Applying to the NSF CAREER mechanism: tips and some of my experiences

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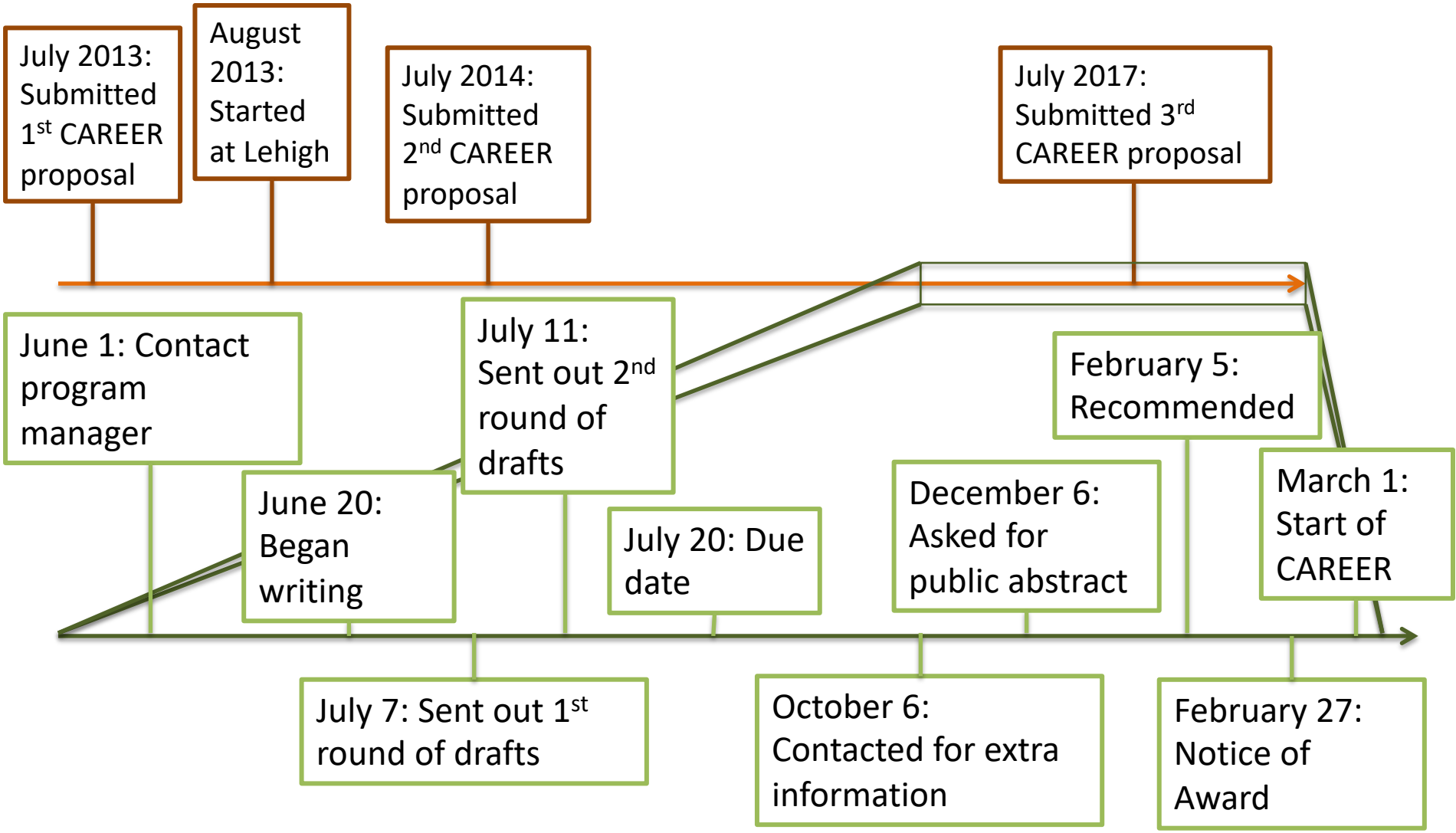
April 10, 2018

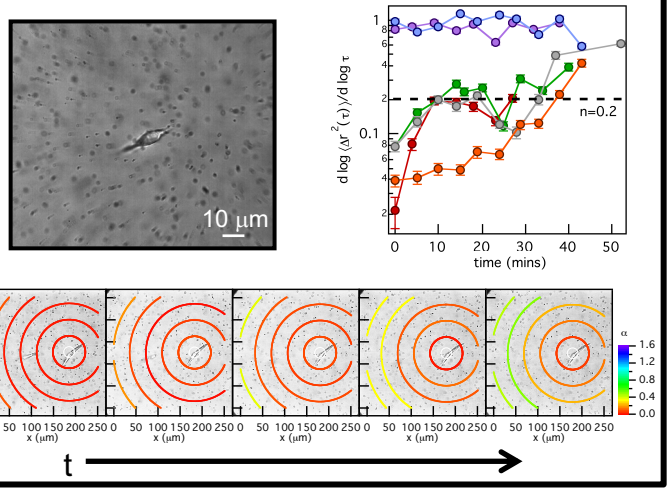
Submission timeline

- Only submit when you feel ready (you only have three submissions)
- Start early and carefully organize a timeline
- Make sure you have a conversation with your program manager early



Developing your project

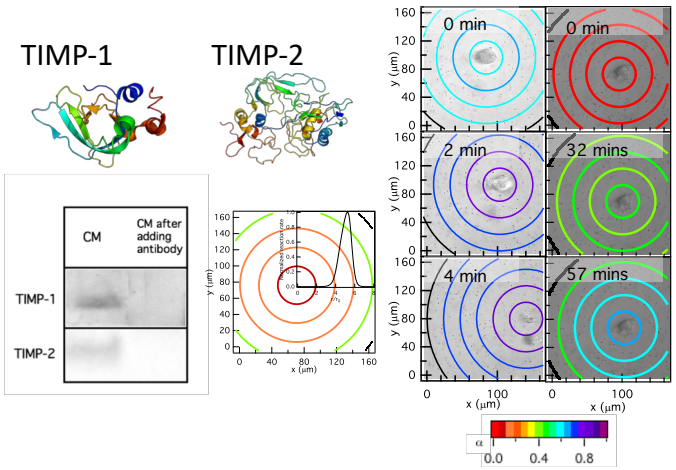
Cell-material interactions



Schultz, Kyburz, Anseth, *PNAS*, **112**, E3757, 2015.

Bio-based project

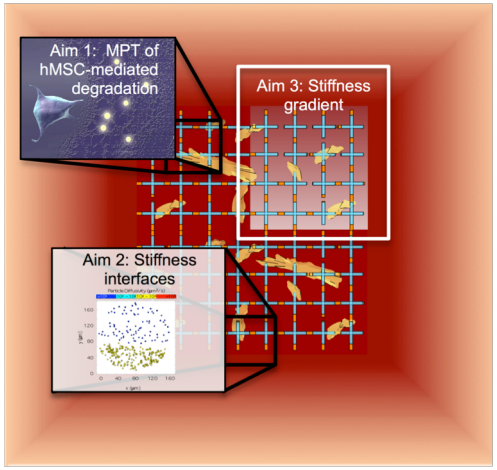
Role of TIMPs in scaffold remodeling



Daviran, Caram and Schultz, *ACS Biomat Scie* Eng, **4**, 468, 2018., Daviran, Casella, Longwill and Schultz, *Soft Matter*, accepted, 2

Rheology based project

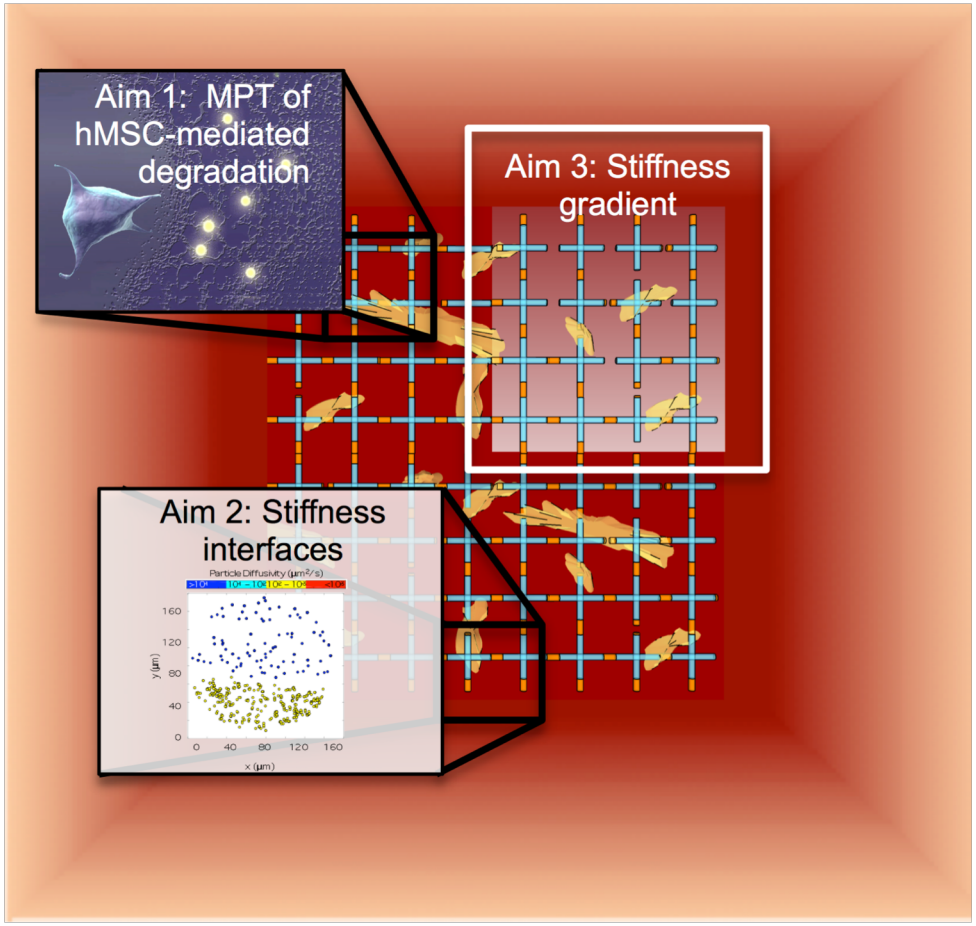
Rheologically distinct microenvironments



Developing your application

- Have a logical progression how your work will feed into your intended application
- Do not force the reviewers to make this leap, LEAD THEM THERE!!!
- Make sure that both your research project and broader impacts work to enable the same application

1. hMSC-laden synthetic hydrogel scaffolds have applications as implantable wound healing scaffolds to deliver hMSCs and give structure to wounded tissue
2. hMSCs are instrumental in wound healing
3. To participate in wound healing, hMSCs migrate out of the niche and to the wound
4. During this migration, hMSCs encounter many rheologically distinct microenvironments, which they must traverse to reach the wound
5. To mimic this native process, these rheologically distinct features can be designed into a synthetic scaffold to enhance hMSC deliver to a wound after implantation
6. To enhance design, we must first understand how hMSC migration and remodeling is changed by these rheologically distinct microenvironments
7. Additionally, cell-mediated degradation can cause the hydrogel to collapse in the wound, which would cause the wounded tissue to move and possibly not heal properly
8. Therefore, the local and macroscopic rheology of the material is key to enabling the use of these materials as implantable wound healing scaffolds



Highlight career building

- Highlight your training and how this makes you uniquely qualified to carry out the work
- Highlight previous accomplishments that are setting you up for a successful career
- Make sure that you say how getting the CAREER and having funding for this work will benefit your laboratory
    - This should be THE project that you are hanging your hat on
    - This should be an area that you are building in your lab
    - The proposed work should form a substantial area that you are developing in your lab

For my work

- I am the only one working at the interface of rheology and biomaterials
- These types of measurements were called for in a NSF report on Biomaterials
- My PhD was in rheology of hydrogel scaffolds
- My post doc began measuring cell-mediated remodeling and degradation in synthetic hydrogel scaffolds
- Recognized by colleagues in my research area as a 'Distinguished Young Rheologist'
- This work is a growing and main area in my lab and will set my career working in this interdisciplinary area

Developing your broader impacts

- Your intellectual merit and broader impacts must have a synergy
- Highlight the impact of both activities in the context of broader impacts
- Choose an activity that has a direct line to your proposed research
- You must ACTUALLY do these activities, so make sure that it is possible and you have a commitment from the group/institution where you will do these activities
- Make sure you actually WANT to do these things and it is not just something you are writing about
- Assessment of each activity

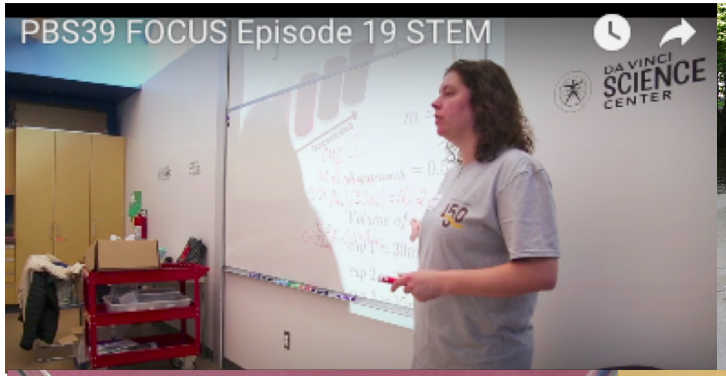
Goals:

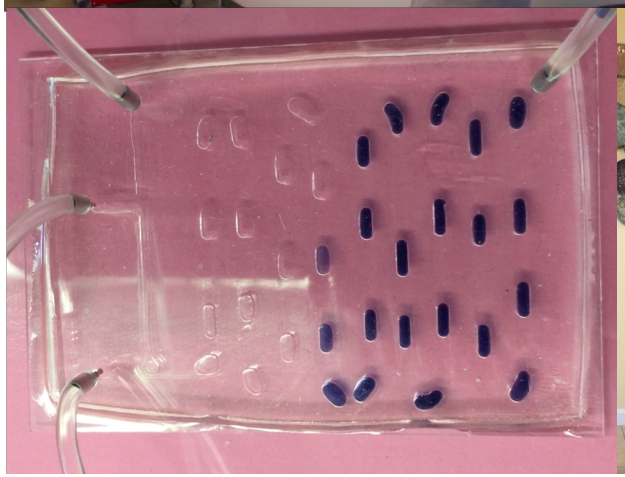
1. Use an interdisciplinary approach to provide new techniques to tackle a known problem in biomaterials and cell biology
2. Recruit and train a skilled and diverse workforce that can tackle complex biological problems by applying concepts from physics
   - Mentor high school students (projects that support this research)
   - Mentor undergraduates
   - Mentor graduate students
3. Educate a broad audience about biomaterials, rheology and wound healing. To achieve these goals there must be integration of research and educational outreach
   - At Da Vinci Science Center
   - Meet the Scientist (all ages)
   - Senior Monday – outreach to senior citizens (highlight wound healing)

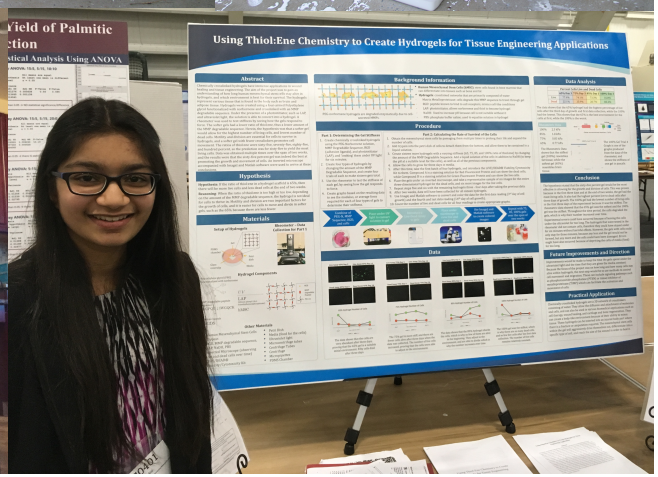
Developing your broader impacts

For later applications show a track record of commitment to these types of activities

- Shameless pictures
- Highlight successes
- Give results from previous assessments



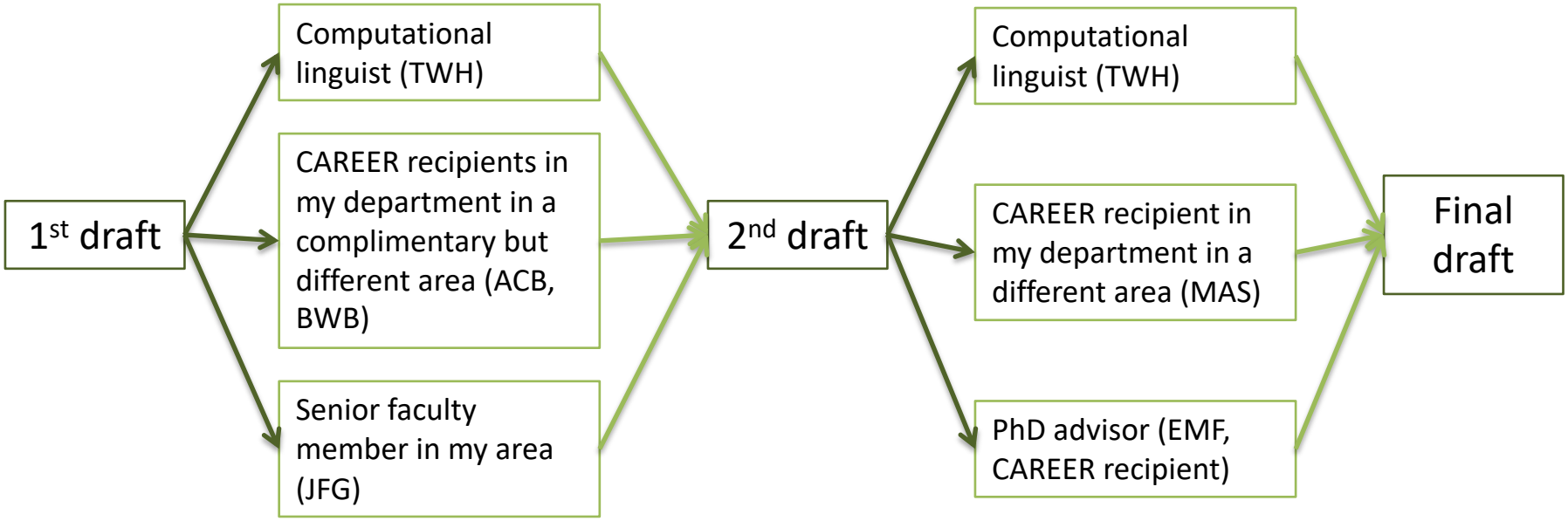




Taking advice

- Be open to all critiques, if someone is confused about anything in the application you were not clear
- Have people completely outside of you area read your application, if you can convey your idea to someone in another area you have clearly explained and motivated your ideas
- Have people in your area read the application to make sure that you haven't missed anything in your science
- Incorporate all ideas that you can, this may mean that rewrite portions or all of your proposal so start early
- Be careful with who reviews your application, make sure you are not limiting people that could be on a panel

My review flowchart



General advice

- Make sure you discuss your idea with the program manager and make sure it fits into their program and the right people will be reviewing your work

- Stay organized and keep your message clean and easily understandable

- Use figures, remember panel members are reading many of these, more words will not help your cause, but clear, concise writing will

- Leave nothing for the panel member to infer, lead them there

- For formatting – collect previously successful proposals and steal the formatting that you like

- Be open to advice, you never have a bad idea, but if people are confused you have not clearly conveyed it and you need a rewrite

- Discuss your idea with anyone that is willing to help, talking about your idea will help you solidify your story and give you a clear, organized way to convey it

Good luck!

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