

**HANDOUT NOTES:** will be in this font and color.

# ***Mentoring in Research: Finding the balance between achieving productivity and spurring creativity***



John M. Boone  
Professor of Radiology  
Professor of Biomedical Engineering  
University of California Davis

**AAPM 2017** JUL 30–AUG 3



CONNECTING OUR PATHWAYS.  
UNIFYING OUR PROFESSION.

59<sup>TH</sup> ANNUAL MEETING & EXHIBITION | DENVER, CO



John Boone



Karen Lindfors



Tony Seibert



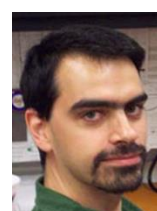
Shadi Shakeri



Craig Abbey



Norbert Pelc



Ramsey Badawi



Simon Cherry



Martin Yaffe



Jeff Siewerdsen



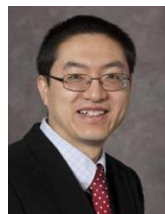
Loren Niklason



Maryellen Giger



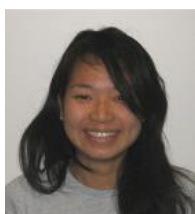
Ingrid Reiser



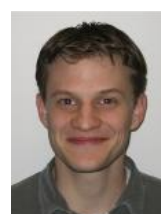
Kai Yang



Orlando Velazquez



Clare Huang



Nathan Packard



Katie Metheany



Whit Miller



Dandan Zheng



Shonket Ray



Anita Nosratieh



Lin Chen



Sarah McKenny



Nicolas Prionas



Peymon Gazi



Andrew Hernandez



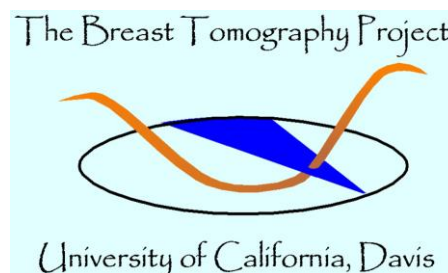
Amy Becker



Nilram Halat



Jessie Xia



George Burkett



John Brock



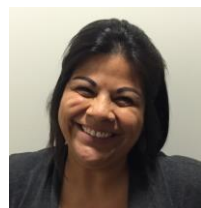
Alex Kwan



Hong Zhou



Laurie Boling



Desirée Lazo



Holly Murphy



Fareedah Simon



Linda Phelps



Heather Johnson

I've been lucky to have a lab and run a large research program for 20 years



Tom Nelson



Elizabeth Krupinski

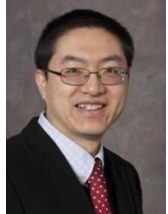


Carey Floyd



Bruce Hasegawa

# 12 Ph.D.'s, 3 Masters



Kai Yang



Orlando Velazquez



Clare Huang



Nathan Packard



Katie Metheany



Whit Miller



Dandan Zheng



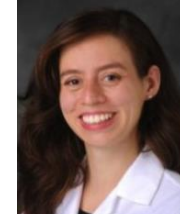
Shonket Ray



Anita Nosratieh



Lin Chen



Sarah McKenny



Nicolas Prionas



Peymon Gazi



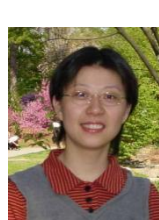
Andrew Hernandez



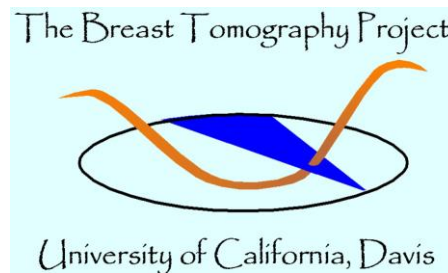
Amy Becker



Nilram Halat



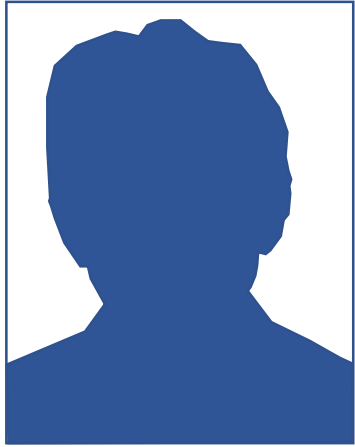
Jessie Xia



Any success that we have had is due to the hard work of the students who I have had the honor to mentor over the years.



# First things first: Educational objectives and (my) philosophy



student

My job is to make you famous

*My other job is to prevent you from becoming infamous*

*I do consider my job as an academic mentor to be to promote the education and ultimately the career of my protégé's - I want them to rise to "the top", however they define that.*

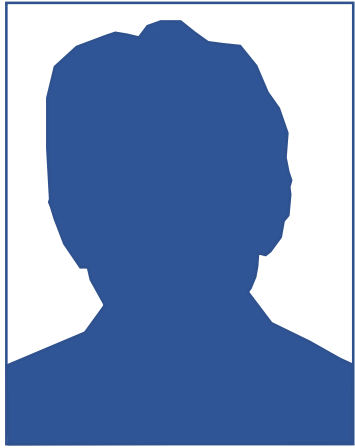
**AAPM 2017** JUL 30–AUG 3



CONNECTING OUR PATHWAYS.  
UNIFYING OUR PROFESSION.

59<sup>TH</sup> ANNUAL MEETING & EXHIBITION | DENVER, CO

# First things first: determining goals and future directions



student

Where do you want to be in 10 years?

Is your focus:

- 7 industry
- 3 clinical medical physics
- 4 academic research
- 1 government  
administrative

Once you have accepted a student into your "lab", you need to determine what the career goals are for the incoming student - as listed in this slide, the options are many and the training methods are different depending on the final goal - realizing that sometimes students change their career goals mid-stream.

**AAPM 2017** JUL 30–AUG 3



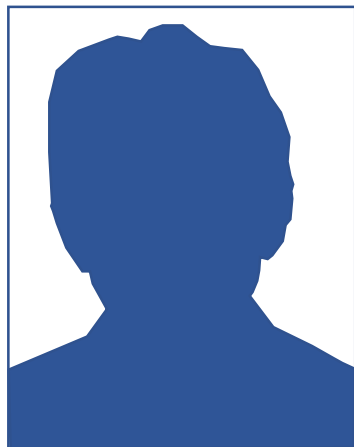
CONNECTING OUR PATHWAYS.  
UNIFYING OUR PROFESSION.

59<sup>TH</sup> ANNUAL MEETING & EXHIBITION | DENVER, CO

# First things first:

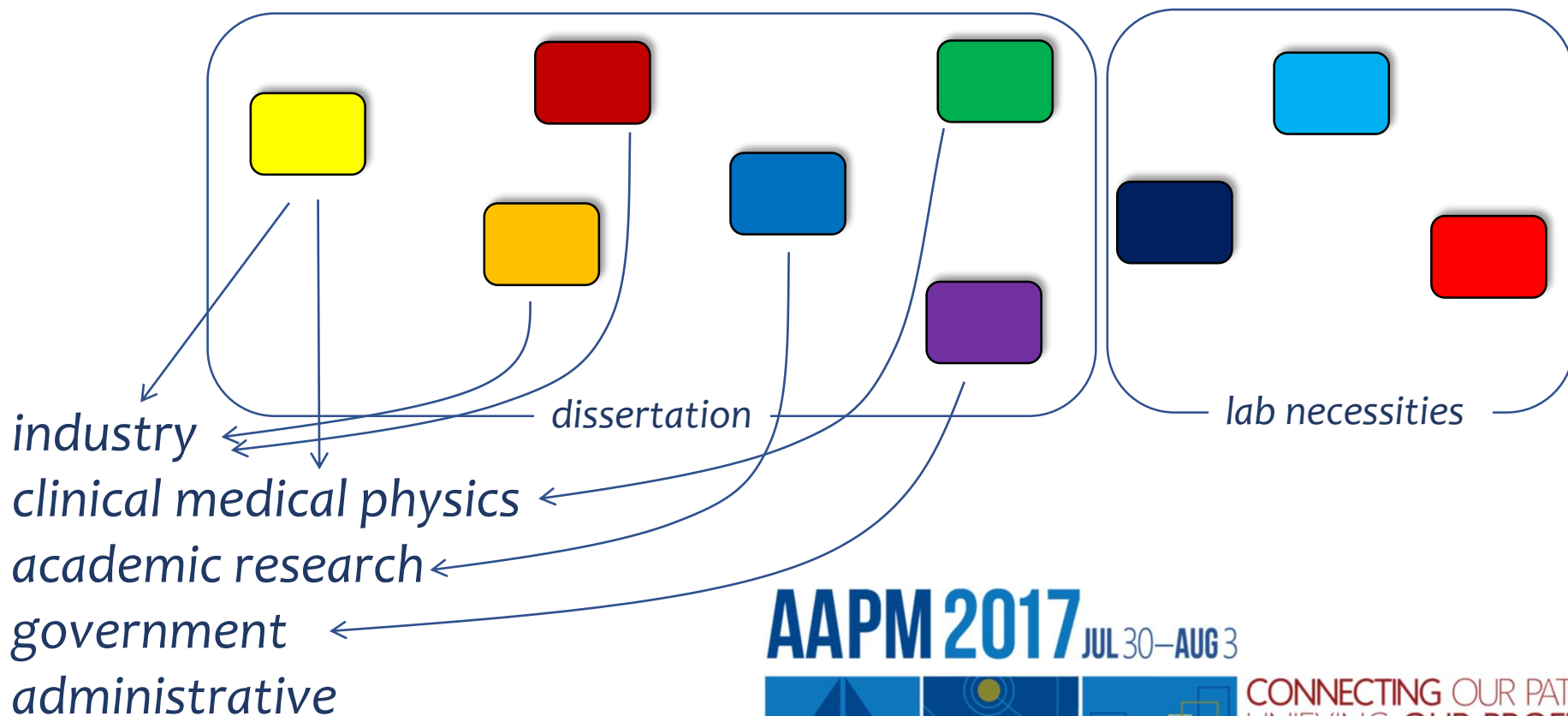
## Educational objectives and (my) philosophy

Outside of classwork, a research-oriented Ph.D. or M.S. is really defined by a collection of different SKILL SETS. Different students will have aptitude for different skills, and this should be nurtured but also directed toward the goal of the project. Some duties of a student involve scut-work, and since I do plenty of that, I expect my students to, also.



student

### Graduate School is about building skill sets



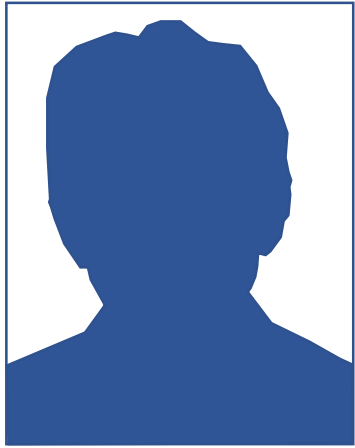
**AAPM 2017** JUL 30–AUG 3



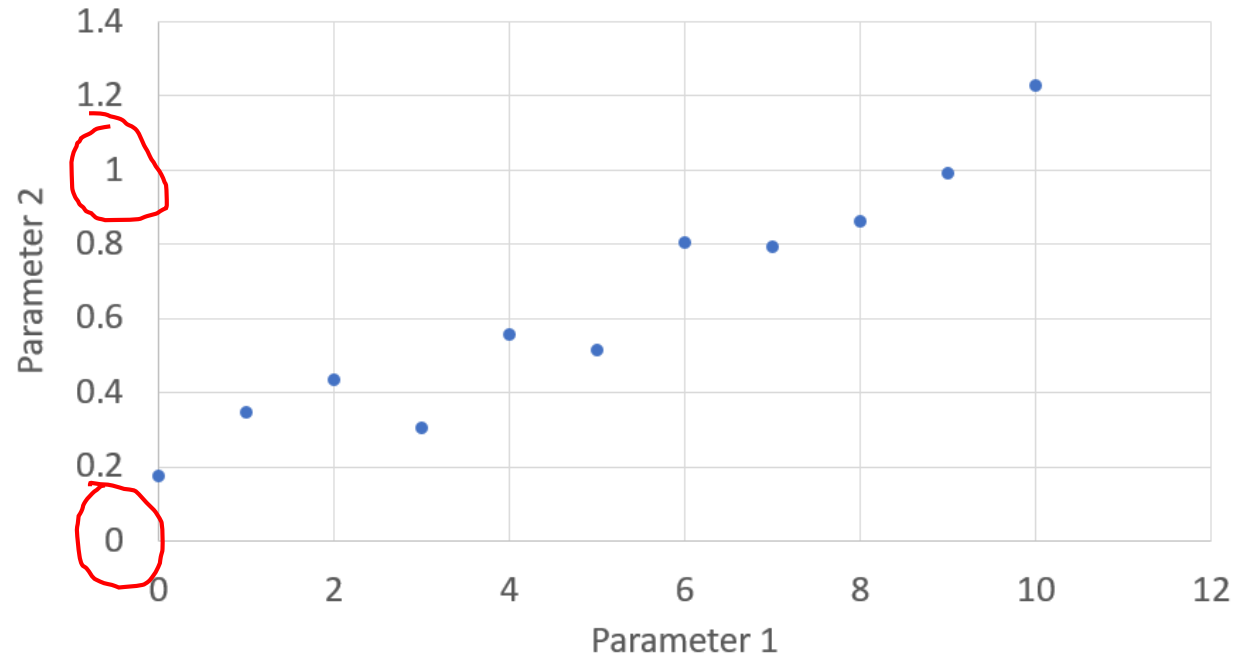
CONNECTING OUR PATHWAYS.  
UNIFYING OUR PROFESSION.

59<sup>TH</sup> ANNUAL MEETING & EXHIBITION | DENVER, CO

# Over time: Pet peeves and guiding principles



student



Just because this is the default of EXCEL and MATLAB,  
using different significant figures on the axis of a plot IS  
JUST WRONG.

**AAPM 2017** JUL 30–AUG 3

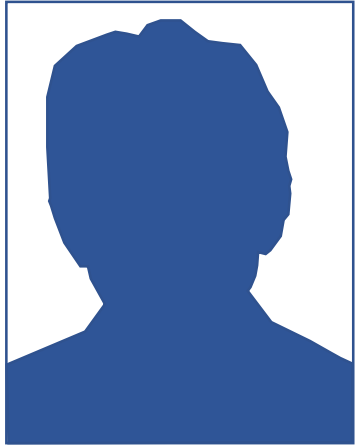


CONNECTING OUR PATHWAYS.  
UNIFYING OUR PROFESSION.

59<sup>TH</sup> ANNUAL MEETING & EXHIBITION | DENVER, CO

# Over time:

## Pet peeves and guiding principles



student

- All work should be the best it can be
- Your publications *ARE* your reputation in academia
- Scientific writing is key to all career paths
- I will always take the effort to understand you
  - ...and you need to take the same effort to understand me
- We follow all the rules, and we always tell the truth
- You can always call me, day or night

This slide speaks for itself. Strive for excellence - always, and despite the straight jacket that researchers are expected to wear, we need to follow the University rules.

**AAPM 2017** JUL 30–AUG 3



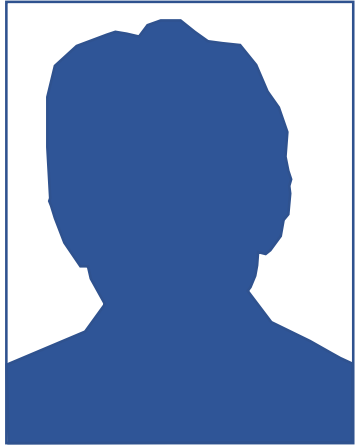
CONNECTING OUR PATHWAYS.  
UNIFYING OUR PROFESSION.

59<sup>TH</sup> ANNUAL MEETING & EXHIBITION | DENVER, CO



**Over time:**

## ***Finding the balance between achieving productivity and spurring creativity***



student

- Lead by example
- Point them in a scientific direction (\*funding dependent)
- Give them the tools, and get out of the way
  - *But always be available for questions and discussion*
- Let them turn over the rocks on their journey
- Expose them to other scientists

Productivity is important, but a student will not learn how to think independently unless you give them the opportunity to do so. That means not micro-managing projects, and letting each student follow their own curiosity as they mature as young scientists. Let them do science that you don't necessarily understand - or your students will only push the limits of your knowledge - not theirs.

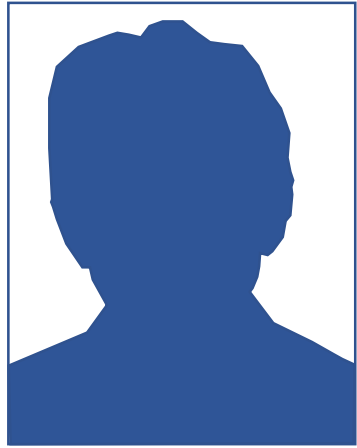
**AAPM 2017** JUL 30–AUG 3



CONNECTING OUR PATHWAYS.  
UNIFYING OUR PROFESSION.  
59<sup>TH</sup> ANNUAL MEETING & EXHIBITION | DENVER, CO

# Experienced Grad Student (4 & 5 years)

## Publication management and developing their next job



student

- Managing student publications
  - The red pen
  - Responding to manuscript reviews
  - Submitting rough drafts to journals
- Involvement in AAPM (& others)
- Post-Doc in my lab?
- Calls from friends in industry & elsewhere

### 1 Significance

Although the currently reported volume computed tomography dose index (CTDI<sub>vol</sub>) is useful for measuring the pitch-corrected x-ray output properties of different CT scanners; it does not represent the average dose for most patients and underestimates the absorbed dose in a typical body-scan.<sup>2</sup> There is a clear need for methods that estimate the radiation dose on a patient-specific basis that is fast and accurate enough to be clinically applicable. Monte Carlo (MC) methods are the current standard for dosimetry in voxelized phantoms and some groups have incorporated patient-specific anatomical models into validated MC simulations of a CT scan.<sup>3</sup> However, MC-based algorithms are not necessarily optimized for clinical use and suffer from long computation times due to the stochastic nature of the approach and the need for a very large number of particle histories to get reliable results. Accordingly, the present dissertation work will focus in part on developing an approach to individualized patient dosimetry using deterministic equations and based almost entirely on the CT image data set and the known geometry and output factors of the CT scanner. This approach has the potential capability of providing accurate and patient-specific dose estimates in a clinically applicable time frame (i.e. several minutes).

In mammography, the normalized mean glandular dose (DgN) values are used in the medical physics field to adjust technique factors and not overexpose the patient to radiation dose. These DgN values are based on simulations of a homogenous breast composition of glandular and adipose tissues. With the advent of the three-dimensional capabilities of breast CT (bCT), recent studies have shown that the assumption of a homogenous breast composition is not valid.<sup>4,5</sup> Accordingly, 3D glandular distributions have been quantified from a large cohort of patient studies.<sup>4,6</sup> Sechopoulos *et al.* found that the approximation of a homogenous tissue mixture results in a significant overestimation of dose to the imaged breast using simulated mechanical compression of

to the tissue at risk in the breast, glandular tissue.

obtain

get

using

to compute

completely

consequently

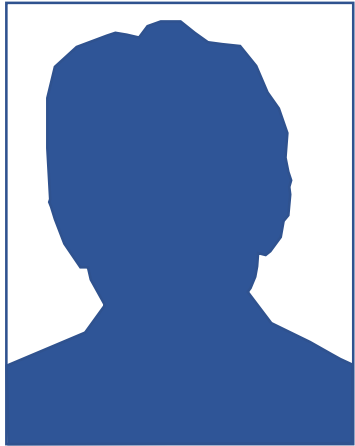
All academic advisors need to teach their students how to write scientifically. E.G., "Nowadays" has no place in a Medical Physics article. I red-pen a lot instead of "track changes", because the student has to actually read the corrections and learn - not just hit "accept all". Get your students involved in AAPM activities - it's a kick down their career path.

AAPM 2017 JUL 30-AUG 3



CONNECTING OUR PATHWAYS.  
UNIFYING OUR PROFESSION.

59<sup>TH</sup> ANNUAL MEETING & EXHIBITION | DENVER, CO



student

## *Finding the balance between achieving productivity and spurring creativity*

Most of these slides have had that icon of a student in them. That's because mentoring is, in fact, all about the student. If you put your own goals above your students, then you should not be an academic advisor. The dirty little secret is, that nurturing your students is the best way to promote yourself academically, anyway.

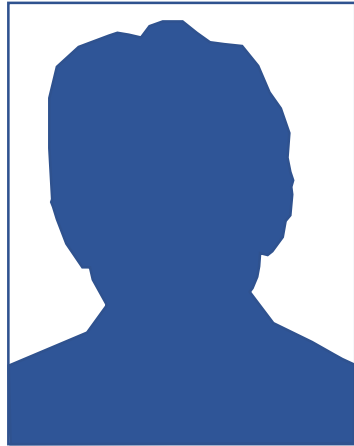
**AAPM 2017** JUL 30–AUG 3



CONNECTING OUR PATHWAYS.  
UNIFYING OUR PROFESSION.

59<sup>TH</sup> ANNUAL MEETING & EXHIBITION | DENVER, CO

# Graduation



student

- Just do it



Graduation ceremonies can go long - six hours at UC Davis for Graduate Degrees. But you have to do it if your student wants to - take an afternoon out of your busy life and celebrate their huge achievement. Smile, pose for photos, and demonstrate to your student's family that you respect their loved one. Embrace the joy of fostering the next generation of scientists.

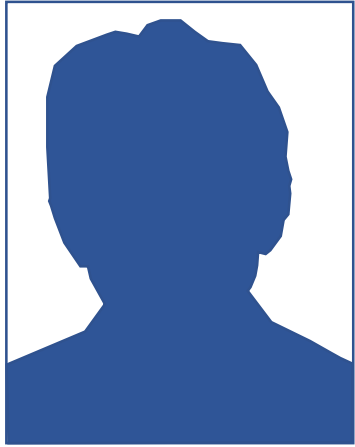
**AAPM 2017** JUL 30–AUG 3



CONNECTING OUR PATHWAYS.  
UNIFYING OUR PROFESSION.

59<sup>TH</sup> ANNUAL MEETING & EXHIBITION | DENVER, CO

# After Graduation



colleague

- Your student will always be your student
  - *Letters of recommendation*
  - *Continuing collaboration*
  - *Providing opportunities to promote their career*

*It doesn't end at graduation.*

**AAPM 2017** JUL 30–AUG 3



CONNECTING OUR PATHWAYS.  
UNIFYING OUR PROFESSION.

59<sup>TH</sup> ANNUAL MEETING & EXHIBITION | DENVER, CO



Panel Discussion: Mentoring and Mentee Roles

Thank you for attending this session, and if you have any questions about my presentation - or about anything - please feel free to Email me at: [jmboone@ucdavis.edu](mailto:jmboone@ucdavis.edu)

# Mentoring in Research: Finding the *balance* between achieving productivity and spurring creativity



John M. Boone  
Professor of Radiology  
Professor of Biomedical Engineering  
University of California Davis

**AAPM 2017** JUL 30–AUG 3



CONNECTING OUR PATHWAYS.  
UNIFYING OUR PROFESSION.

59<sup>TH</sup> ANNUAL MEETING & EXHIBITION | DENVER, CO