



2016 Year in Review for the Blunck Research Group

Dear Colleagues and Friends,

This is our second annual newsletter for the Blunck research group at Oregon State University. I continue to be thrilled with the professional and personal advances which the group has made and am grateful for our successes and our many collaborators. I hope that you will find the newsletter highlighting this past year enjoyable and informative.

Overview

Our research group has grown to 11 graduate students (advised and co-advised) and multiple undergraduate students by January of 2017. The growth has been allowed by new funding from ONR, OSU and SERDP. We now have research in areas of detonations, forest fires, turbulent and MILD combustion, and ignition. These areas align with our key competencies in the fields of combustion, ignition, radiation, and energy. We are very grateful for collaborations and joint proposers with AFRL, Georgia Tech., USDA Forest Service, Princeton, University of Adelaide, and University of Alabama in Huntsville.



Graduate students in fall of 2016. The students' Halloween "costume" was dressing like their advisor (for better or for worse).

A major emphasis within the group is that we display integrity, diligence, and excellence and become known as strong experimentalists with great analytical skills. We have an excellent culture that exists within our research group that tends to drive innovation, collaboration, and fun. What other research group would dress like their advisor on Halloween (picture shown above)?!

Student Successes:

- The Propulsion Laboratory has been established with remote test operation capabilities, an extensive exhaust system, and its own air supply (finalized this month). This is the only such university laboratory, to our knowledge, with these capabilities in the Pacific Northwest.
- The ESRA rocket team achieved 1st place at the national competition last June. Several students from the group actively participated in the project; testing of components for the rocket were performed at the Propulsion Laboratory.
- The group successfully built and is operating a pulse detonation engine (picture shown above). It was recently featured in an article on the front page of the local newspaper (<http://bit.ly/2jp2W7J>).
- Aaron Fillo formed a new club (Project-X) focused on STEM outreach. It has been highly successful and has included demonstrations at the local library and a life-sized pool of "gak" on campus.
- Three students successfully defended their Masters theses: Eric Zeuthen, Eric Walters, and Aaron Fillo.
- The group has successfully collected turbulent flame speeds of jet fuels at subatmospheric conditions.
- We were able to perform experiments at the two-story wind tunnel at the Insurance Institute for Business and Home Safety. Full-scale homes are tested in this facility.



Pulse detonation engine in operation.



- Sebastian Okhovat (graduated in 2015) is now working in the Hypersonics Division (with Tim Ombrello) at the Air Force Research Laboratory. He is applying his background in infrared diagnostics to better understand the burning and ignition processes of scramjets.
- Eric Walters, one of our recent graduates, has started working in the propulsion group at SpaceX.
- Eric Zeuthen is working for the National Energy Technology Laboratory. He is contributing significantly to establishing a supersonic burner for evaluating physics associated with Magnetohydrodynamics.



Setting up for fire spread experiment in at the Insurance Institute for Business and Home Safety. Tyler Hudson is shown in orange.

Other Accomplishments:

- I was able to initiate a 5 year \$2M project investigating the physics associated with smoldering combustion. This is a collaboration between OSU and the USDA Forest Service.
- We were fortunate to receive an ONR Young Investigator Award to investigate the effect of combustion products on ignition, deflagration, and detonations.
- I was able to give invited talks at Penn State, Pratt and Whitney, Honeywell, and FM Global.
- Sheri and our family have recently moved to a home with several acres of land. We are grateful for the opportunity for ourselves and our four rambunctious (and very fun) boys.

Looking Forward:

I envision 2017 as the year that we are able to share many results from our efforts over the last two years to build and shake down experiments, collect data, and analyze results. We plan to have 8 papers at the US National Combustion meeting in April (it will be a busy month) and multiple publications this year. Our detonation tube with optical access will become functional as well as our smoldering and ember generation experiments. We anticipate one or more field-studies as part of our forest fire research. In summary, we are looking forward to a very productive year.

Concluding Remarks:

I hope that each of you are doing well professionally and personally. Please feel free to stop by and visit the group when you are in the Pacific Northwest.

Best Wishes,

David

We have a social media presence if you want to follow our most current results.

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

<https://twitter.com/OSUPropCIRElab>

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



Turbulent Bunsen burner burning jet-like fuel at 0.6 atm.