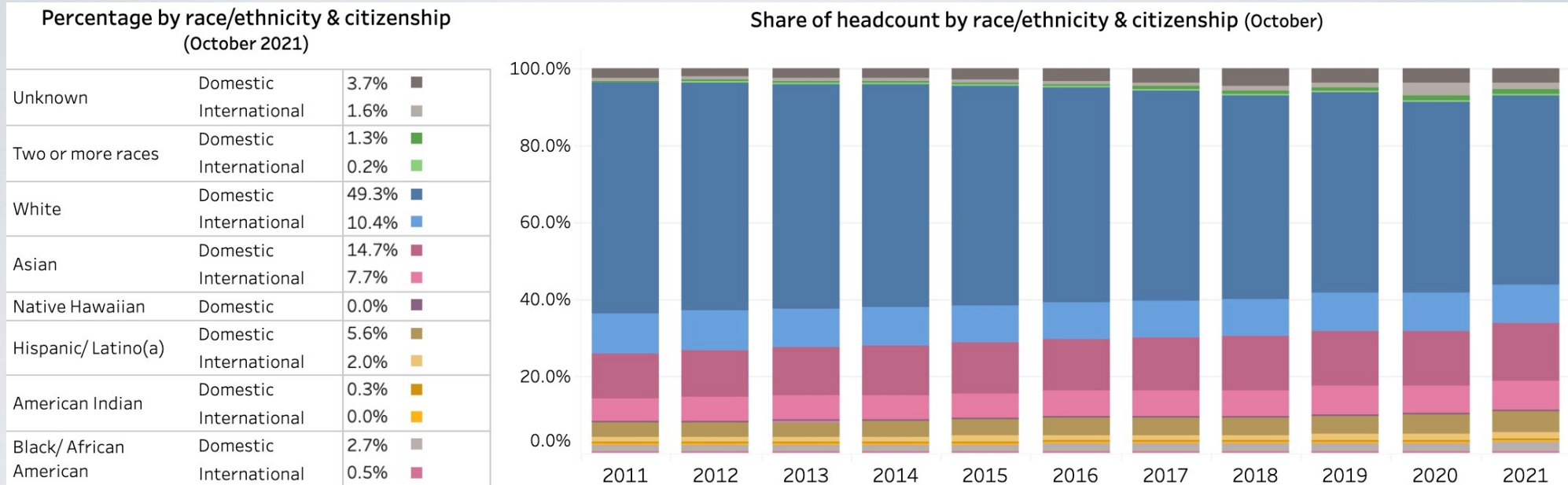
- 28.8% OF THOSE ADMITTED TO AT LEAST ONE UC CAMPUS WERE LATINO, COMPARED WITH 26.8% WHITE... BLACKS FROM CALIFORNIA WERE JUST 4.2%
- AT UCM 52.3% OF OUR UG STUDENTS ARE LATINO/A

OR IS IT?

FALL 2013 UC FACULTY

Area	African-American	Hispanic/Latino	White
Life Sciences	1.8	4.4	80.8
Physical Sciences	0.6	3.4	79.4
Math/CS/Engr	0.8	4.0	68.4
Overall	2.6	5.8	75.4

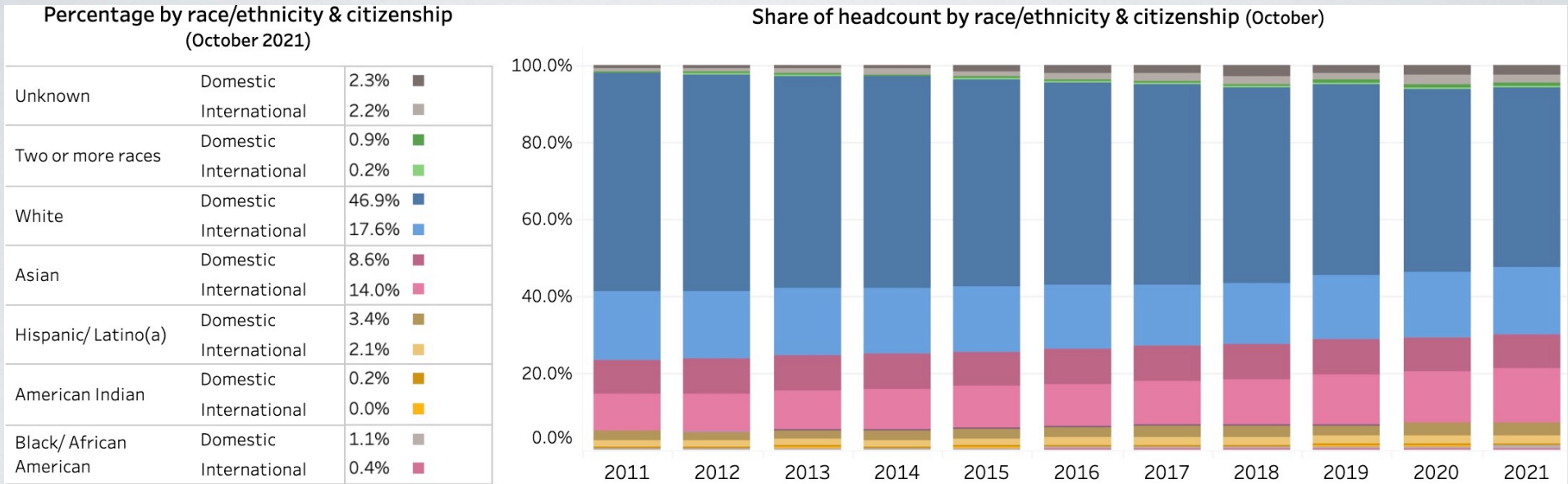
UC FACULTY 2011-2021



- Hispanic/Latino(a)
 - 2011 – 3.9%
 - 2021 – 5.6%
- Black/African American
 - 2011 – 2.1%
 - 2021 – 2.7%

AND THESE ARE
NUMBERS FOR ALL
FACULTY, NOT JUST
STEM

UC FACULTY 2011-2021



- Hispanic/Latino(a)
 - 2011 – 2.3%
 - 2021 – 3.4%
- Black/African American
 - 2011 – 0.6%
 - 2021 – 1.1%

ENGR & CS, LIFE
SCIENCES, MATH,
PHYSICAL SCIENCES

NUMBERS ALONE DO NOT TRANSLATE TO SCIENTISTS OR LEADERS

- NUMBERS NOT SIGNIFICANTLY DIFFERENT THAN THEY WERE
20 YEARS AGO
- IF WE FOLLOW THE SAME PATH WE WILL BE WAITING A
LONG TIME FOR CHANGE
- GLACIAL URM FACULTY AND PROMOTION INCREASES
(NELSON & BRAMMER, 2010)

WHITE PRIVILEGE

ARTICLE BY NICHOLAS KRISTOF, “STRAIGHT TALK FOR WHITE MEN”, FEB 21, 2015, NEW YORK TIMES

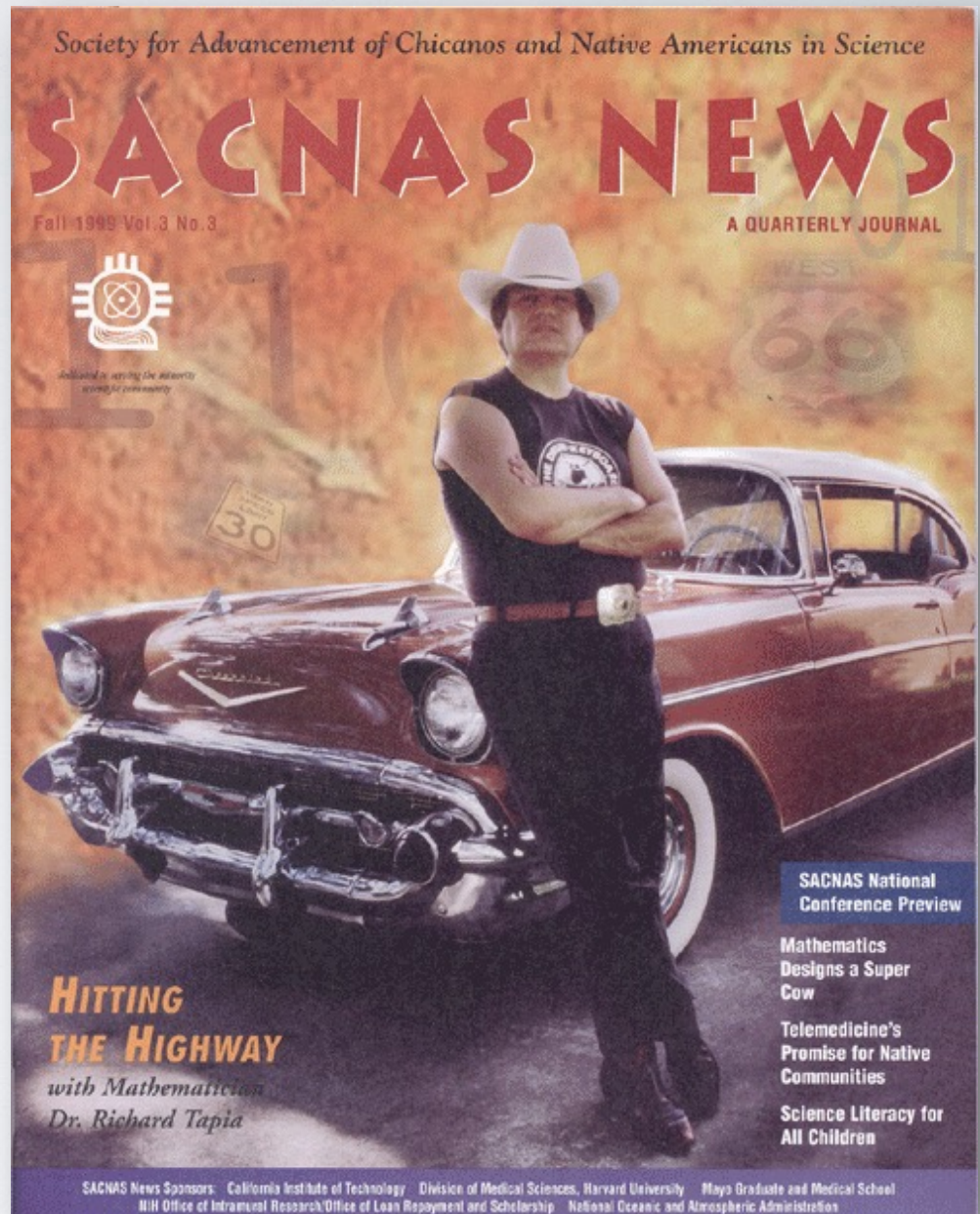
*MAYBE THAT’S BECAUSE IN A RACE, IT’S EASY NOT TO NOTICE A TAILWIND, AND WHITE MEN OFTEN GO THROUGH LIFE WITH A TAILWIND, **WHILE WOMEN AND PEOPLE OF COLOR MUST PUSH AGAINST A HEADWIND.***

EQUATED BEING A MINORITY WITH
RUNNING WITH A HEADWIND



LET'S AT LEAST TURN ON THE LIGHTS

- LISTEN TO THOSE WHO HAVE WALKED DOWN THE PATH: MENTORS & ADVISORS
- THEY KNOW AND CAN TEACH YOU THE “UNWRITTEN RULES”
- DEVELOP A NETWORK OF KNOWLEDGEABLE PEERS



MENTORING TIPS

- MENTORING IS FIRST AND FOREMOST YOUR RESPONSIBILITY
- KNOW YOUR GOALS AND TALK THEM OUT WITH SOMEONE
- DISCUSS BOTH YOUR STRENGTHS AND **WEAKNESSES**
- STEP OUT OF YOUR COMFORT ZONE

MY TOP 3 COMMON MISSTEPS

- TAKING FEEDBACK AND CRITICISM PERSONALLY
- AVOIDING ISSUES UNTIL IT'S TOO LATE
- NOT ASKING FOR SOMETHING IN THE FIRST PLACE

FAILURE IS A GOOD THING

- FAILURE IS A PART OF DOING SCIENCE
- IF YOU NEVER FAIL, YOU'RE NOT CHALLENGING YOURSELF ENOUGH
- SOMETIMES YOU JUST HAVE TO TAKE THAT LEAP OF FAITH



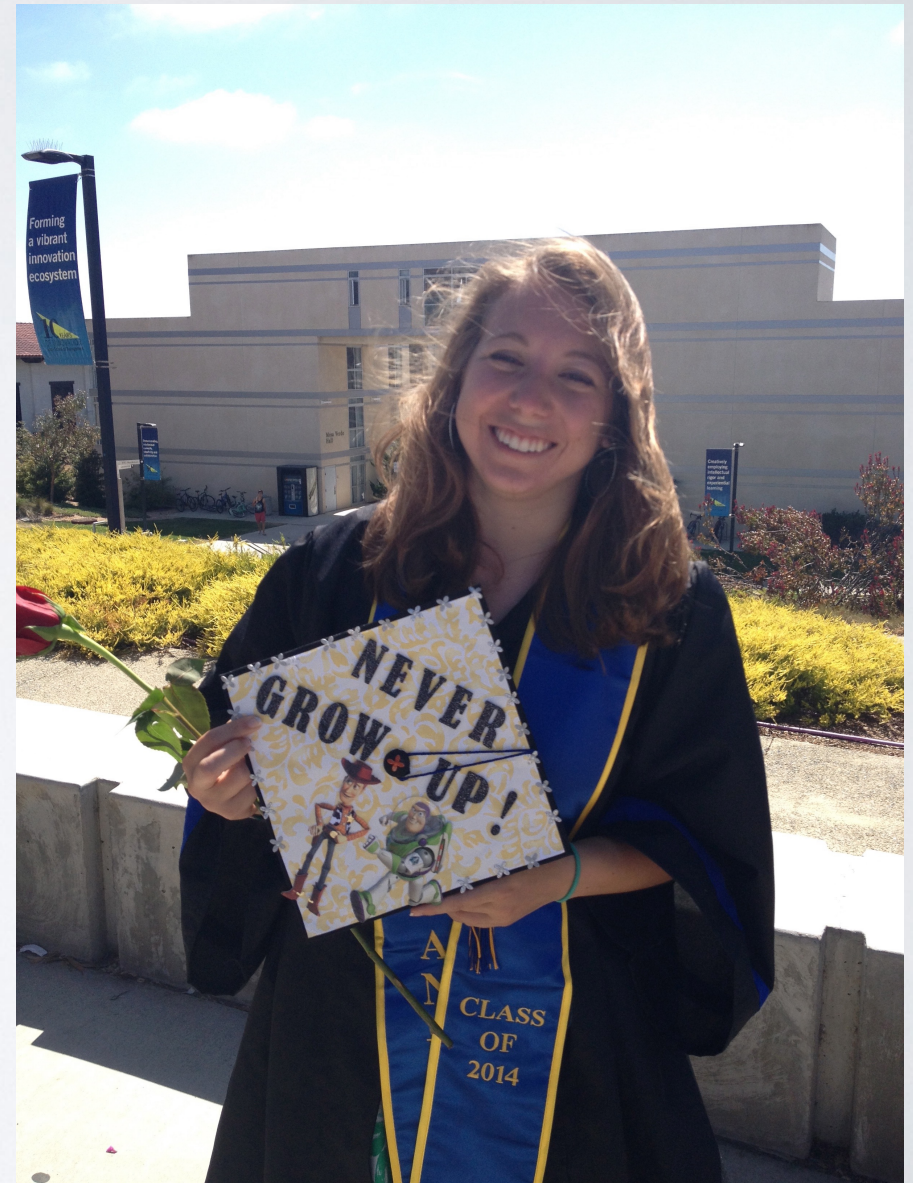
PATIENCE AND STAMINA

- TAKES STAMINA, PERSEVERANCE, AND PERSISTENCE
- NO TIME OUTS, CAN BE A LONG TIME BETWEEN HALVES



HAVE FUN

- CAN'T DO IT (JUST) BECAUSE YOUR PARENTS WANT YOU TO
- YOU HAVE TO HAVE A PASSION FOR YOUR WORK
- NEED BALANCE



ACT V

EPILOGUE: FINAL THOUGHTS

SUMMARY: IDEAS FOR TURNING ON THE LIGHTS

- SEEK OUT MENTORS AND CHAMPIONS
- BUILD A NETWORK OF COLLEAGUES
- TAKE RISKS
- ALWAYS DO YOUR BEST
- HAVE FUN

FINALLY MADE IT TO THE “WALL”





RICE ENGINEERING ALUMNI
2013
**Outstanding
Engineering Alumnus**

Presented to

JUAN C. MEZA

Electrical Engineering BS '78, MEE '79
Mathematical Sciences Ph.D. '86

In recognition of professional achievements,
service to the community,
and dedication to the advancement
of Rice University.



Ted Cidham, ME '90
Rice Engineering Alumni
Board President
2013-2014

FINAL THOUGHT

*“... We will build the roads and bridges, the electric grids and digital lines that feed our commerce and bind us together. **We'll restore science to its rightful place**, and wield technology's wonders to raise health care's quality and lower its cost. We will harness the sun and the winds and the soil to fuel our cars and run our factories. And we will transform our schools and colleges and universities to meet the demands of a new age.”*

*President Barack Obama
January 20, 2009*

*CAN WE RESTORE SCIENCE TO ITS RIGHTFUL PLACE,
WITHOUT OURSELVES FIRST TAKING OUR RIGHTFUL PLACE
WITHIN SCIENCE – IT'S YOUR TURN*



THANK YOU!



AND I'LL SEE YOU BY THE OCEAN!