



2020 Year in Review for the Blunck Research Group

Dear Colleagues and Friends,

How do you start out a newsletter describing 2020? Despite the craziness, this year was another great year full of discovery and accomplishments by the students of the group. We continue to be very grateful to our many collaborators, funding agencies, and colleagues who make our progress possible.



Figure 1. A socially distanced low group density lunch this past summer (left picture) and a group activity before the pandemic (right picture) You have to love/hate 2020!

Overview

Most importantly, all of the students and the post-doc are healthy and well. Admittedly, the mental health of all of us declined for the 2 to 3 months that we were not allowed in our 2 laboratories, and the students shifted completely to computer work. But, we have been back in our laboratories since last summer and research has resumed at its near normal pace. Unfortunately, a dear colleague (Nancy Squires) passed away in June leaving several graduate students without an advisor. So two of them, Adam Ragle and Max Flansberg, joined the group. Their focus is rocket related research so we are now tangentially involved in rocket related work. We also were fortunate to have Alejandra “Ale” Castellano and Dustin Barlow join the group to work on a new project funded by ONR investigating detonations of two-phase flows; Hamid Fazeli joined us in an effort studying ignition of live forest fuels.

At the end of 2020 the research group had 10 graduate students (including 1 that defended in December), 1 post-doctoral scholar, and a few undergraduate students. We continue to perform research related to detonations, wildfires, infrared thermography, and ignition. The wildfires in Oregon this past summer made our wildfire research especially relevant and “brought the importance home.” Fortunately, we were all safe during the fires, but the thick smoke in the air reminded us that many in Oregon were not as lucky.



Figure 2. Harvesting trees for wildfires studies in a pandemic.

Successes of Students and the Group:

- Our research was included in a National Geographic article <https://www.nationalgeographic.com/science/2020/10/meet-the-wildfire-superspreaders-embers/>
- Jonathan Bonebrake successfully defended his PhD degree evaluating the influence of combustion products on forced ignition. He is living in Seattle as his wife finishes her degree and they decide on the “next step.” His work has been very well received by industry and I expect 6 publications to eventually result from his work.
- Harley Glad (MS graduate) successfully defended in December her work related to studying the influence of CO₂ on detonation behavior. She will be seeking a job in industry.
- Mick Carter made significant progress toward visualizing detonation cellular structure and identifying chemical sensitivities.



- Our group continues to lead two efforts worth over \$4M studying burning of live fuels and smoldering of natural fuels. We are collaborating with colleagues from OSU and from the U.S. Forest Service.
- We were interviewed by several reporters from the major TV stations near Portland, OR. Unfortunately, the fires in Oregon generated significant interest. You can watch to one of them here: <https://www.koin.com/am-extra/understanding-embers-impact-crucial-to-wildfire-prevention/?fbclid=IwAR3hVaKRb3Bt1N5LEfEkUinF-any73J6nuuLBMRNByNKMVMgZ3L6LVJWhs8>
- We started another round of firebrand experiments where we burned large trees. Few other groups in the world (and no other universities to my knowledge) are conducting research of the size and repeatability that we doing for individual tree-scale burns. Our new record is burning 20 ft tall trees (they are “fun” to work with). This video is quite intriguing: <https://www.facebook.com/osupropcirelab/videos/1117719348598046>
- Students published several research articles: several of which were very well received.



Figure 3. Ponderosa pine tree torching.

Other Accomplishments:

- My family and I still love each other and enjoy being together (usually)—despite a pandemic and having 4 crazy boys! Ironically, I can hear 1 boy in crazy mode at the time of starting to write the article.
- I was named an Associate Fellow within AIAA. I am grateful for the nominator and people that submitted recommendations.
- My family’s hobby farm was “bigger and better” this year. The fall season was particularly profitable and enjoyable as we sold pumpkins from our pumpkin patch. It continues to be a “love and hate” relationship among my sons, but a worthwhile (ad)venture.

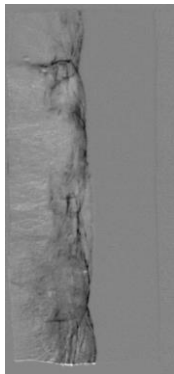


Figure 5. Schlieren image of detonation propagating through a propane/air mixture.

Looking Forward:

In 2021 I am looking forward to several graduate students graduating and applying their experience in industry or national laboratories. I believe that they are well prepared to have a positive impact in the world. I look forward to multiple publications. I think that it will be possible to have 10 published or accepted as we conclude several research projects. Finally, I am excited to continue to serve as the Associate School Head and to positively influence the 1500 undergraduate students in our program. Please be sure to stop and visit the group when you are in the Pacific Northwest.

Best Wishes,

David

Feel free to follow us on social media platforms for current updates about the research group.

Facebook: <https://www.facebook.com/osupropcirelab/>

Instagram: <https://www.instagram.com/osupropcirelab/>

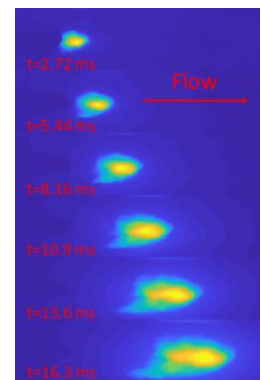


Figure 4. Infrared images of the development of jet-air flame kernels.