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Best Practices for Running a Lab

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Moderator

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Announcements

- The archived recording, presentation slides and resources will be available a few days after the webinar at: http://bmes.org/elearning
- You may submit questions throughout the webinar by using the online chat function. Your questions will be addressed after the featured speaker presentation.
- Please take a few minutes to complete the brief survey following the webinar to provide us with your feedback.

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Polling Question

Which area do you represent?

- Academics
- Industry
- Government
- Other

How much experience do you have with labs?

- Expert
- Very familiar, manage a lab
- Somewhat familiar, work in a lab
- Limited experience
- No experience

Speaker

- **Thomas J. Webster, PhD**

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How to Run A Lab: Lessons Learned

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How to Run a Lab

- Disclaimer: There are many ways to run an effective lab and you need to find the right model that fits your goals and personality.

Polling Question

What stage of your career are you in?

- Hope to start a lab
- Negotiating for a lab
- Started within the past year
- Between 1-5 years
- In position for longer than 5 years

Academics

- Before getting a lab: You need to think about what type of lab you want during the faculty interview process.
- Planning:
  - What size of a lab do you want ?
    - Large (>10) – lots of ideas, lots of funding, not as much interaction with students
    - Medium (5 – 10)
    - Small (<5) – very close interactions with students and maybe even your own lab project
  - What type of research will you do?
    - What electrical needs do you have?
    - Chemical hoods versus laminar flow hoods?
    - In vitro versus in vivo?

Polling Question

Which size of lab do you desire?

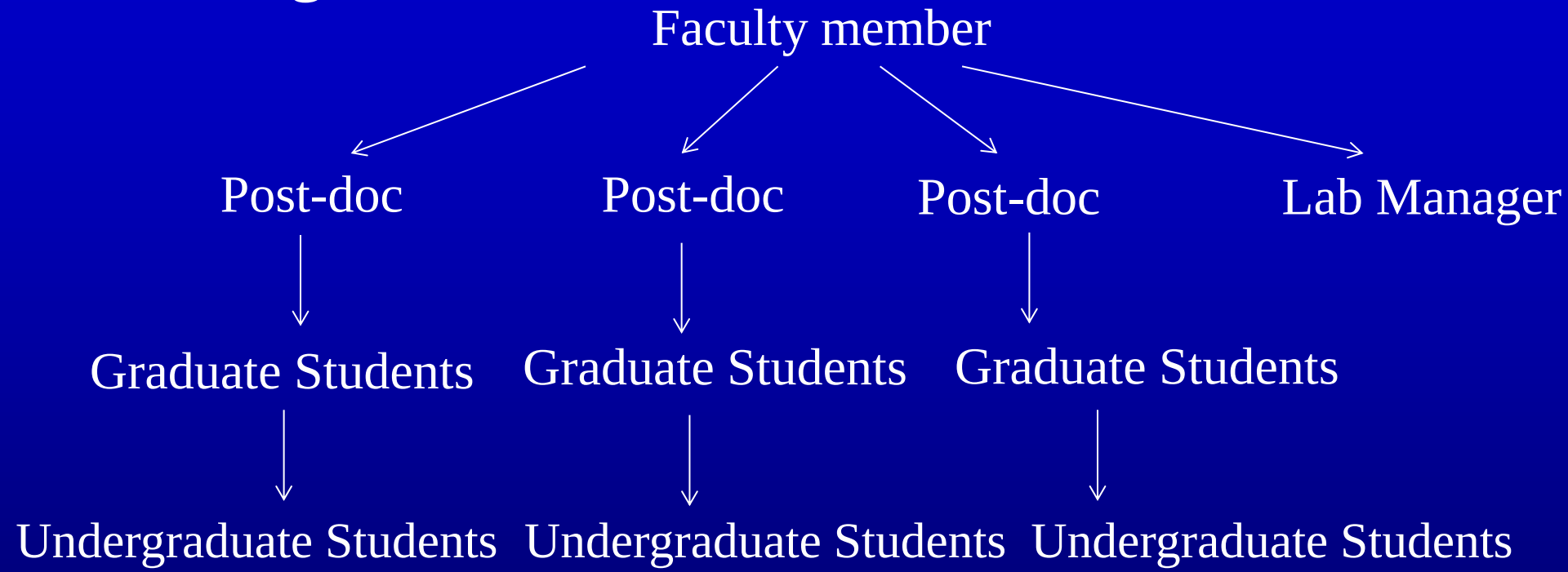
- Large (10+)
- Medium (5-10)
- Small (<5)

What type of research do you do?

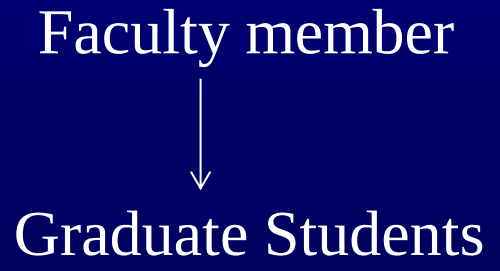
- Please respond using the chat feature on your screen

Lab Structure

- Large lab:



- Small lab:



Academics

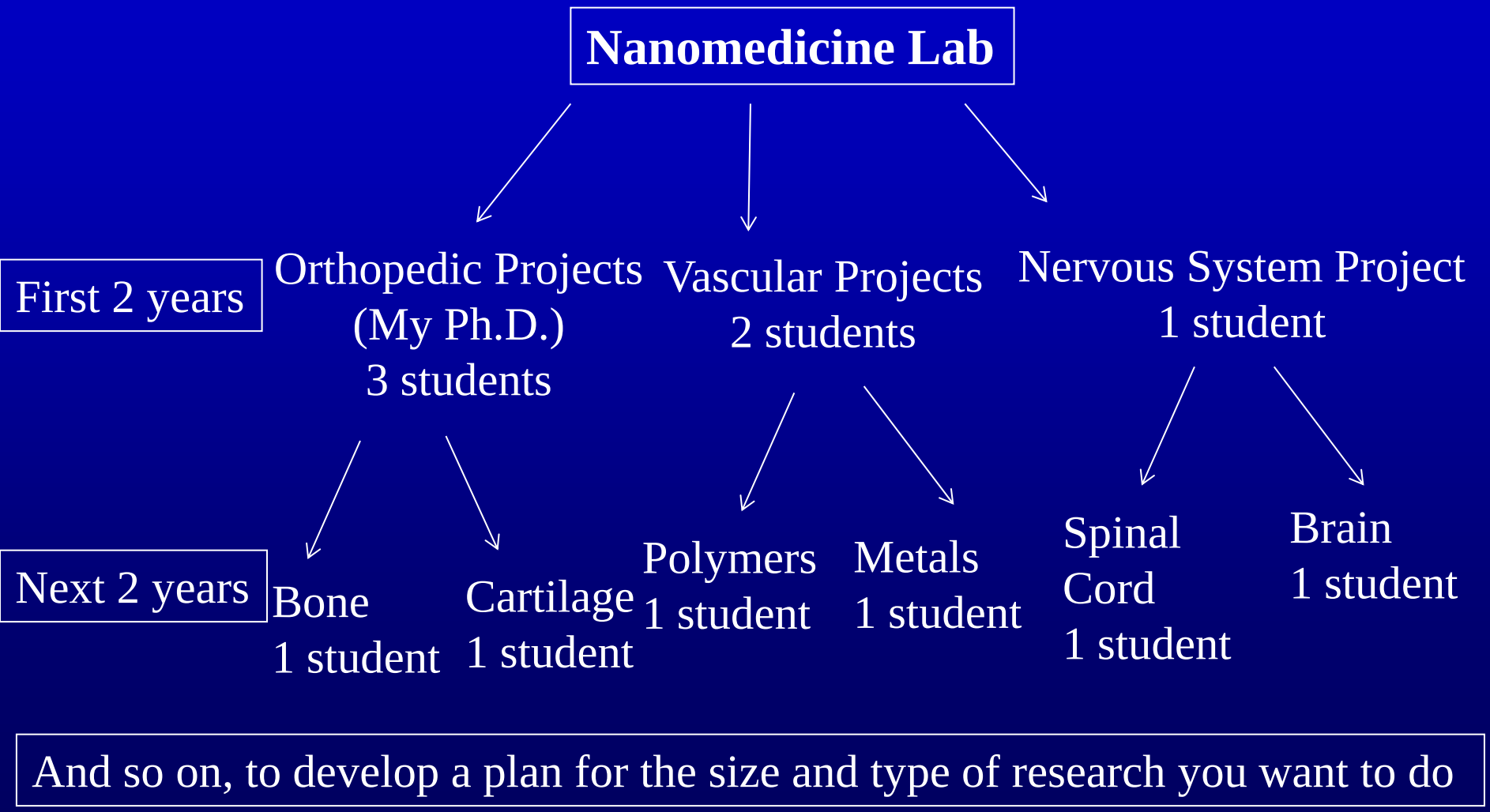
- Planning:
  - What type of equipment will you need?
    - Counter space versus open space
    - Secure space versus less secure space
  - Versatility, versatility, versatility to change your lab with your changing research
  - Suggestion: Develop a career plan and make a list of all the equipment you need with costs as well as electrical and space needs.

Polling Question

Do you have a career plan?

- Yes
- No
- Working on it

An Example: My Lab Career Goals



And so on, to develop a plan for the size and type of research you want to do

Academics

- Negotiations for a faculty position:
  - Make sure you:
    - See where your lab will go
    - Know what the timeline for your lab will be and what will happen if your lab is not ready by then
    - Some people do wait to start until their lab is ready
    - Get in writing the size of your lab
    - Find out if there is separate space for your graduate students or are they expected to have offices in the lab
    - Understand what your start-up package can be used for
    - Find out what the space policy is

An example ‘Space Policy’

GENERAL PRINCIPLES

1. Space will generally be allocated for research on the basis of productivity, potential, and strategic priorities. Research space is not an entitlement, nor is its assignment intended to be viewed as “permanent.” Hence, it is incumbent upon the entire faculty to make the best possible use of all available space. This means that we must be able to assign, or re-assign, the appropriate amount and quality of space based upon usage, greatest need, and strategic priorities.
2. The Associate Dean of Engineering for Graduate and Research Initiatives will be responsible for managing Engineering space. The Associate Dean will inform and advise the Engineering Executive Committee and the Dean on all issues related to space, and the Dean will make the necessary decisions under these guidelines.
3. Space that is suitable as research space will generally not be used for storage or other non-research activities
4. All research laboratories, computer laboratories, offices and graduate student offices should have a nameplate that identifies the occupant(s), faculty, emergency contacts, and purpose.

An example ‘Space Policy’

FACULTY RESEARCH SPACE

1. All graduate student space must be accurately characterized in terms of number of desks. Empty graduate desks for a period of two years, will be considered as shared space available to accommodate students of other faculty colleagues in similar or related research areas. However, it is understood that the intention is for this space to revert back to the control of the original faculty member as his/her research program requires.

2. For purposes of prioritizing space utilization, metrics associated with the last 3-5 years’ of research productivity (e.g., research funding per square foot of space, number of graduate, postdoctoral, and undergraduate research students advised, peer-reviewed publications, number of grant proposals submitted, overhead generated, etc.) associated with a given space will be considered. In the case of programs with growing space needs, potential as well as strategic priority will be considered instead of established productivity metrics. The 3-5 year period will be considered by the Dean in consultation with the Associate Dean and the EEC. Shared space, especially within groups, is encouraged. The sharing of space will be reflected in space utilization studies by attributing the space to each faculty member according to a reasonable estimate of the actual amount of research activity conducted in that space. The attribution will sum to 100% of the research activity in that space.

An example 'Space Policy'

3. Faculty who have external research funding, but have less actively utilized their laboratory space for the purpose of conducting their funded research programs during the previous 3-5 year period, will be first invited to share some part of their laboratory space with those with demonstrated need in a similar research area. A goal is to make this space again available to the original assignee as his/her research program grows with external funding.

4. For future reallocations/additions of research space, the quality and specific features/ capabilities of that space (e.g., fume hoods, laboratory utilities, high ceilings, etc.), will be considered with the intention of matching needs to laboratory features, minimizing laboratory renovation costs, providing appropriate amounts of space to the highest productivity faculty/programs (as measured by the metrics listed above in point 2).

5. Faculty research laboratory space used exclusively for conference/group meeting space may be claimed for higher priority uses. In any case, laboratory space used as meeting space will be counted along with all other research and storage space on the same square foot basis.

Polling Question

Does your place of employment have a Space Policy?

- Yes
- No
- Don’t know

Academics

- After you start, but before your lab is ready:
  - Make sure you:
    - Stay on top of your lab renovations
    - Leverage lab space in a colleague's lab to still be productive while waiting
    - Write grants, write grants, write grants
    - Safety protocols
    - EHS documentation for in vitro and in vivo studies
    - Time your purchases to arrive when your lab is ready

An example: Lab "to-do-list"

	Stanley	Ben	Michelle	Chris	Gavin	Luting	Ece	Mian	Dan	Garima	Di	Gujie
Lab meeting schedule etc.			x									
Autoclaving (consumables)	x	x							x			
autoclaving (waste)	x	x							x			
Ordering (bacterial)		x										
Ordering (mammalian)			x									
Ordering (general)		x	x						x			
Hazardous Waste			x					x				x
General Cell room							x	x		x	x	x
Tip refills				x				x			x	x
Sharps containers	x				x					x		x
General Bacterial room	x				x	x						
Chemical hoods				x		x						
Scales area					x		x			x	x	
Water Baths						x	x			x	x	
Airgas									x			

This is brought to our weekly lab meeting and we identify people who have not completed their lab tasks

Academics

- After you start, after your lab is ready:
  - Individual lab meetings:
    - Establish individual lab meetings according to a schedule that works for you and the student
      - For me, I meet with new students (first year) once a week
      - After that, depending on their growth, I meet periodically
    - Establish meeting minutes – that students keep
    - Establish specific goals to be accomplished every week
    - Evaluate student progress and ‘grade’ them every semester

Academics

- After you start, after your lab is ready:
  - Encourage them to present at conferences, frequently
  - Encourage responsibility – “This is your project”
  - Adjust your management style
  - Encourage students to write an outline of a paper before they do one experiment – this helps them design experiments

An example: Lab "to-do-list"

http://www.ee.ucr.edu/~rlake/Whitesides_writing_res_paper.pdf

ADVANCED MATERIALS

ESSAY

Whitesides' Group: Writing a Paper**

By *George M. Whitesides**

1. What is a Scientific Paper?

A paper is an organized description of hypotheses, data and conclusions, intended to instruct the reader. Papers are a central part of research. If your research does not generate papers, it might just as well not have been done. "Interesting and unpublished" is equivalent to "non-existent".

Realize that your objective in research is to formulate and test hypotheses, to draw conclusions from these tests, and to teach these conclusions to others. Your objective is not to "collect data".

A paper is not just an archival device for storing a completed research program; it is also a structure for *planning* your research in progress. If you clearly understand the purpose and form of a paper, it can be immensely useful to you in

do *not* agree on the outline, any text is useless. Much of the *time* in writing a paper goes into the text; most of the *thought* goes into the organization of the data and into the analysis. It can be relatively efficient in time to go through several (even many) cycles of an outline before beginning to write text; writing many versions of the full text of a paper is slow.

All writing that I do—papers, reports, proposals (and, of course, slides for seminars)—I do from outlines. I urge you to learn how to use them as well.

2.2. How Should You Construct an Outline?

The classical approach is to start with a blank piece of paper, and write down, in any order, all important ideas that

Mandatory reading in my group during group meetings, "journal clubs" are also important.

Academics

- After you start, continuous items:
  - Establish once a year retreats:
    - We use these to brainstorm on new research areas and this is organized and run by students. It is also a fun chance for people to build a community.
  - Your lab productivity will largely depend on funding:
    - Incorporate students into writing grants, developing ideas, etc.
    - Incorporate students into talking with industry, especially making connections at conferences

Academics

- After you start, continuous items:
  - Make sure you identify problem students early and get them out of your lab. A problem student can do a lot of damage to you and your lab
  - Have your students evaluate ‘your’ performance

Academics

- After you start, continuous items:
  - Empower your students to build collaborations
  - Negotiate for more space if you need it
  - Empower your students to supervise other students, establish a managing “tree structure”
  - Make sure all of your students have undergone safety training and maintain safety training
  - Have fun – if you are not having fun why are you doing it?

Polling Question

In the lab you are in or run, have your lab needs changed since you have been working?

- Yes, my needs have changed
- Not yet, but I expect them to
- No, my needs have not changed

Academic versus Industry/Government Labs

- Critical differences between academic and industry/government labs:
  - Cleanliness
  - Regulations
  - Inspections
  - Space policy requirements

Thomas J. Webster, Ph.D.

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Polling Question

Do you now feel more confident about how to run a lab effectively?

- Yes, this was helpful
- Somewhat, but I am still confused
- Not really
- I was an expert already

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QUESTIONS?

BMES Activities and Events

- **2014 Professional Development Webinars**
  http://bmes.org/elearning
  - Lobbying for BME: **July 17, 2014**
  - Technology in the Classroom: **Nov 2014**
- **2014 BMES Annual Meeting**
  http://bmes.org/annualmeeting
  - **Oct 22-25, 2014** in San Antonio, TX
- **2014 BMES Regional Events**
  - Southeast BME Regional Career Conference (SEBECC) http://bmes.org/sebecc14: **Sept 26, 2014 (Atlanta, GA)**
  - Midwest BME Regional Career Conference: **Nov 7, 2014 (Detroit, MI)**

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