

*International Association for Fire Safety Science*

*A charity registered in England and Wales no 800306*

# Fire Safety Science News

<http://www.iafss.org>

December 2021, Issue No. 47

Rita Fahy, Editor

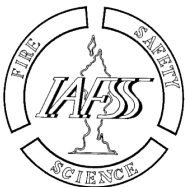
**Associate Editors:** Michael Gollner (USA), Nils Johansson (Sweden), Naian Liu (China), Ai Sekizawa (Japan), and Michael Spearpoint (UK).



*Photo Credit: Yu Wang, University of Edinburgh*

**Kissing Fire**

*Delegates' Choice Outstanding Image  
13<sup>th</sup> IAFSS Symposium*



IAFSS was founded in 1988 with the primary objective of encouraging research into the science of preventing and mitigating the adverse effects of fires and of providing a forum for presenting the results of such research

**Secretariat Office: Email:** [office@iafss.org](mailto:office@iafss.org)

## TABLE OF CONTENTS

Page	
3	Letter from the Chair
5	Overview of the 13 <sup>th</sup> IAFSS Symposium Program
7	14 <sup>th</sup> IAFSS Symposium Planning Committee
8	Updates from IAFSS Working Groups
11	Updates from IAFSS Sub-committees
11	Awards Presented at 13 <sup>th</sup> IAFSS Symposium
12	News from Members
55	Publication News from Members
56	Awards to Members
56	Reports on Past Conferences
58	Upcoming Conferences
59	Calls for Papers/Abstracts
59	Upcoming Events
60	Job Postings
60	Call for Contributions

## EDITORIAL BOARD

**Editor:** Rita Fahy (USA)

**Associate Editors:** Michael Gollner (USA), Nils Johansson (Sweden), Naian Liu (China), Ai Sekizawa (Japan), Michael Spearpoint (New Zealand).

**Contributing Editors:** Marcos Chaos (USA), Wan-ki Chow (Hong Kong), Michael Försth (Sweden), Steven Gwynn (UK), Peter Johnson (Australia), Grunde Jomaas (UK), Anthony Hamins (USA), Anja Hofmann Böllinghaus (Germany), David Lange (Australia), Mariano Lazaro (Spain), Samuel Manzello (USA), Guy Marlair (France), Bart Merci (Belgium), Ali Rangwala (USA), Albert Simeoni (USA), Anna Stec (UK), Peter Sunderland (USA), Stephen Welch (UK).

*The views, findings and conclusions expressed herein are those of the author(s) and do not necessarily represent the official position of the Editorial Board, IAFSS, or any other affiliate. All text in this newsletter is licensed under a Creative Commons license CC BY-NC-ND 3.0. If you use part of this content anywhere, please cite the article properly, link back to our [website](#) and include to the terms of this license.*

### Our Aims

*Fire Safety Science News* aims to be a platform for spreading the work of IAFSS members, and to be the place where fire safety scientists can read what is not readily found elsewhere, thus favoring news and trending research. A digital archive of previous issues can be found [online](#).

### IF YOU HAVE NEWS TO POST TO THE WEBSITE

The newsletter only comes out twice a year, but the IAFSS website is always available for current association news and information. If you have information that you'd like posted on the website, contact the team of webmasters at [webmaster@iafss.org](mailto:webmaster@iafss.org) and they'll help you out.

### MEMBERSHIP REGISTRATION

Both current and new members can easily register online at [www.iafss.org](http://www.iafss.org). *Current members: please sign-in before registering to maintain your account!*

One-Year Membership – 2021 (£25)    Lifetime Membership (£300)    Student Membership – 2019 (£5\*)

### BENEFITS OF MEMBERSHIP

- Symposia attendance at special member rates
  - Free Digital Access to Elsevier's *Fire Safety Journal*
  - Fire Safety Science News (Official Newsletter of the IAFSS)
  - A vote in Association affairs\*\*
  - Discounted Symposium Proceedings
- \*\* IAFSS student members do not have a vote in Association affairs.

\* Registered IAFSS academic members can nominate their students for free IAFSS student membership. Check website for details.

Please contact [office@iafss.org](mailto:office@iafss.org) with any questions about membership or how to register.

## LETTER FROM THE CHAIR



Thank you for being a member of the International Association for Fire Safety Science, for volunteering so much of your time to our association, and for your dedication to advancing fire safety science and engineering research and education for the purpose of understanding, preventing, and mitigating the adverse effects of fire. Your efforts contribute significantly to the fundamental understanding of fire, of how unwanted fire impacts our world, and of what measures can be implemented to reduce the consequences. Through your participation in our symposia, working groups, committees, subcommittees, and related activities, you help to disseminate this knowledge to the global community. I look forward to working with you over the next two years to continue making a positive impact on the world.

As of the first of October 2021, our association has 679 members, of which 525 are non-student members (i.e., annual, 3-year or life). This is about the same as in 2020, with the difference being largely a small drop in student members. While the student numbers can vary quite a bit year-to-year, we have seen steady growth of non-student members in recent years. This is good, but I think we can do better. Not because we have an aim to grow membership numbers – but because I think we can gain many more members if we share more with others about IAFSS, what we do, and what the benefits of membership are.

Some of our key membership benefits are free access to Fire Safety Journal (the annual membership fee is less than the cost to purchase a single article!), reduced registration fees for our symposia, and the opportunity to join our working groups and subcommittees and engage with your peers around the world. I think there are many researchers, educators and practitioners around the world who could benefit greatly from these opportunities. I would encourage all of you to share this information with your colleagues who are not yet members and invite them to join.

Speaking of our symposia series, we successfully completed our first ever virtual International Symposium on Fire Safety Science in April of this year. With more than 620 attendees from 36 countries, this was our most-attended event ever. This included 41% non-student members, 25% students, and 34% non-members (or, potential members!), with about 36% from Europe, 31% Americas, 31% Asia-Oceania, and 2% participating from other regions. The presentations were outstanding and the discussion engaging. By all accounts it was a great success. This was not by chance, but happened only due to the extremely hard work and dedication of several people, including:

- the Local Host Committee, led by Professor Beth Weckman, to work with the University of Waterloo, student volunteers, and the IAFSS, to shift from an in-person to an on-line event,
- the Symposium Planning Committee (SPC) co-chairs, Professor Margaret McNamee and Professor Arnaud Trouvé, for their leadership in helping to organize the symposium and manage the transition to on-line,
- the SPC for putting together such a high-quality program of plenary talks, selected papers and posters, workshops and more,
- the many volunteers who worked 'behind the scenes' to help speakers, keep things running, and facilitate the popular 'Inferno Pub' and 'Fireside Chats' which resulted in some great discussions and interactions, and of course,
- all of the great papers and presentations, largely from you our members, which continued the tradition of sharing of high-quality research findings to the broader community.

Margaret and Arnaud will have a summary of the 13<sup>th</sup> Symposium in this issue, and you can find a few more comments from the University of Waterloo update as well. Thank you again to all who made this a success.

Another significant event from April was the transition to a new Managing Committee (MC) and Association leadership. I would like to thank those MC members who have completed their service and welcome the new leadership to their important positions.

Leaving the MC in April were: Professor Alexis Copalle, France; Professor Bogdan Dlugogorski, Australia; Dr Tuula Hakkarainen, Finland; Professor Guillermo Rein, UK; Dr Anthony Hamins, USA; Mr Peter Johnson, Australia; Dr Björn Karlsson, Iceland; and, Professor Yoshifumi Ohmiya, Japan. I thank each of these exceptional people for their contributions to our association and to fire safety science and engineering.

Joining the MC in April were: Professor Pascal Boulet, France; Professor Kazunori Harada, Japan; Professor Brian Lattimer, USA; Professor Naian Liu, China; Professor Christian Maluk, Australia; Professor Ken Matsuyama, Japan; Professor Yuji Nakamura, Japan; and Professor Jennifer Wen, UK. I welcome each of these dedicated people to the leadership of our association.

Once the new MC was in place, they elected new officers, including myself as Chair. I am humbled and honored to be elected to this position, and I will do my best to serve the association in this capacity. I join all members of the MC in thanking you for your support and trust in electing us to lead your association for the next two years.

As we all know, the past 18 months have been particularly challenging. This includes for the association. However, as with the SPC, the MC and the Executive Committee (EC), under the leadership of Professor Patrick van Hees, has kept us moving onward and forward. We are in good financial condition. We have held our first virtual symposium and our first virtual General Meeting. Thank you, Patrick, for your dedicated service to the Association, and for setting us up so well for the future.

Looking now a bit to the future, I see many opportunities, and have instituted some changes to help us advance in several areas. First, I have modified the scope and structure of our MC subcommittees (SCs) and added a few new ones. My intent is to empower our SCs to take a proactive stance in leading us forward. The current SCs and leaders are as follows:

- Diversity, Equity and Inclusion (DEI) – Jason Floyd and Izabella Vermesi
- Communications and Outreach (CAO) – Rita Fahy and Xinyan Huang
- Early Career Researchers & Professionals (ECRP) – Francesco Restuccia and Bronwyn Forrest
- Research – Jennifer Wen and John Hewson
- Governance – Beth Weckman and Brian Meacham
- Finance – Margaret McNamee
- Education – Charley Fleishmann

You might notice that several have one MC co-chair and one from the general membership, with one having both co-chairs from the general membership. This is by design. I want to engage more members to be active in leading the association, and I see participation in and co-leading the SCs as one opportunity. You will be hearing more about these SCs, their scopes and activities over time. Most are seeking members, so if you are interested in joining, please reach out to the co-chairs (which you can do through the Secretariat).

To help connect better with you, our members, as well as with the rest of the world, we are in the process of scoping needs and features for a new web presence. This is being led by the Communications and Outreach SC. They have been soliciting input from other SCs and Working Groups, and we hope to issue a request for tender by the end of this year, with the aim to have a new web presence by the middle of 2022.

Another SC that I want to comment on here is Governance. As part of reviewing our situation with the UK Charity Commission, we have determined that it would be appropriate to restructure our association to meet current requirements. As such, the Governance SC is preparing drafts for a new Constitution, as well as a new document on Policies and Procedures. Our target is to complete an initial reallocation of our current Rules of the Association into drafts of the relevant new documents by the end of this year. Once we have completed that reorganization, we will be coming to you as the membership to review, comment and vote on recommended changes. We are planning for than in 2022. We are also actively developing new and necessary policies and procedures. You will have already seen the IAFSS Feedback and Complaints Procedure posted, and we are working on a Code of Conduct and Grievance Resolution processes, amongst others. These will be posted as they are completed.

Lastly, one more area of real opportunity that I see is to increase our efforts around diversity, equity and inclusion – welcoming more members from underserved populations and disciplines, perhaps expanding beyond our current three regions, and developing new relationships with kindred organizations – and together helping to tackle major global challenges where fire safety science and engineering can help facilitate a more fire safe world for all. I share, and completely support, the research vision and needs as outlined in our *IAFSS agenda 2030 for a Fire Safe World*, and as Chair, I will work to advance the vision and advocate in these areas on behalf of you, our members.

This has been a rather lengthy note, but if you are still reading, I hope that you agree with me that we have great opportunities in the coming years, and that you will be able to help us realize them. I would again like to thank you for being a member of IAFSS, and I look forward to working with you, and to having you engage with us, as we progress forward.

*Signed: Brian Meacham, Chair IAFSS, Meacham Associates, USA*



## INTERNATIONAL SYMPOSIUM ON FIRE SAFETY SCIENCE

### Overview of the Program at the 13th International Symposium on Fire Safety Science

We provide below a brief overview of the program that was offered at the 13th International Symposium on Fire Safety Science on April 26-30, 2021. The 13th IAFSS Symposium was initially scheduled to take place in-person at the University of Waterloo, Canada, in April 2020 (<https://uwaterloo.ca/international-symposium-on-fire-safety-science/>). Due to the Covid-19 pandemic, the Symposium was postponed until April 2021 and ultimately was offered in a virtual format (<https://pheedloop.com/iafss2021/virtual/>). A consequence of the pandemic is that Beth Weckman (the “Local” Host) and the Symposium Planning Committee essentially organized two meetings given that the original planning was largely complete before being delayed and then transferred to the virtual format. Beth Weckman and the entire team on the Symposium Planning Committee must be commended for stepping up to the challenge of organizing the meeting in these two formats, and putting together a very successful meeting despite the demanding circumstances. Kudos to them!

Naian Liu and Sara McAllister deserve a special mention as Co-Chairs of the Program Scientific Committee. Their Committee of 35 members organized and oversaw the technical structure of the program, the reviewing process and with the help of Luke Bisby and Bart Merci (Co-Chairs of the Program Proceedings Committee), the final publication of the manuscripts in the *Fire Safety Journal* (<https://www.sciencedirect.com/journal/fire-safety-journal/vol/120/suppl/C>).

The technical program was organized into 9 tracks:

- 1) Material Behavior in Fires (Ignition, Pyrolysis, Flame Spread, Smouldering)
- 2) Fire Dynamics (Pool Fires, Fire Plumes, Compartment Fires, Tunnel Fires)
- 3) Fire Chemistry (Chemical Kinetics, Material Toxicity, and Flame Retardants)
- 4) Structures in Fire
- 5) Fire Suppression
- 6) Wildland and WUI Fires
- 7) Evacuation and Human Behavior
- 8) Fire Risk Analysis and Fire Safety Design
- 9) Other Topics (Fire Detection and Smoke Control, Explosions and Industrial Fires, Fire Codes and Standards, Fire Safety Management)

The evaluation of submitted papers was based on two successive review steps: one for acceptance to an oral presentation and one for acceptance to publication. 256 papers were submitted for presentation at the Symposium (using the EasyChair platform); each submitted paper was evaluated by at least 3 reviewers; 124 submissions were accepted for presentation; preliminary accept/reject decisions were made in January 2020 (i.e. prior to the pandemic). The second review step took place on the Elsevier website for the *Fire Safety Journal*. A group of 10 additional papers submitted by invited speakers was also reviewed and accepted for presentation and publication. We are very grateful to Naian, Sara, Luke, Bart and to the entire Program Scientific Committee for their efforts to maintain the high technical quality standards that have become a trademark of the IAFSS Symposium.

The invited speakers were:

- 1) Bogdan Dlugogorski (recipient of The Howard W. Emmons Invited Plenary Lectureship Award)
- 2) Mark Finney, Anne Steen-Hansen, Erica Kuligowski, Tara McGee, Jinhua Sun (invited plenary lectures)
- 3) Enrico Ronchi (recipient of the Proulx Early Career Award)
- 4) Xinyan Huang (recipient of the Magnusson Early Career Award)
- 5) Eric Mueller, Yongzheng Yao, Joshua Swann (recipients of the Best Thesis Award “Excellence in Research”)

(For more details about the different IAFSS Awards, go to <https://iafss.org/awards/>)

We take this opportunity to congratulate all awardees and featured researchers once again!

Similarly, Karen Boyce and Yi Wang deserve a special mention, as Co-Chairs of the Program Communication Committee. Karen and Yi were responsible for communication with authors and attendees of the Symposium. They were also responsible for producing the schedule of the program, which was a particularly difficult task since the schedule had to account for time zone differences for both authors and attendees. We are very grateful to Karen and Yi for their plan that took full advantage of the challenges and opportunities posed by running a symposium in many different time zones.



The virtual Symposium was held on April 26-30, 2021. In addition, seven workshops and three Working Group meetings were held virtually during the week prior to the regular program. The list of workshops topics was:

- Compartmen  
t fires
- Education
- Façades
- Lithium  
batteries
- Retardants  
and toxicity
- Smart  
firefighting
- Timber

The list of IAFSS Working Groups holding meetings was:

- The Human Behaviour in Fires Working Group (a new IAFSS working group)
- The Large Outdoor Fires & the Built Environment (LOF&BE) Working Group
- The Working Group on Measurement and Computation of Fire Phenomena (the MaCFP Working Group)

All events used the Pheedloop platform (<https://pheedloop.com/iafss2021/virtual/>). The format of the Symposium was a mix of “live” and recorded events: invited speakers made their presentations through live streaming; paper authors made their presentations using pre-recorded videos and live panel discussions; poster authors made their presentations using pre-recorded videos and booths. The program also included live networking events (called “Fireside chats”), two Early Career Researchers social events, two Diversity, Equity and Inclusion (DEI) events, two Farewell social events, a Special Session on Covid-19 Applications, two Award ceremonies, and an IAFSS business meeting. The mixture of live and pre-recorded events and the repeat of some of the events was intended to accommodate problems posed by time zone differences.

Beth Weckman and her team at the University of Waterloo showed unflagging patience and diligence in their efforts to ensure the success of the symposium (both live and virtual). Further, a cadre of doctoral students and postdocs supported the logistics of running the symposium virtually (in particular, they helped prepare and support the live sessions). Kudos to you all!

In conclusion, while the exceptional circumstances created by the Covid-19 pandemic have made working on the 13th IAFSS Symposium challenging, it has also been a rewarding experience which has showcased the strength of the IAFSS community and the importance and value of volunteering and of community engagement. Kudos to the IAFSS community and we look forward to our continued interactions as we now turn to preparations of the 14th Symposium!

*Signed: Margaret McNamee and Arnaud Trouvé (Co-Chairs of the Symposium Planning Committee)*

## **Symposium Planning Committee (2017-2021)**

### **IAFSS Chair (2014-2021)**

Prof P. van Hees, Lund University, Sweden

### **IAFSS Past Chair (2011-2014)**

Prof B. Dlugogoski, Charles Darwin University, AUS

### **Symposium Co-Chairs**

Prof M McNamee, Lund University, Sweden

Prof A Trouvé, U of Maryland, USA

### **Local Host Co-Chairs**

Prof E Weckman, Chair, U of Waterloo, Canada

Prof C Devaud, U of Waterloo, Canada

### **Program Scientific Committee Co-Chairs**

Prof N Liu, U of Science and Technology of China

Dr S McAllister, USDA Forest Service, USA

### **Program Communication Committee Co-Chairs**

Dr K Boyce, Ulster University, UK

Dr Y Wang, FM Global, USA

### **Symposium Proceedings Co-Chairs**

Prof L Bisby, U of Edinburgh, UK

Prof B Merci, Ghent University, Belgium

### **Symposium Poster and Image Co-Chairs**

Dr T Hakkarainen, VTT Technical Research Center,  
Finland

Dr J Floyd, Jensen Hughes, USA

### **Symposium Workshop Co-Chairs**

Dr A Hamins, National Institute of Standards and  
Technology, USA

Prof G Rein, Imperial College, UK

### **English Language Mentoring Chair**

Dr C Wade, Building Research Assoc, New Zealand

### **Diversity Group Co-Chairs**

Dr A Steen-Hansen, NTNU/RISE, Norway

Dr S Suzuki, National Research Institute of Fire and  
Disaster, Japan

Dr I Vermesi, Bureau Veritas, UK

Prof E Weckman, U of Waterloo, Canada

### **Awards Committee Co-Chairs**

Prof C Fleischmann, U of Canterbury, New Zealand

Prof M Gollner, U of California, Berkeley, USA

Prof J Wen, U of Warwick, UK

### **IAFSS Working Group Co-Chairs**

MaCFP

Prof B. Merci, Ghent University, Belgium

Prof A. Trouvé, U of Maryland, USA

LOF&BE

Dr S. Manzello, NIST, USA

Dr S. McAllister, USDA Forest Service, USA

Dr S. Suzuki, NRIFD, Japan

### **IAFSS Symposium Local Host 2021**

Prof R. Dobashi, University of Tokyo, Japan

## 14th IAFSS Symposium – Symposium Planning Committee Leadership

While it seems like our very successful 13<sup>th</sup> IAFSS Symposium just came to a close, we are already looking to the 14<sup>th</sup> Symposium, which is being planned for Tsukuba, Japan, on 22-27 October 2023. Being just two short years away, the planning process has begun. As Chair of the IAFSS, I am pleased to announce the leadership structure of the 14<sup>th</sup> Symposium Planning Committee (SPC). The SPC is comprised of a number of subcommittees, each with important roles to play. The list of committees and committee leadership is presented below. As the planning proceeds, the Program Scientific Committee will expand to include Topic Area leaders for the scientific program, who will manage the paper review process, who in turn will be reaching out to the membership to assist with the reviews. In due time, you will hear from the Program Communication Committee regarding the call for papers and more information about the symposium.

For this SPC leadership team, we have aimed to be diverse and inclusive, adding members from countries not represented in the past, broadening diversity in committee leadership positions, and including a number of early career professionals. About half of the SPC is comprised of members who have not served on a SPC in the past. The SPC has representation from academia, research institutions, and the private sector. These steps are all part of our broader objectives to provide more opportunities for members to participate in our activities, to engage early career professionals in more leadership roles, and to overall expand our efforts to include underrepresented groups.

I think we have a great 14<sup>th</sup> SPC leadership team, and my sincere thanks to all for your contributions and service to the IAFSS.

### **Symposium Planning Committee Co-Chairs**

Prof. Naian Liu  
Prof. Anna Stec  
Prof. Arnaud Trouvé

### **Program Scientific Committee Co-Chairs**

Prof. Erica Kuligowski  
Dr. Yi Wang

### **Local Organizing (Host) Committee Co-Chairs**

Prof. Ritsu Dobashi  
[Prof. Kazunori Kuwana](#)  
Prof. Yuji Nakamura

### **Program Communication Committee Co-Chairs**

Prof. George Boustras  
Prof. Brian Lattimer  
Prof. Cristian Maluk

### **Technology Committee Co-Chairs**

Prof. Xinyan Huang  
Prof. Nils Johansson  
Prof. Beth Weckman

### **Program Proceedings Committee Co-Chairs**

Prof. Luke Bisby  
Prof. Bart Merci

### **Poster Committee Co-Chairs**

Prof. Nieves Fernandez Anez  
Prof. Andres Fuentes

### **Images Committee Co-Chairs**

Prof. Ken Matsuyama  
Prof. Pedro Reszka

### **Workshop Committee Co-Chairs**

Prof. David Lange  
Dr. Sarah Scott  
Prof. Wojciech Węgrzyński

### **Diversity, Equity and Inclusivity Committee Co-Chairs**

Dr. Jason Floyd  
Prof. Rosaria Ono  
Ms Courtney Rhoda  
Dr. Izabella Vermesi

### **Early Career Committee Co-Chairs**

Ms. Bronwyn Forrest  
Prof. Jie Ji  
Prof. Francesco Restuccia

### **English Mentoring Chair**

Dr. Colleen Wade

### **Awards Committee Co-Chairs**

Dr. Tuula Hakkarainen  
Prof. Longhua Hu  
Prof. Albert Simeoni  
Prof. Stanislav Stoliarov  
Prof. Takeyoshi Tanaka  
Prof. Jennifer Wen  
Prof. Hideki Yoshioka

### **IAFSS Chair**

Dr. Brian Meacham

### **IAFSS Past Chair**

Prof. Patrick van Hees

### **15<sup>th</sup> IAFSS Symposium Local Host**

Prof. Thomas Rogaume

## Updates from IAFSS working groups

### Measurement and Computation of Fire Phenomena (MaCFP) Working Group

#### Second MaCFP Workshop (MaCFP-2, April 22-23, 2021)

The second workshop organized by the “IAFSS Working Group on Measurement and Computation of Fire Phenomena” (the “MaCFP Working Group”, <http://iafss.org/macfp/>) took place on April 22-23, 2021, as a virtual pre-event to the 13th IAFSS Symposium (<https://uwaterloo.ca/international-symposium-on-fire-safety-science/>). The workshop (called MaCFP-2) had two sessions: a first session held on April 22 organized by the Gas Phase Phenomena subgroup and a second session held on April 23 organized by the Condensed Phase Phenomena subgroup.

**Gas Phase Phenomena subgroup:** The workshop planned by the Gas Phase Phenomena subgroup featured discussions of the following three target experiments:

- Case 1 (Turbulent buoyant plumes): the Helium plume experiment previously studied at Sandia National Laboratories (*J. Fluid Mech.* 544 (2005) 143-171). The discussion included: a presentation of the experimental database by Alexander Brown and John Hewson (through a pre-recorded video); a series of presentations of computational results submitted by NIST, Sandia National Laboratories and University of Gent (through pre-loaded PPT files); an overview of comparisons between experimental data and computational results presented by Randall McDermott (live); and an open discussion (live).
- Case 3 (Turbulent pool fires with liquid fuel): the methanol pool fire experiments previously studied at the University of Waterloo (Case 3a, *Combust. Flame* 105 (1996) 245-266) and also currently studied at NIST (Case 3b, *Fire Safety J.* 107 (2019) 44-53). The discussion included: a presentation of the experimental databases by Elizabeth Weckman and Anthony Hamins (through a pre-recorded video); a series of presentations of computational results submitted by Electricité De France/Aix-Marseille University, FM Global, NIST, Sandia National Laboratories, University of Gent, University of Maryland, University of New South Wales and University of Warwick (through pre-loaded PPT files); an overview of comparisons between experimental data and computational results presented by Arnaud Trouvé (live); and an open discussion (live).
- Case 5 (Flame extinction. Flame radiation): the controlled co-flow round ethylene diffusion flame experiment currently studied at FM Global (*Proc. Combust. Inst.* 37 (2019) 825-832; *Proc. Combust. Inst.* 37 (2019) 3951-3958). The discussion included: a presentation of the experimental databases by Dong Zeng and Yi Wang (through a pre-recorded video); a series of presentations of computational results submitted by NIST, Sandia National Laboratories, University of Connecticut, University of Gent and University of Maryland (through pre-loaded PPT files); an overview of comparisons between experimental data and computational results presented by Bart Merci (live); and an open discussion (live).

In total, 9 modeling groups submitted computational results and 5 CFD solvers were used: Code\_Saturne developed by Electricité De France; Fire Dynamics Simulator (FDS) developed by NIST; FireFOAM developed by FM Global (note that modified in-house versions were used by University of Connecticut and University of Warwick); fireFPVfoam developed by University of New South Wales; and Sierra/Fuego developed by Sandia National Laboratories.

The MaCFP repository hosted on GitHub (<https://github.com/MaCFP>) contains the experimental databases corresponding to Cases 1, 3a, 3b and 5, the computational submissions made for the 2017 MaCFP-1 and 2021 MaCFP-2 workshops, as well as copies of the material generated during MaCFP-1 (<https://github.com/MaCFP/macfp-db/releases/tag/macfp-1.0>) and MaCFP-2 (<https://github.com/MaCFP/macfp-db/releases/tag/macfp-2.0>).

Proceedings of the MaCFP-2 workshop are being prepared by Randall McDermott, Bart Merci and Arnaud Trouvé.

**Condensed Phase Phenomena subgroup:** The workshop organized by the Condensed Phase Phenomena subgroup was designed to assess the current state-of-the-art approaches available to parameterize (i.e., calibrate) pyrolysis models and to understand the potential impact of variations between these approaches on simulations of material flammability behavior. This was accomplished by organizing a multi-year, collaborative effort to study a single reference material: cast, black poly(methyl methacrylate), PMMA. Main objectives of this workshop included:

- Cataloging current approaches used to parameterize pyrolysis models;
- Quantifying the interlaboratory variability for comparable experimental datasets;
- Assessing the impact of the variability of model parameters on predictions of sample decomposition in response to well-defined heating conditions.



In total, 16 institutions located in 10 countries submitted experimental measurements from 220 unique tests to the MaCFP-2 Condensed Phase Workshop. This measurement data, which can be used as targets for pyrolysis model calibration and validation, has been uniformly formatted and well-documented (i.e., saved with corresponding metadata describing sample preparation, test setup, and experimental conditions) to allow for efficient, automated analysis. All measurements (and related analysis and visualization tools) are maintained in a digital, version-controlled, and freely-available online repository (<https://github.com/MaCFP/matl-db>). Modelers from 9 different institutions in 6 countries analyzed these experimental measurements to develop complete parameter sets that can be used to describe the thermal decomposition behavior of the reference material of interest (i.e., cast, black PMMA). These property sets were then used to predict sample decomposition in response to well-defined zero- and one-dimensional heating scenarios: preliminary results suggest that variation in modeling results exceeds experimental scatter.

Proceedings of the MaCFP-2 workshop are being prepared by Morgan Bruns, Isaac Leventon, and Stanislav Stoliarov.

#### **Points of contact**

Gas Phase Phenomena Subgroup: Bart Merci ([bart.merci@ugent.be](mailto:bart.merci@ugent.be)); Arnaud Trouvé ([atrouve@umd.edu](mailto:atrouve@umd.edu))

Condensed Phase Phenomena Subgroup: Morgan Bruns ([mbruns@stmarytx.edu](mailto:mbruns@stmarytx.edu)); Isaac Leventon ([Isaac.Leventon@NIST.gov](mailto:Isaac.Leventon@NIST.gov))

*Signed: Arnaud Trouvé and Bart Merci, Co-Chairs*

## **Large Outdoor Fires and the Built Environment (LOF&BE) Working Group**

### **Large Outdoor Fires & the Built Environment Permanent Working Group Updates**

#### Three Virtual Workshops Held at 13th IAFSS

The 13th IAFSS was held successfully in an all-virtual format. LOF&BE held three virtual workshops. These were attended by more than 200 participants. We are working to make the recordings available to our members.

April 19, 2021 - 1 hr EME Program (Moderator: Samuel Manzello, Presenters and discussion leaders: Sayaka Suzuki and Maria Theodori) Emergency Management and Evacuation During Large Outdoor Fire Disasters: Review and Discussion on Missing Pieces for the IAFSS Community to Tackle

April 20, 2021 - 1 hr IRC Program (Moderator: Sayaka Suzuki, Presenters and discussion leaders: Alex Filkov, Daniel Gorham, David Rush) Hardening Communities to Resist Large Outdoor Fire Disasters: Review and Discussion on Missing Pieces for the IAFSS Community to Tackle

April 21, 2021 - 1 hr LOFF Program (Moderator: Sara McAllister, Presenters and discussion leaders: Xinyan Huang, Brian Lattimer) Firefighting During Large Outdoor Fire Disasters: Review and Discussion on the Use of Emerging Technologies (e.g. Drones)

#### New Subleaders Welcomed!

Due to our ever-growing membership, Yu Wang and Rahul Wadhvani joined IAFSS LOF&BE as are co-leading of our EME group.

Dr. Yu WANG is currently a Full Professor at the State Key Laboratory of Fire Science in University of Science and Technology of China (USTC), focusing on the fire safety of informal settlement, high-rise building and green buildings. In 2016, he obtained double PhDs from USTC and City University of Hong Kong. After that, he worked at the National University of Singapore and the University of Edinburgh from 2016 to 2020.

Dr. Rahul WADHWANI is a former Research Associate at Department of Wildlife Protection, Leh where he was involved in developing snow run-off modelling, SWAT analysis for watershed basin to study the impact of artificial glaciers, and revised the disaster management plan for the Union Territory of Ladakh, India. He completed his PhD from Victoria University, Melbourne in 2019 on physics-based simulation of short-range spotting in wildfires.

During her tenure, Maria Theodori has done an excellent job co-leading the EME group with Sayaka Suzuki. Good luck to Maria on her PhD studies and thanks again for all her great efforts co-leading EME!

#### Establishment of Fire Service Advisory Panel

As part of our continued growth plans in IAFSS LOF&BE, we are establishing a fire service advisory panel to help bridge the gap between fire management and fire research. The fire service panel advisory will be of great help to all three of our subgroups; we expect valuable input to guide our future activities! If interested to join the panel, please send a CV along with relevant experience with the fire services to Sara, Sayaka, and Samuel.

### **Large Outdoor Fires & the Built Environment Working Group Webinar Series**

Due to delay in hosting the 13th IAFSS Symposium, LOF&BE initiated a new webinar series. The webinars are running monthly and to date, 11 webinars have been delivered. These are listed below. LOF&BE also started its

own YouTube channel, so anyone is free to watch any of these interesting webinars. The reception with the webinars has been positive with about 1000 people pre-registering for the first eleven webinars! Please join us for upcoming webinars and see all recordings: <https://iafss.org/lof&be-webinar-series/> or <https://sites.google.com/view/lof&be>.

November 2020 - Samuel L. Manzello (NIST) - Welcome to LOF&BE Webinar Series and Snapshot of Recent Research Activities of Interest to Urban and WUI Fires

December 2020 - Sayaka Suzuki (NRIFD, Japan) - Overview of Urban Fire Management in Japan

January 2021 - Amy Christianson (NRC Canada, Canada) - Blazing the Trail: Celebrating Indigenous Fire Stewardship in Canada

February 2021 - Sara S. McAllister (USDA Forest Service, USA) - The Need for Fundamental Wildfire Behavior Research in the Context of the 2020 Fire Season in the Western USA

March 2021 - Raphaelae Blanchi (CSIRO, Australia) - Challenges from the 2019-2020 Fire Season in Australia - Role of Science to Improve WUI Fires Understanding and Preparation

April 2021 - Elsa Pastor (UPC, Spain) - WUI Fires in Mediterranean Europe: Current Research and Innovation Actions to Increase Communities' Resilience

May 2021 - Yu Wang (USTC, China) - Overview of Informal Settlement Fires: An Asian View

June 2021 - Ofodike Ezekoye (University of Texas-Austin, USA) - Overview of Large Outdoor Fires in Texas

July 2021 - Off

August 2021 - Stephen Wong (University of Alberta, Canada) - Lessons Learned from Recent Evacuations in California

September 2021 - Emanuele Gissi (CNVVF National Fire and Rescue Service, Italy) - Fighting WUI Fires in Italy: Role of Simulation Tools

October 2021 - Enrico Ronchi (Lund U, Sweden) - Evacuation Modeling for Wildland-Urban Interface (WUI) Fires

November 2021 - Ido Marom (Technion – Israel Institute of Technology, Israel) - Wildland-Urban Interface (WUI) Fires in Israel and the Role of Social Interactions during Evacuation

### **Introducing IAFSS LOF&BE Student Webinar Series**

As part of our member feedback process, we undertook a survey to gauge interest in continuing the webinar series. We are excited to know that everyone wishes for us to continue the webinar series! During the survey process, it was suggested by LOF&BE members to consider hosting a student webinar series. As we think this is a great idea, we would like to ask the following:

- Please feel free to volunteer to deliver a student webinar. We would like to hear from students directly.
- We plan to have the student webinars in a shorter format, so we can host three student talks in one monthly webinar series.
- Each student webinar you will introduce yourself, why you are drawn to large outdoor fire research, and provide brief overview of your research.
- Please contact Sayaka, Sara, and Samuel, so we can set you up on the schedule. Looking forward to hearing from our students in the LOF&BE community. The first student webinars are set for January 2022!

*Signed Samuel L. Manzello, Sara McAllister, and Sayaka Suzuki (IAFSS LOF&BE Co-Leaders)*

### **IAFSS Working Group on Human Behaviour in Fires (HBiF)**

Following the kick-off event during the last IAFSS Symposium in 2021, the working group now includes over 180 registered members. The group's first activity is the development of a research roadmap concerning human behaviour in fires, which involves the following steps: documenting research needs and possibilities, mapping out existing research through bibliometric analysis, identifying gaps (and assessing motivations/reasons behind the research gaps), and outlining the research agenda. Subgroups and subgroup leaders of each step have been identified. In addition, on the 19th of October 2021, the WG initiated a webinar series. The first webinar, for which over 100 people registered, focused on academic publishing. This webinar recording is uploaded to the group's Youtube channel, which will also feature videos of all future webinars: <https://www.youtube.com/channel/UCSqMIEaZ08r5BrtOb5q2d0Q>.

For further information about the IAFSS HBIF WG, please contact the group leaders: Erica Kuligowski [erica.kuligowski@rmit.edu.au](mailto:erica.kuligowski@rmit.edu.au) and Enrico Ronchi [enrico.ronchi@brand.lth.se](mailto:enrico.ronchi@brand.lth.se).

*Signed: Erica Kuligowski, PhD (RMIT) and Enrico Ronchi (Lund University), Co-Chairs*

## Updates from IAFSS sub-committees

### Call for Early Career Researcher Sub-Committee Membership!

The sub-committee's role is to be an interface between the IAFSS executive committee and students/postdocs/graduate engineers from worldwide universities and companies on the organization of events for early career researchers and professionals in the fire science community. Ultimately, we want to deliver on proposals (with support from the executive committee of the IAFSS) to integrate and give more opportunities to early career researchers in fire science.

Some of our objectives include:

- a) provide funding opportunities to promote travel and lab exchanges,
- b) assist in organizing an IAFSS summer school to further global connections and educate early career members into the fire science community,
- c) build a mentorship framework to allow early career researchers to become more involved in executive initiatives/committees as well as learn from mid and late-career academics/researchers,
- d) host virtual seminars as a way for early career researchers to present their work, learn various skills (i.e. conducting a peer-review), network and forge connections.

The work on these proposals, if approved by the Management Committee, would then be carried out by this subcommittee. If you are interested in getting involved, please do not hesitate to reach out to Bronwyn Forrest ([bronwyn.forrest@uwdbc.com](mailto:bronwyn.forrest@uwdbc.com)) and Prof. Francesco Restuccia ([francesco.restuccia@kcl.ac.uk](mailto:francesco.restuccia@kcl.ac.uk)) to inform them of your interest, or to ask any questions you may have. Thank you & we look forward to hearing from you!

*Signed: Bronwyn Forrest and Prof Francesco Restuccia, Co-Chairs*

## Awards Presented at 13<sup>th</sup> Symposium

**Philip Thomas Medal of Excellence** awarded for best paper presented at the 12th IAFSS Symposium (2017) to: James White, Salman Verma, Elizabeth Keller, Ailing Hao, Arnaud Trouvé and Andre Marshall  
Title of the paper: "Water mist suppression of a turbulent line fire"

### Poster and Image Award Recipients from the 13<sup>th</sup> Symposium

The Poster and Image Awards committee announced the recipients of three poster and one image award. The Committee was chaired by Jason Floyd and Tuula Hakkarainen. Other members of the Committee were Samuel Manzello, Sarah Scott, Sayaka Suzuki and Jennifer Wen.

The following awards were presented at the 13<sup>th</sup> symposium:

*Best Student Poster:* The Effect of Vegetation Root on Smoldering Propagation in Peat Soils

Jeihan Hapsari, Sarah Nugroho, Hafizha Mulyasih, Randitia Putra, Lasta Akbar and Yulianto Nugroho  
Department of Mechanical Engineering  
Faculty of Engineering  
Universitas Indonesia

*Best General Poster:* Developing Transportation Strategies for Wildfire Evacuations via an Empirically Supported Traffic Simulation of Berkley, California

Bingyu Zhao<sup>1</sup> and Stephen Wong<sup>2</sup>  
<sup>1</sup>University of California, Berkeley  
<sup>2</sup>University of California Institute of Transportation Studies  
Transportation Sustainability Research Center

*Delegates' Choice Poster:* Determination of critical separation distance between dwellings in informal settlements fire

Yu Wang<sup>1,2</sup>, Lesley Gibson<sup>1</sup>, Mohamed Beshir<sup>1</sup> and David Rush<sup>1</sup>  
<sup>1</sup>School of Engineering, University of Edinburgh, Edinburgh, UK  
<sup>2</sup>State Key Laboratory of Fire Science, University of Science and Technology of China, Hefei, PR China

*Delegates' Choice Image:* Kissing Fire (see front cover of newsletter)

Yu Wang<sup>1,2</sup>, Mohamed Beshir<sup>1</sup>, Rory Hadden<sup>1</sup>, Antonio Cicione<sup>3</sup>, Michal Krajcovic<sup>1</sup>, and David Rush<sup>1</sup>

<sup>1</sup>School of Engineering, University of Edinburgh, Edinburgh, UK

<sup>2</sup>State Key Laboratory of Fire Science, University of Science and Technology of China, Hefei, PR China

<sup>3</sup>Stellenbosch University, Stellenbosch, South Africa

**Philip Thomas Silver Medal of Excellence for the Best Paper of the Previous Symposium:** James White, Salman Verma, Elizabeth Keller, A Hao, Arnaud Trouvé, and Andre Marshall for best paper at the 12th IAFSS Symposium (2017): “Water Mist Suppression of a Turbulent Line Fire”

The **Sjölin Award**, a FORUM Prize selected annually and awarded at the IAFSS symposia, recognize ‘an outstanding contribution to the science of fire safety or an advance in the state of the art in fire safety engineering practice of extraordinary significance.’ Awards were presented to Haukur Ingason (2020), Brian Lattimer (2019) and Weicheng Fan (2018).

## NEWS FROM MEMBERS

### News from the International Master of Science in Fire Safety Engineering (IMFSE)

#### New Associated Partner UPC

The IMFSE consortium is very proud to announce the strengthening with [Universitat Politècnica de Catalunya \(UPC\)](#) as Associated Partner. The inclusion of UPC in IMFSE is a major step forward for the IMFSE program.

#### New IMFSE Contributor Thunderhead

[The group of IMFSE Contributors](#) is still growing, with several companies and organizations extending their financial commitment to the IMFSE program for the coming years. Thanks to these contributions the IMFSE Management Board can grant additional scholarships and tuition fee waivers to talented applicants. We are honoured and thankful that [Thunderhead Engineering](#) is now also one of our IMFSE Contributors!

#### New programme director at the University of Edinburgh

Rory Hadden is the new programme director for IMFSE at the University of Edinburgh since September 2021. He looks forward to continuing the role that Professor Grunde Jomaas has carried out with great dedication during the past five years. We wish Grunde all the very best in his new job (<https://www.frissbe.eu/news/the-frissbe-era-chair-holder-has-been-selected>), and hope that we can continue to collaborate on educating the future leaders in the field of fire safety engineering.



Rory Hadden on this new role: “I am excited to be taking on the role of IMFSE programme director in Edinburgh. It is an honour to take on the stewardship and I look forward to the next phases of the IMFSE which I am sure will continue to grow from strength to strength. The most important part of the IMFSE is the students, and I look forward to meeting you all.”

#### IMFSE Graduation Ceremonies

Unfortunately it was again not possible to organize a graduation ceremony in person. Therefore the IMFSE class of 2021 had an online event on **21 June 2021** where they all presented their thesis and several inspiring speeches were given.

If everything goes well, the class of 2022 will have a graduation ceremony in person in June 2022. Let's keep our fingers crossed!



#### Awards & publications IMFSE staff, students and alumni



[IMFSE alumnus Leo Menzemer won the 2021 IFV-VVBA Thesis Award](#). You can read (in Dutch) all about it [here](#). Also IMFSE alumnus Robert Bray was the runner up. Congratulations to both!





Mentoring of students is essential for the success of the IMFSE. In 2012, we were excited when one of the founders of the programme, Robert Jönsson, received the John L. Bryan mentoring award. It is with great pride and pleasure that we can announce that **Grunde Jomaas is the 2021 recipient of the same award (The John L. Bryan Award - SFPE)**, as it means that our mentoring now has been recognised for a decade by the leading professional organisation in our field.

**Jose Torero on receiving the David A. Lucht Lamp of Knowledge Award:** “Educating the next generations of professionals in the field has always been my main driver. It is the people that make our profession and therefore it is the people that have been my focus. I believe the drive to increase the

opportunities for higher education in Fire Safety Engineering is something I shared with David A. Lucht. I therefore feel deeply proud and humbled to receive the SFPE David A. Lucht award (<https://www.sfpe.org/about-sfpe/awardshonors/luchtrecipients>). It is particularly rewarding to receive the award alongside two individuals, both affiliated to the IMFSE, with whom I have shared a long path and a commitment to higher education. Grunde Jomaas (receiving the John L. Bryan award for his commitment and dedication to education) and Richard Emberley (SFPE Emerging Professionals 5 Under 35 award).”



*Signed: Lies Decroos, Erasmus+ Administrator*

## News from Ghent University

### PhD defenses

On 4 October 2021, **Junyi Li** successfully defended his PhD, entitled ‘Experimental and Numerical Study of Fire Dynamics in Air-Tight Buildings’. The academic supervisors were Bart Merci and Tarek Beji. The full text will be available on <https://lib.ugent.be/>.

On 27 May 2021, **Yuanjun Liu** successfully defended her PhD, entitled ‘[The Combined Effect of Water Mist System and Longitudinal Ventilation on Fire and Smoke Behavior in Tunnel Fires](#)’. The academic supervisors were Bart Merci, Zheng Fang and Tarek Beji.

Also several months ago, on 3 March 2021, **Boris Kruljevic** successfully defended his PhD, entitled ‘[Fundamental Study in Applications of the Conditional Moment Closure Method to Fire-Related Flows](#)’. The academic supervisors were Bart Merci and Ivana Stankovic.



### Master of Science in Fire Safety Engineering

In the current academic year 21-22, there are 15 students following the [Master of Science in Fire Safety Engineering](#) at Ghent University.

### Graduation Ceremony

In 2021, 9 students successfully graduated from the MFSE program. We are thankful that we were able to celebrate this with a live graduation ceremony in September. Best wishes to our graduates!



### FSE Introduction Day

On Monday 4 October the FSE Introduction Day took place at Ghent University. The goal of this event was to bring all FSE students together at the start of the academic year. Not only did the students receive a lot of information, they also participated in an interactive project about a performance-based fire safety engineering case, presented by Koen Van Herpe (VK architects & engineers).





### **Conferences/symposia participation**

On 10-11 June 2021, a research delegation from Ghent University participated in the 7<sup>th</sup> **International conference Applications of Structural Fire Engineering (ASFE21)**, which was organized by the Faculty of Civil and Geodetic Engineering of the University of Ljubljana (UL FGG). The conference virtually brought together experts and specialists in design against fire from all over the world to share ideas and to acquire knowledge in the field of structural fire engineering. Dr Andrea Lucherini (postdoctoral research fellow) and Mr Balša Jovanović (PhD candidate) represented Ghent University and orally presented the following papers:

- Lucherini A., Jovanović B., Van Coile R. and Merci B. *“Background and limitations of the Eurocode parametric fire curves, including the fire decay phase”*.
- Jovanović B., Lucherini A., Van Coile R., Merci B., Caspeepele R., Reynders E. and Lombaert G. *“Effects of the fire decay phase on the bending capacity of a fire-exposed reinforced-concrete slab”*.

### **Welcome Back Event**

Since the COVID-19 situation kept on improving, the Department of Structural Engineering and Building Materials (EA14) of Ghent University organised a “Welcome Back Event” for all colleagues on 17 September 2021. Food and drinks were enjoyed



outside the Magnel-Vandepitte Laboratory in the September sun. It was an ideal opportunity to renew social contacts with everyone, welcome new colleagues and look forward to a hopefully Corona-free future.

### **SFE Team Building Days**

On 7-8 September 2021, the SFE (Structural Fire Engineering) research team led by Prof Ruben Van Coile arranged a 2-days team-building workshop, as a post-pandemic re-start and reflection point. The 2 days were spent discussing and brainstorming about research ideas and approaches, collaborations, communication, supervision and future goals for the research team. The two days were also filled with social activities and games, resulting in a very positive experience for the whole team.



*Signed: Prof. Bart Merci, Ghent University*

## **News from the Hong Kong Polytechnic University**

### **PolyU will host SiF 2022 in Hong Kong**

The 12<sup>th</sup> International Conference on Structures in Fire (SiF 2022) will be hosted by PolyU Fire Safety Engineering Research Group at the Hong Kong Polytechnic University. The main focus of the SiF series of conferences is to provide an opportunity for researchers, practitioners, and engineers to share and discuss their research related to structures in fire with their peers in an open, international forum. Several workshops, including smart fire fighting and timber structure, will be held. This will be an in-person conference. Looking forward to meeting all of you in Hong Kong next year.



**Prof. Usmani is promoted to Chair Professor**



Prof. Asif Usmani is promoted to Chair Professor of Building Sciences and Fire Safety Engineering. Before joining PolyU in 2016, he led civil engineering research and teaching in the UK, spending most of his career at the University of Edinburgh. His main research is simulating the thermo-mechanical behaviour of structures in fire and developing methodologies for performance-based fire safety engineering. At PolyU, he has expanded into AI and other emerging technologies for smart firefighting in dense urban environments. He currently leads a HK\$33.333 million research project in this area.

**Dr. Huang became an Associate Editor of IJWF and received 5 under 35 Award from SFPE**

Dr. Xinyan Huang is elected as Associate Editor of the prestigious Springer Nature journal – International Journal of Wildland Fire and the Editorial Member of Fire Safety Journal from June 2021.

Xinyan also received the “5 Under 35 Award” from the Society of Fire Protection Engineers (SFPE), which recognizes 5 individuals each year who best represent the industry’s top rising leaders who are giving back to the fire protection engineering profession and the community. Dr. Xinyan Huang is the first one in Asia to receive this prestigious award.

Emerging  
Professional's  
5 Under 35



**Shaorun defended his PhD thesis with a unanimous vote of excellence**



Shaorun Lin successfully defended his PhD thesis entitled “Fundamental Study of Near-Limit Smoldering Fire Dynamics” on 10 Aug 2021 with a unanimous vote of excellence, supervised by Dr Xinyan Huang. Dr. Lin is the first Ph.D. graduate from the Research Center for Fire Safety Engineering. His thesis is composed of 10 journal publications in different disciplines, including Combustion and Flame, Proceedings of the Combustion Institute, Science of the Total Environment, Fire Technology and Fire Safety J. He will continue working as a Postdoc in Dr. Huang’s research group with a focus on the smoldering fire.

**SFPE Hong Kong Student Chapter receives the Gold Award for Chapter Excellence in 2021**

SFPE Hong Kong Student Chapter receives the **Gold Award** for Chapter Excellence, making it the only Student Chapter that gets this award in 2021. The award is to recognize SFPE Chapters that demonstrate excellence in contributing to the needs of their members and the Society.



**New management team of SFPE Hong Kong Student Chapter**

We are happy to announce a new team of officers for the SFPE HK Student Chapter: Tianhang Zhang (President), Xiaoning Zhang (Vice President), Cheng Chen (Treasurer), and Gulzhan Aldan (Secretary). We would also like to thank the previous team of officers for their contributions in the past year.



*Tianhang Zhang*



*Xiaoning Zhang*



*Cheng Chen*



*Gulzhan Aldan*

**Large-scale tunnel fire test at SCFRI**

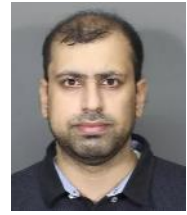
PolyU fire group has extensive cooperation research projects with other academics and governmental associations. From July to Sept 2021, PolyU fire research group sent a six-person team to the Sichuan Fire Research Institute (SCFRI) to conduct full-scale tunnel fire tests. One mission of our fire researchers is evaluating the performance of our smart firefighting system at a real scale level. With the collaboration of SCFRI, it is more likely to get significant progress on AI-driven fire technology.



### Updates in Group Members

Two new postdocs, Dr. Rahul Wadhvani and Dr. Xuesong Cai, three new Ph.D. students and four new MPhil students, join us this year. A Warm Welcome to our new members!

Dr. Wadhvani is a postdoc fellow at the Hong Kong Polytechnic University. He received his PhD (2019) from the Centre of Environmental Safety and Risk Engineering at Victoria University, Melbourne, where he experimentally and computationally studied the transport of short-range firebrands inside a forest canopy. He got his M. Tech (2014) and B. Tech (2014) from Indian Institute of Technology, Roorkee, during which he focused on fluid flow and combustion.



Dr. Xuesong Cai is a postdoc fellow at the Hong Kong Polytechnic University. He studies structural behaviors in fire based on hybrid simulations.

He received his PhD (2020) from Tongji University, Shanghai, China. His applied hybrid simulation techniques to investigate the seismic performance of underground structures. He got his M. Tech (2014) and B. Tech (2012) from Harbin Institute of Technology, Harbin, China.



PhD student  
Yanhui Liu



PhD student  
Yanfu Zeng



PhD student  
Tanwei Chu



MPhil student  
Yuhan Wang



MPhil student  
Ho Yin Wong



MPhil student  
Yizhou Li



MPhil student  
Yunzhu Qin

### EV battery fire review paper receives 2021 Jack Bono Award

The latest review paper on EV battery fire led by Peiyi Sun, Xinyan Huang, and collaborators have been recently awarded the [Jack Bono Award](#) for Engineering Communications. This award is given by SFPE Educational and Scientific Foundation to the paper that has most contributed to the advancement of professional fire protection engineering. The awarded review paper has been published on Fire Technology, which aims to encourage active research collaborations and attract future research and development on improving the overall safety of future EVs.



### Tianhang won the best paper award at ISTSS



Ph.D. student Tianhang Zhang won the Best Paper Award in 9th International Symposium on Tunnel Safety and Security (ISTSS) for his paper entitled "Experimental study of backlayering length and critical velocity in longitudinally ventilated tunnel fire with wide shallow cross-section". This paper presents very nice experimental and theoretical work on critical velocity and backlayering length, which largely verifies and explains previous important findings.

*Signed: Dr. Xinyan Huang, The Hong Kong Polytechnic University, Hong Kong, China*

### Three Big Fires

Three big fires occurred in urban districts of Hong Kong emitting smoke in two weeks around June 2021. Residents in many areas were affected by inhaling toxic smoke for several hours.

#### **Fire 1: Ship Fire**

A 100 m long vessel caught fire [1] in the Harbour of Hong Kong in the evening on 2 June 2021, and the fire was extinguished in the next morning. The fire incident was suspected to be caused by explosion of lithium battery. As there were winds and strong sea waves at the burning site, firemen were difficult to board the cargo ship to take appropriate action. 32 fire trucks and ambulances, 9 firefighting vessels, and 183 firemen and ambulance staff were deployed. Vast amount of smoke was emitted from the burning vessel when the ship was burnt for 15 hrs, affecting citizens around the harbour area [1]. Environment of the districts around the harbour was polluted for such a long time of 15 hrs. Air monitoring stations of the government recorded poor air quality at various stations. The concentration of pollutants at the worst district was 10 times above acceptable levels, where the concentration of suspended particulates PM10 and PM2.5 were 5 times and 10 times above acceptable level.



## **Fire 2: Typhoon Shelter**

Two yachts at a typhoon shelter caught fire at 2:34 a.m. on 27 June 2021 [2] and affected the ships nearby. Narrow water channel, strong wind and the burnt cable made the ship drift away by the action of water. These accelerated the spread of blaze and increased the difficulty in firefighting. Firemen used fire extinguishing water cannon for firefighting operation. The fire was extremely violent and the flame billowed skyward. Fuel tanks exploded and the blaze was under control after 6 hours. The fire services had deployed 7 fire boats, 43 fire trucks and ambulances, and 215 firemen and ambulance staff. During the fire, as thick smoke might drift to different parts of the Hong Kong Island by wind, residents in those areas were advised to shut the windows if affected by smoke and peculiar smell. No significant deterioration in the air quality health index was observed.

## **Fire 3: Waste Management Areas**

A waste collection station caught fire [3] at 5:38 a.m. on 29 June 2021. Smoke originated from burning plastic spread to the residential districts by the action of wind, affecting many residents. As the fire source was located inside the "iron scrap mountain", it took 5 hours to extinguish the fire. In the blaze, no injuries were reported, but smoke spread to many areas around. Air monitoring station at Tsuen Wan recorded a slight increase in the concentration of suspended particles.

## **Observations**

It must be pointed out that big fires can happen in urban areas. Good fire safety management must be implemented to avoid having long duration of big fires. Environmental impact of such big fires can bring disaster.

## **Doctoral Graduates**

Several full-time non-local doctoral graduates in local higher education institutions had completed their studies with degree to be conferred. There are student awards to some graduated students from different professional parties including the local engineering registration authority, The Hong Kong Institution of Engineers.

## **References**

1. The Standard, "Only metal scrap found on burning vessel at Stonecutters Island: firemen", 3 June 2021.
2. Reuters, "Ten cabin cruisers sink in Hong Kong marina fire, no serious casualties", 27 June 2021.
3. South China Morning Post, "Residents complain of 'scorching smell' as Hong Kong recycling site burns for 5 hours", 29 June 2021.

*Signed: W.K. Chow, Emeritus Professor (Architectural Science and Fire Engineering), The Hong Kong Polytechnic University, Hong Kong, China, Email: wan-ki.chow@polyu.edu.hk*

## **News from Lund University**

### **Education**

The University has been open for students during the 2021 autumn semester, but teaching have been taken place partly as distance teaching and partly with activities on campus. As an example, laboratory sessions and seminars in smaller groups have been held on campus, while lectures have been online. However, from November 1<sup>st</sup> all teaching will go back to campus. During the pandemic lessons have been learnt on how teaching and examination can be done on distance, and this have inspired our teachers and it will hopefully result in the development of our courses and improve our students learning even more.

There is currently a review and development process of our B.Sc. program in fire protection engineering. This means, among other things, that we will introduce a new course linked to sustainability, structural fire resistance and rescue services. With this course we will strengthen our student's knowledge about issues related to sustainability in their work as fire protection engineers.

### **Research**

A new research project has been granted at the Division of Fire Safety Engineering, namely "WUI-NITY 3: Multi-method traffic movement data collection for WUI fire evacuation modeling" funded by NIST. The project focuses on gathering data concerning evacuation from a traffic movement database and from Virtual Reality experiments. This is an international project coordinated by the Fire Protection Research Foundation at NFPA, involving along with Lund University, the National Research Council of Canada (NRC), Movement Strategies (UK), Imperial College (UK), and RMIT University (Aus). Lund University is involved through Dr Enrico Ronchi, Dr Jonathan Wahlqvist and Arthur Rohaert.

There are several more on-going research projects and the result from many of them are reported in open access Lund University reports. You can access our publications through our webpage: [www.brand.lth.se/publications](http://www.brand.lth.se/publications)

### **Positions and personnel**

Silvia Arias successfully defended her PhD thesis "Application of Virtual Reality in the study of Human Behavior in Fire" on June 18. Her thesis is available as open access through the [Lund University library](#).

Our PhD student Erik Smedberg received the 2020 RiMEA-Award. This award is given annually to the best thesis in the field of pedestrian and evacuation dynamics. The RIMEA association is made of a group of researchers and consultants in the field of pedestrian and evacuation dynamics from German-speaking countries. Erik received the award for his master thesis "The Analysis of Results of Stochastic Evacuation Models" in which he developed a methodology to study the uncertainty of probabilistic evacuation models. The thesis work has also resulted in a scientific publication in the journal [Fire Technology](#).

Two prestigious awards were awarded to people associated with the division of Fire Safety Engineering during the latest IAFSS symposium. Dr. Enrico Ronchi received the Magnusson early career award, for his numerous research contributions that have covered a wide range of areas concerning human behavior in fire and fire evacuation. Prof. Haukur Ingason received the Sjölin Award for his outstanding contribution to the science and fire safety in regard to tunnel fire safety.

Dr Robert McNamee has joined the staff at the division. Dr McNamee has a research focus on fire resistance and reaction-to-fire and will contribute to enhancing research and education with respect to structural fire safety. He has a research background at SP Fire Research in Sweden and has also been head of research for five years at one of the larger consulting companies in Sweden. He will, therefore, contribute to the high standard of research and education at the division. Dr McNamee will share his time between Lund University and his position at Research Institutes of Sweden (RISE).

Three new PhD students have begun their studies at the division during the last months; Joakim Åström, Arthur Rohaert and Leo Menzemer.

The focus of Joakim's research will be on fire dynamics and more specifically on fires in environments with reduced oxygen. Joakim also has an interest in virtual reality in evacuation research. Joakim holds a BSc in Fire Protection Engineering and a MSc in Risk Management from Lund University. Joakim will be supervised by Prof Patrick van Hees, Dr Marcus Runefors and Dr Nils Johansson.

Arthur's PhD will be in the domain of wildfire evacuation under the supervision of Dr Enrico Ronchi, Dr Jonathan Wahlqvist and Dr Hanna Lindbom. Arthur holds a MSc in Fire Safety Engineering from the IMFSE programme jointly arranged by Ghent University, Lund University and the University of Edinburgh.

Leo Menzemer, a graduate from the IMFSE programme has started his industrial PhD at Lund University together with The Danish Institute of Fire and Security Technology (DBI). His research will be on the impact of evacuation training on bio-based building fire safety. This PhD received funding from the Innovation Fund Denmark and will be carried out under the supervision of Dr Enrico Ronchi, Prof Steve Gwynne, Dr Janne Sorensen and Dr Metter Marie Vad Karsten.

More information about the Division, are available on [www.brand.lth.se](http://www.brand.lth.se). Our website is continuously updated with news.

*Signed: Nils Johansson, Lund University*

## News from the University of Waterloo

### Hosted 13<sup>th</sup> International Symposium on Fire Safety Science

The University of Waterloo was honoured to host the 13<sup>th</sup> International Symposium on Fire Safety Science which took place between April 19-30<sup>th</sup> 2021. The event was the largest ever, attracting more than 620 attendees from around the world. Scientific topics included human behaviour in fire, Li-ion battery fires, compartment and timber structure fires, fire modeling, wildland fires, and smart firefighting technologies.

This year, the symposium was held virtually using Pheedloop virtual event software. The online platform allowed participants to attend sessions regardless of their time zone. Delivery of the symposium included workshops, plenary and award lectures, papers with breakout rooms for panel discussions, awards sessions, and yoga and stretch breaks hosted by UWaterloo athletics. The live interactions created great networking opportunities for the fire science community.

### Large Scale Furniture Experiments

This past summer the fire research group at UWaterloo completed large scale furniture experiments in their two-story burn house. The experiments were part of a large fuel volatility and ventilation research project. Two series of tests were completed which aimed at studying the effects of mechanical ventilation on fire growth and the burning behaviour of different furniture types.



*An external view of the burn house.*



The house is complete with a living room (which is also the fire room), a kitchen, and two bedrooms on the second level. Each room is instrumented to track the conditions inside the house during and after the fire. Instrumentation includes Mircom and VESDA smoke detection systems, load cells to record mass loss data of the fuel, radiation heat flux gauges, thermocouples, differential pressure transducers in all doorways and the staircase, 19 electrochemical gas sensor locations measuring O<sub>2</sub>, CO<sub>2</sub>, CO, NO<sub>x</sub>, and other toxic gases, a Novatech gas analyser, an FTIR, and 18 cameras recording the fire and smoke movement.

The mechanical ventilation series was completed with all windows and doors sealed, ensuring the only air available to the fire was the internal volume of the house and the air provided through the HVAC system. IKEA Vimle couches (Canadian non-fire retardant version) were used as the fuel. Similar chairs and IKEA Lack tables were placed to replicate a living room setup in the fire room. A benchmark experiment, with a ventilation level based on the size of the house was conducted. Additional ventilation cases were tested to be compared to the benchmark case. These included no ventilation, twice the benchmark amount, and 100% recirculation. Due to the nature of the tests, the fires often reached an under-ventilated condition and self-extinguished.

A second series of tests studying the volatility of various couch types was also conducted. Seven couches with different materials were tested under the same conditions as the mechanical ventilation series and with the benchmark ventilation level. The couch types included Canadian non-fire retardant (cloth, faux leather, and leather), United Kingdom fire retardant (cloth, faux leather, and leather), and United States fire retardant (cloth and leather).

Next summer, the group will run a third set of experiments focused on the dynamics of the fire across a range of passive ventilation methods.



*Typical experiment setup.*

### **Fire Performance Tests**

In addition to the house fire experiments, we have also been busy with large and small scale fire performance testing for industry partners and sponsors. Small scaling testing is performed on products for many industries. Rockwool and the Canadian Department of National Defense have funded larger projects to study performance of exterior and interior insulated walls.

One such project is studying the impact of outdoor fires on exterior wall assemblies. This project with Rockwool is conducted primarily by MASc student Vusal Ibrahimli for his thesis. The walls are constructed of seven layers: dry wall, vapour barrier, wood studs, internal insulation, particle board, external insulation, and vinyl siding. Fire performance of each material is first tested at small-scale in the cone calorimeter. In subsequent exterior exposure tests, different types of insulation (stone wool, extruded polystyrene, and polyisocyanurate) are compared for their ability to protect the wall from fire exposure.

Vusal has also been working with Matt DiDomizio, from the UL Fire Safety Research Institute. They have published a paper on "Testing of liquids with the cone calorimeter" in the *Fire Safety Journal*. The study investigates previously used methods of testing liquid samples with a cone calorimeter and their effects on test results. Further experimentation is now being done to provide recommendations toward a standard method of testing such samples. The paper has been selected as the *Fire Safety Journal* Editor-in-Chief's Featured Article for September 2021.



*Example wall fire exposure.*

### **Awards and Scholarships**

The UW Fire Safety group proudly recognizes their accomplished student scholars:

Bronwyn Forrest, a PhD student, has received an NSERC-CGSD scholarship and Waterloo Institute for Nanotechnology Fellowship for her research entitled "Human Physiological Response to Fire Exposure: A Comprehensive Model". This is a cross disciplinary research project between the Department of Mechanical and

Mechatronics Engineering and the Department of Kinesiology. Bronwyn also received an SFPE student research award for her exceptional work during her MASc degree.

Alex DiPaola is a new MASc student in the group. He has received an NSERC-CGSM award for his research on “Heat Release Rate in Under-Ventilated Compartment Fires”. He has also received an Excellence in Engineering Fellowship from the University of Waterloo.

Ayaan Aly Lakhani is an undergraduate co-op student joining the group for the fall term. Ayaan has received an NSERC-USRA for his position.

PhD student Jennifer Ellingham also holds an NSERC-CGSD scholarship and Provost’s Doctoral Award for her research on “Tenability Analysis of Multi-Storey, Multi-Compartment Residential Living Room Sofa Fires”.

On the faculty, research, and program front:

Professor Beth Weckman has been awarded the IAFSS Dougal Drysdale Award for her work in hosting the 13<sup>th</sup> IAFSS symposium. This honour is awarded for exceptional service and contribution to the fire safety science community.

Bronwyn Forrest, Professor Beth Weckman, and Professor Paolo Dominelli have recently been awarded a 2021 Catalyst Grant from the Network for Aging Research. Their interdisciplinary research is studying the impact of fire gases and smoke on the ability of the elderly and mobility impaired to evacuate burning structures.

Our fire safety program continues to attract graduate students from both industry and undergraduate degree programs. There are currently 11 MEng, 5 PhD and 5 MASc students in fire safety. This year, we have also hosted 4 undergraduate students for research work terms at the lab.

*Signed: Alex DiPaola and Prof Beth Weckman, University of Waterloo*

## **News from State Key Laboratory of Fire Science, University of Science and Technology of China**

### **Prof. Weicheng Fan Received the FORUM Sjölin Award**

On the 13th International Symposium on Fire Safety Science held in April 2021 at the University of Waterloo in Waterloo, Canada, Prof. Weicheng Fan, former Director of the State Key Laboratory of Fire Science (SKLFS) at the University of Science and Technology of China, was rewarded the FORUM Sjölin (Lifetime Contribution) Award 2018, in recognition of his outstanding contribution of extraordinary significance to fire safety engineering practice. This award is issued by the International FORUM of Fire Research Directors.

Professor Fan graduated from the University of Science and Technology of China (USTC) in 1965. Then he was employed in USTC and in 1987 promoted to be a professor there. He has been engaged in cross-disciplinary research on fire safety science and engineering for 30 years. Prof. Fan established many mathematical and physical models describing the interactions of flow, heat transfer, and combustion in fires, and also developed the net modeling method for fire smoke simulation. He also contributed many theoretical models for special fire phenomena such as flashover, backdraft, and fire whirl. Prof. Fan has authored seven monographs, 230 research papers (nearly 200 papers were indexed by Web of Science), and 6 authorized invention patents to date. Tens of papers of Prof. Fan were published in Combustion and Flame, Combustion Science and Technology, Fire Safety Journal, and so on.



Prof. Fan has also contributed to the technological researches of fire safety. His technologies have been successfully applied to hundreds of large and high-rise buildings in China. As a result, he ever won three times of China National Award for Science and Technology Progress. In recent years, Prof. Fan successfully established a China national emergency system for fires and other disasters. For his outstanding contribution, he was elected to be an academician of the Chinese Academy of Engineering in 2001. In 2011, Prof. Fan won the First Prize of China National Award for Science and Technology Progress.

Prof. Fan is the founder of SKLFS. By his great leadership, SKLFS has developed rapidly to be one of the world’s most eminent fire laboratories. Prof. Fan, Prof. Toshisuke Hirano, and Prof. Victor K. Bulgakov initiated the

establishment process of Asia-Oceania Association for Fire Safety Science and Technology (AOAFST) in 1991. Prof. Fan ever held the President of AOAFST for six years (1995-2000). Prof. Fan also held the Executive Member of IAFSS and the Deputy Chair of FORUM. In addition, he contributed nearly 30 invited/plenary speeches in symposiums of the fire safety community. In 2012, Prof. Fan was rewarded the Lifetime Contribution Award of AOAFST. In July 2013, Professor Fan was presented the Honorary Doctor of Technology Degree from Loughborough University, UK, in recognition of his outstanding contribution and pioneering work in the fields of fire safety science and public safety technology.

Prof. Fan has also contributed to the technological researches of fire safety. His innovative technology of fire detection for large spaces has been successfully applied to hundreds of large and high-rise buildings in China, for which he won the China National Award for Science and Technology Progress in 2001. For his significant contribution, he was elected to be an academician of the Chinese Academy of Engineering in 2001. In recent years, Prof. Fan successfully established a China national emergency system for fires and other disasters. In 2011, Prof. Fan won the First Prize of China National Award for Science and Technology Progress.

*Signed: Naian Liu, State Key Laboratory of Fire Science, University of Science and Technology of China*

### **Special Issue on State-of-the-Art Fire Research in China and 30th Anniversary of SKLFS is Coming in Fire Technology**

China, together with the fast-growing economy, has promoted the science and engineering of fire safety for decades by contributing more than 30% of quality papers to the global fire safety academic society. The advancement in fire safety science and engineering has witnessed a reduction of the annual death toll caused by fire disasters from over 5,000 in the 1970s to around 1,000 now.



The growing impact of the fire safety research community from China is highlighted by the establishment and development of the State Key Laboratory of Fire Science (SKLFS) since 1991. SKLFS, as the world's largest fire research center, contributes more than 350 papers to international journals annually and has educated more than 1,000 graduates who continue to improve global fire safety in universities, institutions, government sectors, and enterprises.

Currently, the State Key Laboratory of Fire Science (SKLFS) is celebrating its 30th anniversary. It collaborates with journal *Fire Technology* for this special issue **State-of-the-Art Fire Research in China and the 30th Anniversary of SKLFS**, with the aim of supporting and advocating for research and education in fire safety engineering and reducing the worldwide burden of fire hazards. The following research topics are of particular interest and welcoming:

1. Fire hazards to humans and environments;
2. Fire safety science and engineering problems relevant in industrial, operational, cultural, and environmental applications;
3. Fire modeling, testing, detection, suppression, human behavior, wildfires, structures, and risk analysis; and
4. Multidisciplinary research to improve fire safety and protection.

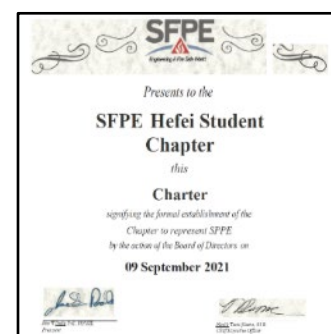
Research Article, case Study, short Communication and review Letter to the Editor are all acceptable. The submission deadline is **31 Jan 2022**.

*Signed: Naian Liu, State Key Laboratory of Fire Science, University of Science and Technology of China; Kaiyuan Li, Wuhan University of Technology; Xinyan Huang, Hong Kong Polytechnic University*

### **SFPE Hefei Student Chapter**

With the approval of SFPE Board of Directors on 9th September 2021, we are very excited to announce the official establishment of SFPE Hefei Student Chapter.

Hefei is the capital city of China Anhui Province, where there are 6 institutes engaging in fire safety engineering, including USTC, Tsinghua University Hefei Institute for Public Safety Research, Hefei University of Technology, Anhui Jianzhu University, Anhui University of Science and Technology and Anhui University of Technology. A total of more than 500 undergraduate and graduate students in the above institutes are studying fire safety science. The SFPE Hefei Student Chapter, based in State Key Laboratory of Fire Science at USTC, aims to enhance the students' connections between the above institutes and help to promote their interests in Fire Protection Engineering. In addition, the student chapter will provide the local students with excellent opportunities to interact with international fire safety professionals to gain new and novel insight into this exciting field. We believe this endeavor would benefit both the local students and international researchers/engineers in the fire safety area.



*The official certificate and logo of SFPE Hefei Student Chapter*



This chapter is the 113th Chapter and 24th Student Chapter of SFPE (<https://www.sfpe.org/membership-communities/chapters/student-chapters>), currently led by four student officers from SKLFS: Hongli Ruan (President), Ting Xia (Vice President), Muhammad Tanveer Riaz (Secretary), and Xiaoqing Li (Secretary). Prof. Yu Wang is the Faculty Advisor of this student chapter.

*Signed: Prof. Yu Wang, State Key Laboratory of Fire Science, University of Science and Technology of China*

### Special Issue on Fire Safety of Informal Settlements and Historic Buildings in Fire Technology

Prof. Yu Wang from SKLFS, Dr. David Rush from University of Edinburgh, Ms Danielle Antonellis from US Kindling, Dr. Keisuke Himoto from Japan National Institute for Land and Infrastructure Management and Dr. Lesley Gibson from Agricultural Research Council of South Africa are launching a new Special Issue of Fire Safety of Informal Settlements and Historic Buildings in Fire Technology, with consideration of the increasingly outdoor fires all over the world.

**SPRINGER NATURE** **SFPE** **NFPA**

Call for Papers: Special Issue  
**Fire Safety of Informal Settlements and Historic Buildings**

**Guest Editors:**  
Prof. Yu Wang, State Key Laboratory of Fire Science, China  
Dr. David Rush, University of Edinburgh, UK  
Dr. Keisuke Himoto, ARIKI, Japan  
Dr. Lesley Gibson, University of Edinburgh, UK

**Paper submission deadline: 31st December 2021**

A common characteristic of informal settlements and historic buildings is that they often do not comply with local code requirements, such as separation distances, structural resistance rating, or firefighting and rescue facilities, to name just a few. Examples are shacks, refugee camps, traditional/ancient villages, castles, and palaces. It is a challenge to alter these buildings to include current fire protection features due to the complexity, cost and architectural consequences of the alterations. In addition, updating the fire safety of informal settlements and historic buildings must consider also the broader social, economic and political contexts, which could be very different to other building types.

**Topics:**

- Fire spread and fire development
- Detection, communication, and firefighting
- Evacuation and human behaviour
- Fire incident investigation
- Risk assessment
- Remote sensing and geospatial analysis
- Socioeconomic aspects
- Resilience

A common characteristic of informal settlements and historic buildings is that they often do not comply with local code requirements, such as separation distances, structural resistance rating, or firefighting and rescue facilities, to name just a few. Examples are shacks, refugee camps, traditional/ancient villages, castles, and palaces. It is a challenge to alter these buildings to include current fire protection features due to the complexity, cost and architectural consequences of the alterations. In addition, updating the fire safety of informal settlements and historic buildings must consider also the broader social, economic and political contexts, which could be very different to other building types.

This special issue of Fire Technology is devoted to understanding the risks, fire development, and resilience of these buildings and communities. The paper submission deadline is 31<sup>st</sup> December 2021 and any excellent work in this area are very welcome.

<https://www.springer.com/journal/10694/updates/19234024>

*Signed: Prof. Yu Wang, State Key Laboratory of Fire Science, University of Science and Technology of China*

### New English Course of Fire Dynamics launched by USTC and UoE

With the great demand of international fire safety engineers and researchers, SKLFS has released the new English “Introduction of Fire Dynamics” course for graduate students in USTC since the fall semester of 2021. This new course at USTC aims to provide the knowledge required for quantitative fire hazard analysis and focuses on analyzing the inherent dynamic behaviour rules of fire and the research frontiers of fire dynamics. Three lecturers (Prof Yu Wang, Dr Ricky Carvel and Dr David Rush) from USTC and UoE with different expertise and horizons of fire safety science teach this course. Two additional invited lectures will be given as well from top researchers in fire safety community. The interactions between lecturers and students are proposed to inspire interest and passion among students to learn more about fire safety engineering.

**NEW COURSE!**

**Introduction of FIRE DYNAMICS**

**Summary:** This new course at USTC aims to provide the knowledge required for quantitative fire hazard analysis. It focuses on analyzing the inherent dynamic behaviour rules of fire and the research frontiers of fire dynamics. Two lecturers from USTC and two lecturers from UoE will teach this course. The interactions between lecturers and students are proposed to inspire interest and passion among students to learn more about fire safety engineering.

**Lecturers:**

- Dr. Yu Wang**  
Professor of Fire Science and Fire Dynamics  
Research interests: studying the fire dynamics
- Dr. Richard Oswald Carvel**  
Fire Dynamics Researcher  
Research interests: Fire hazard, understanding fire behaviour
- Dr. David Rush**  
Senior Lecturer in Structural Engineering  
Research interests: Structural Fire Protection, Behaviour of structural members in fire, Behaviour of structural systems in fire

This course has been the first English course in SKLFS and is currently the only course at USTC taught by local and registered international lecturers. Through the project from “USTC English-Taught Program”, we believe this teaching initiative across the continent will significantly broaden the horizon of our Chinese graduate students and make fire safety knowledge much more accessible for international students in USTC.



The remotely live teaching from Ricky (left) and David (right) and USTC students

*Signed: Prof. Yu Wang, State Key Laboratory of Fire Science, University of Science and Technology of China*

### Full-Scale Fire Experiments of Chinese Informal Settlement (Urban Village)

With the rapid urbanization in China, the urban village plays an important role in providing the living room for migrant workers. In Shenzhen, one of the largest cities in China, 58% of its population live in the urban village according to the data in 2021. However, urban village, as the primary form of the informal settlement in China, is subject to considerably large fire risks.

Prof Yu Wang's research group and Anhui Province Fire Brigade have recently conducted two full-scale urban village experiments in the real urban village building of Chuzhou City. Two identical rooms, with and without the doors and windows, were furnished in the same way. The burning room with window and door is shown in the below photographs captured by a drone.



*Burning urban village room and its ejected flame and smoke in an adjacent room*



*Ejected flame beside the road after complete fallout of window glass*

The two experiments were broadcast live, and more than 50,000 people watched the experiments. After that, the experiment videos were reported by the official Wechat platform of China Fire and Anhui Fire that attracted another 50,000 reads. These experiments inform more than 100,000 people to know how the fire develops and spreads in urban villages in China, which has a significant and positive impact on our society.



#### 房间起火到失控用时多久？我们做了个实验

中国消防 1 week ago

China Fire

你知道一间普通房间  
起火到完全失控需要多长时间  
留下的自救时间又有多少呢？



近日

中国科大火灾实验室王禹教授团队和安徽消防做了一个实验  
模拟了普通民房起火的过程





The social impact of the fire experiments, a total of 100,000 people watched/read

Signed: Prof. Yu Wang, State Key Laboratory of Fire Science, University of Science and Technology of China

## News from Central South University in China

Central South University (CSU) established the department of fire protection engineering in 2004. It is the only "Project 985" university in China that offers undergraduate and graduate (master and Ph.D.) programs for fire protection engineering students. In the year 2020, fire protection engineering in CSU was credited as the national first-class fire protection engineering major in China by the ministry of education of the People's Republic of China and is also ranked as A+ level fire protection engineering major by the Shanghai Ranking's Academic Ranking of World Universities.

Currently, 17 staff including six professors, six associate professors, four lecturers, and one lab manager are working full-time in the department of fire protection engineering. All of these staff have doctoral degrees. Some were graduated from or have visited the international top fire research institutes, such as Hong Kong polytechnic university, University of Maryland, University of Sheffield, research institute of Sweden, University of British Columbia.

The department has over 1,000 square meters of laboratory for teaching, an 800-square-meter lab for innovative experimental research, and an intelligent fire protection training lab by cooperating with industrial corporations.

**Education:** every year, the department enrolls over 50 undergraduate students, over 25 master students, and over four Ph.D. students. 25 undergraduate professional courses and 19 graduate professional courses are offered to the students. These courses are mainly concluded into four categories: fire safety science, structural fire resistance, fire protection engineering technology and equipment, fire alarm system based intelligent fire protection. During the past 18 years, more than 500 undergraduates, 300 masters, and 50 doctoral students have been graduated. Graduated alumni are mainly engaged in fire protection research, teaching, design, construction, consulting, and management.



PhD students



Masters students



Undergraduate students

textbooks, such as *Safety System Engineering*, *Fire Investigation*, *Smoke Suppression*, and *Combustion Science*. These textbooks have been widely used for teaching by many fire protection engineering institutes.

**Research:** the research in the department of fire protection engineering at central south university includes combustion science, construction structural fire resistance, tunnel and underground space fire safety, fire suppression, and intelligent fire protection. The research fundings are mostly granted by the national natural

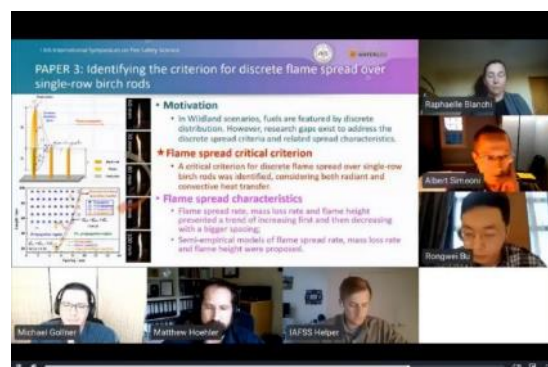
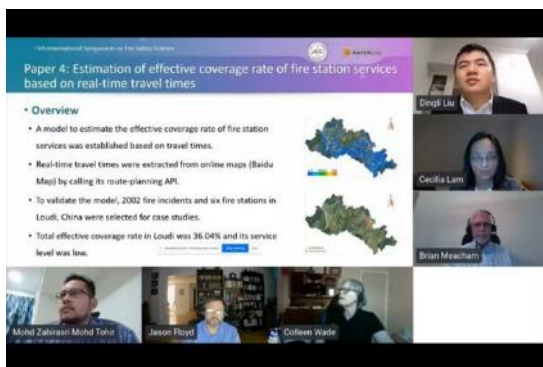
science foundation including major program, key program, general program. The research results were published in fire safety top journals including *fire safety journal*, *proceedings of combustion institute*, and *combustion and flame*, and were presented at international conferences such as the international association for fire safety science symposium and the international symposium on combustion. These works were applied to the construction of national engineering projects, for example, The Hong Kong-Zhuhai-Macao island and tunnel project and the Shiziyang tunnel project of Guangzhou-Shenzhen-Hong Kong passenger dedicated line. These contributions were rewarded a national science and technology progress award and 12 provincial and ministerial awards



*Intelligent fire protection training lab*

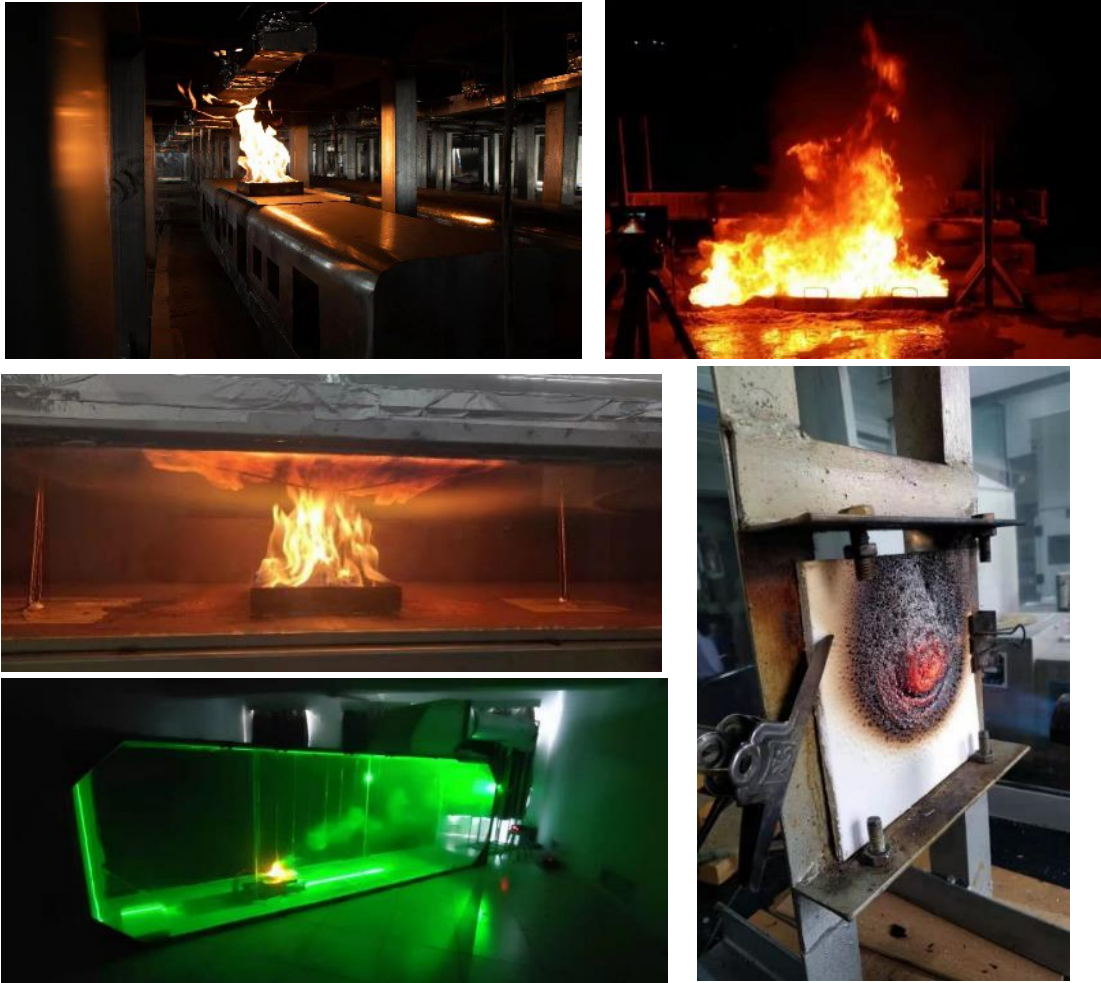


*Innovative experimental research lab for structural fire resistance test and tunneling fire protection research*



*PhD students present at the 13<sup>th</sup> IAFSS*





*Innovative experimental research lab for fire safety research*

*Signed; Zhengyang Wang, Central South University in China*

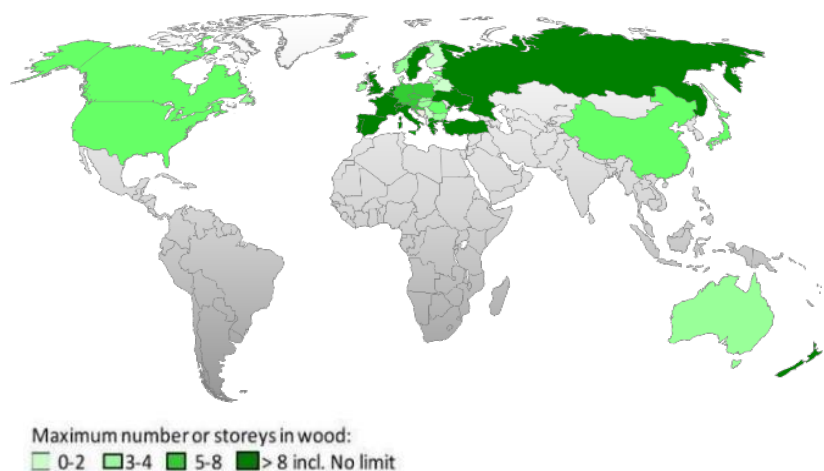
## News from Linnaeus University

### National fire regulations for the use of wood in buildings – Worldwide review 2020

The possibilities for building in wood have gradually increased in recent decades mainly due to environmental benefits. But there are still restrictions in terms of fire regulations in many countries, especially for taller buildings. The situation has therefore been mapped in about 40 countries on four continents as an update to a survey in 2002. The main issues are how high buildings with load-bearing wooden frames may be built and how much visible wood may be used both inside and outside on facades.

The restrictions apply primarily to prescriptive fire design according to so-called simplified design with detailed rules, which are mainly used for residential buildings and offices.

For more complicated constructions, performance based design can be used by fire safety engineering design, which increases the possibilities of using wood in buildings.



*Maximum number of storeys with load-bearing elements in wood in residential buildings acc. to prescriptive requirements without sprinklers.*

Major differences between countries have been identified, both in terms of the number of storeys permitted in wood structures, and of the amounts of visible wood surfaces in interior and exterior applications. The possibilities to use wood in buildings increase if sprinklers are installed, which is highlighted. The differences are still large, but harmonizing activities on performance based principles are ongoing worldwide. Preliminary results are published in Wood Material Science & Engineering, DOI: [10.1080/17480272.2021.1936630](https://doi.org/10.1080/17480272.2021.1936630). Full results are published in a report at Linnaeus University [www.lnu.se](http://www.lnu.se).

Signed: Birgit Östman [Birgit.Ostman@lnu.se](mailto:birgit.ostman@lnu.se), Linnaeus University, Växjö, Sweden

## News from the University of Canterbury

### Education:

It has been an exciting year for our program despite COVID related disruptions. We had the opportunity to upgrade one of our courses and to welcome an unprecedented large cohort of students. Now, as we approach the end of the year, 45 students are benefitting from high-quality academic education in fire engineering, and more than 20 students are expected to graduate from our program.

The upgraded Fire Safety Engineering Design course, led by Dr. Dennis Pau, is currently running full year providing our students with the opportunity to interact closely with industry professionals and to learn first-hand about best practices. A new important aspect of the course involves the participation of 9 guest lecturers invited to talk about 'Current Industry Interests' touching on various topics including quantitative risk analysis, passive fire protection, fire safety of mass timber, sprinkler system, performance-based fire safety design and fire service operations. Additionally, students do designs with varying level of complexity, ranging from massive high-storage warehouse to crowded sports arenas and exposed mass timber residential buildings, are now in full-swing with several groups being mentored by 8 volunteer ENZ Chartered Professional Engineers (CPEng).

### Program:

We are pleased to announce that the University of Canterbury and Fire Emergency New Zealand (FENZ) have strengthened their long-standing relationship by renewing a +1M\$, 5 years financial support to the fire engineering program. The funding has proved to be essential to keep the educational and scientific excellence, and it will be leveraged to continue improving the quality of the program. Additionally, both institutions agreed on prioritize several strategic research subjects aligned with current global challenges involving wildfires and smart buildings.

### Achievements:

Dr. Anthony Abu is now editorial board member of the journal "Frontiers in Built Environment – Fire Resistant Engineering", which is a new journal focused on structural fire engineering sciences.

Prof. Daniel Nilsson started his new position as Head of Department of Civil and Natural Resources Engineering (CNRE) at the University of Canterbury on 1<sup>st</sup> March 2021. He is still alive.

The UC fire group is currently involved in several projects including structural fires, evacuation and wildfires:

1. *Assessing performance of firestopping systems in post-earthquake scenarios* (Dr. Anthony Abu and Prof. Charles Fleishmann)
2. *"Agent models of tsunami evacuation behaviour to improve planning and preparedness"* (Prof. Daniel Nilsson) : The project, which is led by William Power at the Institute of Geological & Nuclear Sciences Limited (GNS), explores the use of evacuation models for tsunami evacuation, and more specifically multimodal evacuation. Daniel's role in the project is to provide input for the evacuation model development, as well as assist in the visualisation of modelling results. The department will soon initiate the recruitment of a PhD student linked to the project.
3. *"Extreme wildfire: Our new reality - are we ready?"* (Dr. Andres Valencia & Prof. Daniel Nilsson) : The project, led by New Zealand Forest Research Institute Ltd Trading as Scion, will incorporate world-leading fire science into wildfire detection, fire and smoke spread tools and used to enhance situational awareness technologies used by fire managers. WUI computational modelling of fire behaviour at the fuel-atmospheric dynamic interface is one of the research challenges in which Andres will be involved. Daniel's part of the project relates to planning of communities in relation to the wildfire threat and evacuation strategies.

### Conferences:

The CNRE department successfully hosted the IABSE Congress: Resilient Technologies for Sustainable Infrastructure. Anthony Abu was highly involved organization and development of it. Additionally, Anthony Abu and Andres Valencia will present their works in the upcoming 12th Asia-Oceania Symposium on Fire Science and Technology (AOSFST) between the 7<sup>th</sup> and 9<sup>th</sup> December 2021, in the areas of Fire Dynamics and Structural Fires.

### PhD students:

Gordon Chen started his PhD on the topic "Performance of New Zealand steel connections under fire conditions" in March this year. He is funded by BRANZ and HERA. Kate Melnik started her PhD focused on the study of the flammability of typical New Zealand WUI vegetation. Luke De Schot started his PhD studies on the use of Virtual Reality to study people movement in crowds. Luke is one of the recipients of the prestigious UC Accelerator Grant, which was initiated in 2020. We are currently looking for motivated students to join our PhD program via UC Accelerator or numerous additional Grants available at UC.

*Signed: Dr Andres Valencia-Correa, University of Canterbury*

## News from the University of Queensland Fire Safety Engineering Research Group (UQFire)

### New arrivals

**Mr Stavros Spyridakis** joined UQFire in July 2021 to commence his PhD studies on a research project investigating the scientific basis for the use of intumescent coatings and fire retardants in mass timber structures, supervised by Dr Cristian Maluk and Dr Felix Wiesner. Prior to joining UQ Fire, Stavros worked for Arup between 2016 and 2021 (Bristol, UK and Sydney, Australia).

**Mr Waseem Hittini** joined UQFire in July 2021 to commence his PhD studies under the supervision of Dr Juan Hidalgo. Waseem is currently working on CFD modelling, including simulation of compartment fires and flame spread with various turbulence flow, pyrolysis, and combustion models. Prior to joining UQ Fire, he developed research and teaching in Western Sydney University and United Arab Emirates University. His previous research focused on developing various micro and nano polymeric composites for different purposes ranging from thermal insulation to gas sensing.

**Ms Satorupa Karmakar** and **Mr Anish Banerjee** have both commenced a joint PhD through UQ and IITDelhi through the UQIDAR. Satorupa is investigating the resilience of communities exposed to fire and is jointly supervised by Dr David Lange from UQ and Associate Professor Upasna Sharma from IIT Delhi's school of public policy. Anish is investigating the impact of technological change on the resilience of the built environment to fire and is jointly supervised by Dr David Lange, Dr Juan Hidalgo and Dr Matt Mason from UQ and by Professor Vasant Matsagar from IIT Delhi's school of civil engineering.

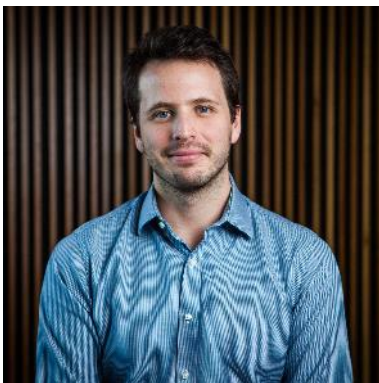
**Mr Zhiruoyu Wang** has commenced a remote PhD investigating the resilience of structures to fire. Zhiruoyu is supervised by Dr David Lange and Professor Andy Hu of Chongqing University in China.

### Recent Graduates

**Dr Juan Cuevas** was awarded a PhD with a thesis entitled "*Critical conditions for the self-extinction of timber*".

**Dr Jaime Cadena** was awarded a PhD with a thesis entitled "*Risk assessment based on maximum allowable damage*".

**Vinny Gupta** passed his PhD thesis defence on "Open-plan compartment fire dynamics".



*Dr Juan Cuevas*



*Dr Jaime Cadena*



*Vinny Gupta*

### SFPE UQ Student Chapter

During 2021, despite pandemic related restrictions, the SFPE UQ Student Chapter has continued to actively host and organize educational events to promote and develop knowledge and networking within the discipline of fire safety engineering. The Chapter fosters a space where our alumni talk about the diverse research undertaken at UQ. Three webinars have featured former UQ Fire PhD students, titled "Thermal inertia as an integrative parameter for building performance" and "Studies for the Design of Fire-Safe Bamboo Structures" by **Dr Gerado Soret (Queensland Fire and Emergency Services)** and **Dr Angela Solarte (Monash University)**, respectively.



Also, experts from academia and industry have been invited to talk about state-of-the-art topics in which they have worked or are currently working. We were really proud to have webinars featuring **Dr Liming Jiang (HKPU)** talking about computer modelling for fire structural analysis, **Dr Andrea Frangi (ETH Zurich)** about Eurocode 5 and the challenges of updating the fire standard for timber, **Dr Erica Kuligowski (RMIT)** talked about bushfires and the interdisciplinary approach to save lives and **Dr Johan Anderson (RISE Fire Research)** to speak about their research carried out in Sweden about facades. Our latest speaker, **Prof. Guillermo Rein (Imperial College, HazeLab)** presented about travelling fires in structural design.

Before the end of the year, one more webinar is yet to come, **Dr Margaret McNamee** will talk about sustainable fire safety (date and time TBC).

We are very happy for all the people, from local to international academics, students, and professionals, who have participated in our webinars and have shown an impressive interest with every event, and we expect to keep expectations with more webinars and events. Hopefully by the end of the year we can come back to have some face-to-face networking and engaging events if COVID restrictions allow it.

Follow our social media accounts to keep updated on the latest webinars and events.

**Twitter:** @SFPE\_UQ

**LinkedIn:** [www.linkedin.com/in/SFPE-UQ](http://www.linkedin.com/in/SFPE-UQ)

**Eventbrite:** [www.uqsfpe.eventbrite.com](http://www.uqsfpe.eventbrite.com)

### **12<sup>th</sup> Asia-Oceania Symposium on Fire Science and Technology**

Organisation of the 12<sup>th</sup> Asia-Oceania Symposium on Fire Science and Technology (AOSFST 2021 – <https://aosfst2021.com>) is well underway. The conference will be host by UQFire, and organised in collaboration with Charles Darwin University, Griffith University, Monash University, Victoria University, The University of Melbourne, Queensland University of Technology, RMIT University, University of New South Wales, University of Canterbury, and Massey University. **AOSFST 2021 will take place between the 7<sup>th</sup> and 9<sup>th</sup> December 2021**, with post-conference workshops taking place on the 10<sup>th</sup> December.

We are very excited about hosting the AOSFST 2021 which received 239 two-page extended abstracts from 38 countries. The focus of the AOSFST series of conferences is to provide an opportunity for researchers, practitioners, and engineers to share and discuss their research related to fire safety science and engineering in Asia-Oceania and around the world. Research and engineering outcomes presented at AOSFST will include fundamental work that progresses the understanding and application of fire safety engineering and science.

As the key conference in the Asia-Oceania region, AOSFST is a venue for networking and where the latest research is presented. In addition to the plenary and parallel sessions of the conference, AOSFST 2021 will provide an opportunity for further discussions both formally following presentations and informally through the state-of-the-art online platform.

**Registration fees for AOSFST 2021 are only AU\$35. Register at <https://aosfst2021.com>.**

*Signed: Cristian Maluk, Fire Safety Engineering Group at The University of Queensland*

## **News from Imperial College London**

Hello! Welcome to another news update from Hazelab at Imperial College London.

For more follow us on twitter @ImperialHazelab, visit our [website](#) or watch our [video](#).

### **New arrivals**

Firstly, we would like to wish a warm welcome to our newest member of the Hazelab family, PhD student **Nikolaos Kalogeropoulos**! Nikolaos Studied at Imperial for his Masters degree, and will now be pursuing a PhD on “Multiscale and Data-Driven Simulation of Wildfires for the Protection of Rural Communities Worldwide”. Welcome to Hazelab, Nik!

Over the summer, Hazelab also had the joy of hosting several UROP summer research students: Han, Clarissa, Edward, Jamie, and Francesco.

**Edward** studied the fire performance of aluminium columns via numerical simulations. **Clarissa** helped develop a field scale model of flaming and smouldering wildfires in tropical peatland using cellular automata. **Jamie** worked on AI approaches towards identification and segmentation of flames within images. **Han** worked on numerical models of ember flight during wildfires, to understand and mitigate against them. **Francesco** developed a set of fire-themed Heat Transfer problems for the 2<sup>nd</sup> year Undergraduate Mechanical Engineering course led by Guillermo. Thank you, UROP students, and we wish you the best in your future endeavours!



## Graduating Students

This has been a dramatic year for people graduating from Hazelab – we have had four members submit their theses and pass their vivas! We would like to *proudly* congratulate **Agung** (Peat fires), **Mohammad** (Travelling fires), **Xuanze** (battery fires), and **Zhenwen** (battery fires) for all passing your vivas, and making the field of fire science burn a little brighter. From the aforementioned graduating students, Xuanze will be leaving Hazelab, and moving a few doors down to the battery research group, where he will continue to utilise his expertise in the world of burning batteries! Zhenwen is moving to China while Mohammad is staying at CERIB in France. Dr Agung Santoso is returning from Indonesia as a postdoctoral staff member to work on Arctic wildfires in a project funded by the Leverhulme Centre for Wildfires, Environment and Society.

**Leonardo Caracci** completed a final year project exploring the fire risk to London residents using the London Fire Brigade incident database. He scored well in his final report, and did a fantastic job presenting his work to the London Fire Brigade's data analysis team. He is currently working on publishing this work in a scientific journal. **Hannah Nevill** completed her final year project on visualisation methods of evacuees during a forest fire, successfully integrating her work into the bigger WUINITY platform. **Nikolaos** worked on developing an improved algorithm for forest fire trigger buffer calculations called K-PERIL, which he integrated into WUINITY and will continue to develop as part of his PhD. Finally, **Olivia Keaton** for her final year project developed a finite element model to study the heat transfer through a timber beam and predict charring rates. We thank you all for your contributions and wish you all the best in your future career!

## Conferences and Outreach

Despite some anticipated Covid-related challenges, this academic year has been an exceptional time for outreach from Hazelab to the fire science community and beyond!

**Matt, Ben, Francesca, and Harry** all presented posters on their research at the 2021 IAFSS virtual conference, which many of Hazelab also attended and even helped run (**Simona, Rikesh and Harry** all taking lead with official media for the event via twitter!).

At the Application of Structural Fire Engineering 2021 conference, **Ben** presented his work on Numerical validation of Firefoam for narrow facade cavity fires.

**Matt and Guillermo** were also special guest speakers on facade fires and peatland fires for the new and rapidly growing Fire Science Show podcast, run and hosted by ITBs own Wojciech Węgrzyński!

**Prof Rein** was also featured in a [video about wildfires](#) by The Sun newspaper, in which he demonstrates the principles of fire dynamics with matches, and discusses good and bad wildfires, firefighting and fire safety.

## Awards

**Guillermo** was awarded the FORUM Mid-Career Researcher Award, which recognizes exceptional achievement and demonstrated leadership in the field of fire safety science. **Francesco Restuccia**, Hazelab alumni, was awarded an honourable mention for best thesis for the thesis titled "Self-heating ignition of natural reactive porous media", conferred by Imperial College. While **Xinyan Huang**, also Hazelab alumni, was awarded the 2020 Early Career Proulx Award. Congratulations to all!

**Francesca** was awarded the first prize at the 2021 Imperial PhD Summer Showcase. The competition is organized by the Graduate School annually to celebrate the research being carried out by the College's PhD students. Francesca submitted a 3-minute video entitled "Fire Safety of Glass Facades" and won over the jury with her stunning illustrations and engaging explanation.

Hazelab's 2018 review paper on smoke emissions from smouldering wildfires has been selected for the Special Issue in the International Journal of Wildland Fire in celebration of the journal's 30th anniversary. The paper was selected as one of the top 15 reviews published in the past 12 years (more than 700 papers!).

## SFPE Greater London Student Chapter

The chapter received a 2021 Bronze Award of Chapter Excellence! This is our second award after the 2020 Silver award, we are now working hard for a gold award in 2022!

To promote the field of fire safety and the amazing people that have advanced and brought innovation to the field, we have launched PYROPEdia, where we develop Wikipedia biographies for our favourite past and present fire safety pioneers. We are currently focusing on diversity, and therefore are promoting scientists and engineers from minority groups. For our first Wikipedia article we worked on the biography of Margaret Law from Arup and the



Fire Research Station UK, who was a key proponent in fire-safe building design and external flaming. We have also announced the second edition of [Flash Points](#), a student communication competition for UK based students.

The chapter's monthly publicly available fire science webinars continue:

- Xinyan Huang from Hong Kong Polytechnic University– Fire Hazard of Dripping
- Iza Vermesi from Bureau Veritas– Fire Engineers What They Do?
- Sandra Vaiciulyte from Arup London– Human Behaviour in Response to Wildfires
- Laura Schmidt from WPI Australia – Char Fall-Off in Cross Laminated Timber Structures
- Birgitte Messerschmidt from NFPA – Fire Safety in US Since 1980
- Egle Rackauskaite from Arup London – Fire Experiment in a Large and Open Plan Compartment: x-ONE

Sign up to our mailing list by emailing [sfpelondonstudentchapter@gmail.com](mailto:sfpelondonstudentchapter@gmail.com) for further updates!

### Collaborations

A collaboration between Hazelab, CERIB and Arup was carried out earlier this year, in which two experiments were carried out on the largest mass timber compartment fire in history (around 380 m<sup>2</sup>), with the aim of understanding how timber performs in larger spaces. A team of Hazelab members (**Harry, Rikesh, and Simona**) were invited to attend and assist in the design and data collection of the experiments. Being at the height of the pandemic, this involved turbulent travel, plenty of self-isolation, and preparing instrumentation in hotel suites! Initial reports from these experiments are [available here!](#)



A very important paper led by Hazelab was finally published. The paper reports observations from a large-scale fire experiment x-ONE conducted in Poland in 2017. The objective of x-ONE was to capture experimentally a natural fire inside a large and open plan compartment. With an open-plan floor area of 380 m<sup>2</sup>, x-ONE is the largest compartment fire experiment carried out to date! The products of this collaboration between Imperial Hazelab, CERIB, ITB, the polish fire service and Arup will be published as an open access paper available on Fire Technology from the 1st of October 2021.

### Coping with the Pandemic

During the pandemic, **Dwi** created artistic images of Hazelab members by modifying photos in very creative and personal ways. The images are inspired by our individual work and have been collected into an online artbook. They are really, really cool, thank you Dwi - [Check out the Artbook!](#)

Our team is adapting and thriving in the new world of remote learning. During the pandemic, our team created and ran a home experiment for the heat transfer laboratory session for second-year mechanical engineering students. **Harry and Guillermo** helped lead development and running of the lab for 168 Mechanical Engineering students, all from the comfort of their home offices!



That's everything from us for now!

*Signed: Francesca Lugares and Harry Mitchell, Imperial College*



## News from the University of Cantabria

### New fire resistance furnace

Reaching the final stage of the installation of a new Fire Resistance Furnace. The furnace has an internal chamber of 1.5 m (width) x 1.5 m (height) x 1.5 m (depth), and allows to analyze the fire resistance properties and behavior of a material when it is exposed to specific heating conditions, using only a fraction of the material required by large-scale standardized furnaces. The installation of this equipment is the result of a collaboration agreement between the University of Cantabria, Fernández-Jove Group and Cantabria Fire Cluster (CIF Cantabria), together with the support of SODERCAN and the Torrelavega City Council for stablishing and operating new facilities.



### Inauguration of Torrelavega Facilities of the Cantabria Fire Cluster (CIF Cantabria)

On March 26, the CIF Cantabria facilities were inaugurated by the Department of Industry, Tourism, Innovation, Transport and Commerce of the Government of Cantabria and the Torrelavega City Council, with the representation of the Cluster members Burnetts Hispania and Hawke Transit System from Fernández-Jove Group, CTC Technology Center, SODERCAN, University of Cantabria, ITM Global, Perlins-Consulting Insurance, PUERTAS ROPER, and SDS STOP FUEGO.



In the facilities, a large-scale calorimeter is already operational to measure variables related to the fires manifestations, such as flame spread, energy released, combustion gas opacity, etc. Likewise, a second large-scale unit is in the process of being installed for testing delimiting and bearing construction elements. These equipments are complemented with various equipments for micro, small and medium scale analysis.

The main objective of CIF Cantabria is to enhance cooperation between the different organizations, equipment and component manufacturers as well as the industry service providers that require or use fire behavior tests of materials for validation, processing, manufacturing, and / or certification of its production processes or manufactured

products. In such a way that they can obtain a higher level of competitiveness, paving the way to guarantee adaptation to technological changes, market challenges and, ultimately, for the general defense of their interests.

### Workshop "New Technologies Applied Self-protection PHASE II" with Renfe Passengers

Last July the Workshop 'New Technologies Applied Self-protection PHASE II' was held at the University of Cantabria, for the Self-protection staff of RENFE Passengers. Within the workshop, a presentation was made by the GIDAI Group at the University of Cantabria to later delve into the capabilities of Computational Modeling and its applicability for improving safety in rail transport and in particular in stations and rolling stock.

Regarding the Fire Computer Modeling, an introduction was made to the models, both mathematical and physical, together with several use cases such as the work carried out in Stations (Maria Zambrano in Malaga, the Albacete railway station, the Train Terminal of the New Mexico City International Airport, Bogotá Metro stations, Madrid elliptical plaza interchange, etc.), railway tunnels, and passenger trains (modeling and real scale fire tests in high-speed train, analysis of new compartmentalization solutions, calculation of thermal loads, etc.).

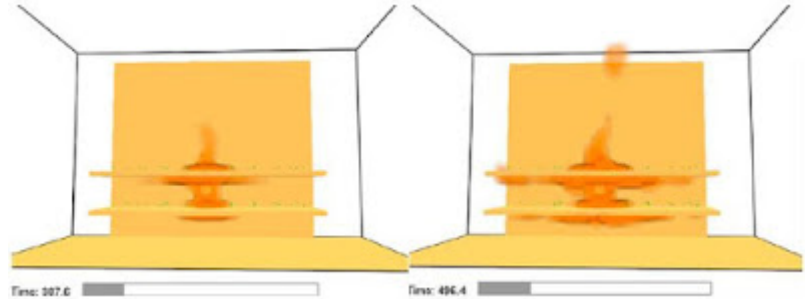
In the case of Egress Modeling, like those carried out for companies such as CAF, or different developments in projects for instance SIGNAL - Intelligent System for Incident Management in Suburban Railways (RTC-2016-5474-4) (AEI / ERDF, EU) to support security



decision-making, the Real Time Evacuation Tool (RTET) developed under LETSCROWD Project (Law Enforcement Agencies human factor methods and toolkit for the security and protection of crowds in mass gatherings ) funded by the European Union's Horizon 2020 Research and Innovation programme under the grant agreement N° 740466.

### PRISME / FIRE benchmark Follow-up Meeting

On June 7 and 8, took place the PRISME / FIRE benchmark follow-up meeting with the participation of GIDAI Group at the University of Cantabria in coordination with the Spanish Nuclear Safety Council. The benchmark focuses on the analysis of the computational modeling of the fire propagation through cable trays in nuclear power plants, with the ultimate aim of establishing a common methodology regardless of the software used to carry out the modeling. The meeting addressed the progress and next steps to be taken.



During the conference, Dr. David Lázaro presented the advances in fire propagation modeling in cable trays through a modification of the FLASH-CAT methodology that together with the FDS computational model allows predicting the fire development in cable trays. This modification allows applying FLASH-CAT to a greater number of scenarios, improving its calculation possibilities.

Signed: Mariano Lazaro Urrutia, University of Cantabria (GIDAI)

## News from Universiti Putra Malaysia

### Welcoming new PhD and Master's students into our group!

Al-Juboori Mays Mahmood Mutlak is a first year PhD candidate who is focusing on a project related to *Investigation of Burning Behavior and Smoke Toxicity of Different Types and Conditions of Photovoltaic Solar Modules*.

Iffah Umairah Zulmajdi graduated in August 2021 from Universiti Putra Malaysia with a BEng in Chemical Engineering. In October 2021, she started her PhD entitled *Comparison of Zone and Field Model for the Probabilistic Simulation of Fire Phenomena* under the supervision of Dr. Mohd Zahirasri Mohd Tohir.

Michael Chong Vui San started as PhD student at Universiti Putra Malaysia in October 2021 after he graduated with a BEng in Chemical Engineering. He plans to work on a research entitled *Assessment of Thermal Radiation Models Performance for Different Fuel Variants*.

Farah Wahida Mohd. Razelan is on her way to earning her master's degree with a project entitled *Identification of Parameters Affecting Patient Evacuation Time in High Rise Hospitals in Malaysia*.



Mays



Iffah



Michael



Farah

### Award received by our member

Iffah Umairah Zulmajdi has received a Student Research Grant from the SFPE Foundation as part of the Spring 2021 Grant Cycle for her PhD research entitled *Comparison of Zone and Field Model for the Probabilistic Simulation of Fire Phenomena*. The award recognizes excellence in her research proposal and the grant includes a \$5000 stipend and opportunities for exposure at:

- SFPE or SFPE Foundation meetings



- The Foundation's website and social media pages
- The FPE Magazine

With the aim of comparing the differences in qualitative and quantitative results of modelling, the grant will be used to support a foreign travel to Building Research Institute (BRE), Warsaw, Poland in year 2022 for a 3-month practical hands-on to the high-performance modelling system of computer. Efforts to identify gaps in which zone models may excel are most welcome since our community relies too heavily on the use of CFD models. She will be given the opportunity to use the computational infrastructure to gain knowledge on performing multi-parametric CFD analyses with FDS code. During her stay in Poland, Iffah Umairah will be directly supervised by Dr Wojciech Węgrzyński, Professor of ITB.

#### **Attachment at Hong Kong Polytechnic University**

Dayang Nur Sakinah Musa has been offered by The Hong Kong Polytechnic University for a 6-month Research Student Attachment Programme. She received a financial support of HKD53,000 from the university. The programme is scheduled from December 2021 to May 2022. Dayang will conduct a meso-scale experiment by varying the effect on smouldering peat fires suppression under supervision of Dr Xinyan Huang from the Department of Building Services Engineering. The results from the experiments will provide insights into lab-scale peat fire suppression which are expected to be compared with field-scale experiments to achieve her research objectives.

*Signed: Zahirasri Tohir, Universiti Putra Malaysia*

### **News from Pprime Institute – Poitiers – France**

#### **Experimental investigation of alcohol fire at large scale with the fire rescue service of Cognac**

A collaboration has been developed with the fire rescue of Charente (near Cognac) which has built a new training school with specific equipment's dedicated to the alcohol fire.

In June, a specific experimental campaign took place. 2 different large-scale fires have been studied with a pool of 18m<sup>2</sup>. The scientific equipment's of Pprime Institute were:

- One high speed camera
- Two infra-red thermal cameras
- On standard video camera
- Two trees of 10 thermocouples
- Two trees of five total fluxmeters.



This first campaign has so permitted a first characterization and understanding of the temperatures, the thermal exchanges and the dynamic of development of such fires. Other campaigns will be programmed.

#### **Mid-scale characterization of chimney fire. Internship of Pauline Dias Lopez**

The origin of chimney fires can be various. The most common scenario is when the fire takes place in the chimney duct or in the chamber of combustion. This fire can be caused by the inflammation of the creosote. In order to study and characterize the inflammation of creosote, a specific bench has been developed at the Ceric Laboratory.

This bench is representative of the semi-real conditions. It is equipped in order to work with varying experimental conditions: a heat gun is placed under the sample holder which temperature is imposed by the experimenter and the composition of airflow is adjusted to generate different atmospheres. Although, the bench is equipped with a scale, 14 thermocouples to follow the evolution of temperatures of creosote and gazes and two gas analyzers: one before the sample holder and one at the top of the duct. The coal chosen to replace creosote is lignite.



One of the aims of experimental tests was to determine the minimum ignition conditions that are representative of the most unfavorable conditions in terms of safety. Under conditions that are similar to the realistic ones (12% of oxygen and airflow at 340°C), it needs at least 20g of lignite to generate an inflammation. Although, these 20g of lignite can ignite if the temperature of airflow exceeds 280°C. Other tests were performed to determinate the maximum temperature reached in the chimney duct by varying the mass of lignite and the oxygen concentration of the airflow. At the maximum, this temperature is 1400°C. For the next studies, a new bench will be developed to drop off the lignite on the inside wall instead of arrange the lignite in a sample holder.

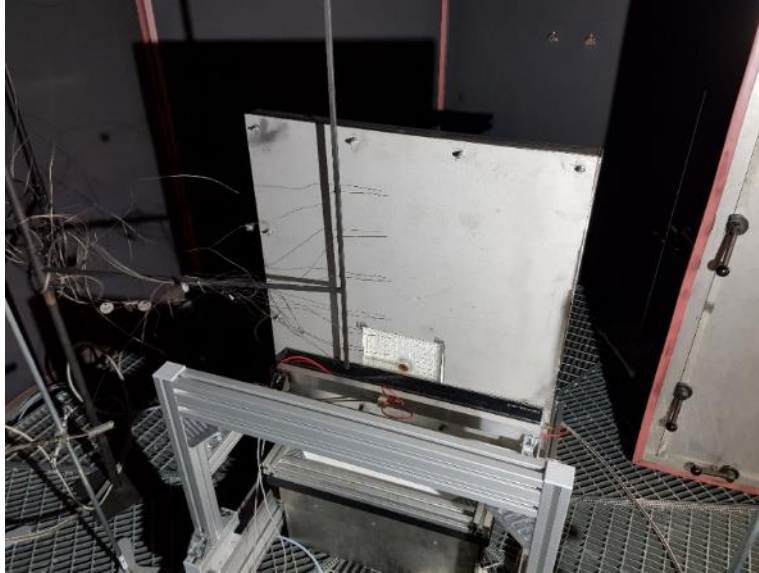
### **Study of the degradation of GB solid fire materials exposed to controlled under-oxygenation regimes simulating real environmental conditions of a fire source in a confined / ventilated environment**

PMMA is an important constituent in a material (ex. Kyowaglas) used as a protection panels for glove boxes in nuclear facilities. A fire in a nuclear installation very often leads to under-ventilated fires as it is highly confined and mechanically ventilated. The amount of oxygen available for combustion will depend on its depletion due to the fire, but also on the supply of air through the ventilation system or openings. A decrease in the oxygen level leads to a decrease in the heat flux from the flame to the fuel surface, which results in a decrease in the pyrolysis rate. The change in behaviour of certain combustion parameters (surface mass flow rate of fuel, convective and radiative heat flux, combustion products, etc.) was also observed. Past studies in this field were mainly done on small scale (cone calorimeter) and are often found that bench scale results do not replicate large scale flame spread. Therefore an intermediate-scale controlled calorimeter apparatus named 'CADUCEE' has been designed and developed at IRSN for full-scale fires with a maximum power of 250 kW. This calorimeter measures nearly 3m in diameter, for a combustion chamber of around 22 m<sup>3</sup>. In the previous work, samples with horizontal configuration are tested and analysed under CADUCEE. The literature shows that change in orientation also affects the time to ignition, surface temperature and pyrolysis rate. Therefore it is of prime importance that these parameters should be studied in under oxygenated condition as well.

In the present work the above study has been extended to vertical configuration and additional radiant panels installed in CADUCEE (to represent soot radiation in the smoke layer in a confined / ventilated environment) and / or a preheater for the oxidizing mixture (to represent hot stale gases near the fireplace). The primary objective of all the tests is to measure the surface mass flow rate of the fuel as a function of the level of oxygen concentration and the incident heat fluxes. Determining this data over a wide range of parameter variations will make it possible to respond to certain still existing gray areas concerning the degradation process of solid materials. This will also make it possible to feed the experimental databases allowing the validation of the ISIS and SYLVIA simulation tools developed by IRSN. The experimental campaign at IRSN is divided into three sub campaigns. In the first place thermal degradation of PMMA will be studied in Vertical configuration in the Absence of external Heater. In the second part thermal decomposition of PMMA will be studied in Vertical configuration but in the Presence of external Heater. At last thermal decomposition of PMMA will be studied in Horizontal configuration in the Presence of external Heater. In these three experimental campaign 3 different size of PMMA sample (200×200, 400×400 and 600×600 mm<sup>2</sup>) will be tested at different O<sub>2</sub> concentration. The study of the scale effect is a second

objective of this work which will be carried out at Pprime laboratory under Cone Calorimeter Atmosphere Control (CCAC) on small PMMA samples.

To perform these objectives Hussain Najmi (Research Engineer) has been recruited by IRSN. This Engineer is working under the supervision of Prof. Thomas Rogaume, Franck Richard and Dr. Benjamin Batiot at Pprime Institute (Poitiers) and Dr Mickaël Coutin at IRSN (Cadarache). This work is part of the research program FIGARO (Fires Involving Glove boxes with Aerosol Release Occurrences) between IRSN, NRA (Nuclear Regulation Authority of Japan) and JAEA (Japan Atomic Energy Agency).



PMMA sample (200×200 mm<sup>2</sup>) in the vertical orientation, with all the sensors (flux meter, thermocouple etc.), inside CADUCEE (before the start of test).

*Signed: Thomas Rogaume, University of Poitiers*

## News from Department of Fire Protection Engineering, Worcester Polytechnic Institute (WPI), MA, USA

### New Members:

Navya Muniraj is a Ph.D. student working under Prof. Albert Simeoni. She received her master's degree in Aeronautical Mechanics and Energetics, major in Propulsion and Energetics from ISAE-ENSMA Poitiers, France. As a Ph.D. student under Prof. Albert Simeoni, her research will be focused on understanding the influence of vegetation distribution and flow on fire behavior and plume development for risk mitigation in prescribed burns.



Sharanya Nair is a Post-doctoral fellow in Prof. Rangwala's group. She received her Ph.D. from the Indian Institute of Technology Madras, India, focusing on the numerical study on methanol flames under natural and forced convection conditions using detailed kinetic mechanisms. She plays a major role in the comprehensive analysis of in-situ burning of oil spills in oceans and ice-infested waters, using analytical and computational methods. She also works on the analysis of experimental data by conducting flame shape studies through image processing and edge detection. Additionally, her research also includes understanding fires in pit burners.

Muthu Kumaran Selvaraj is a Post-doctoral fellow in Prof Simeoni's group. He received his Ph.D. from the Indian Institute of Technology Madras under the guidance of Prof. V. Raghavan, where he focused on understanding the structure, stability and emission characteristics of LPG-Air diffusion flames in different configurations using a comprehensive numerical model coupled with a short kinetic mechanism. At WPI, his work will focus on a multiscale study of the influence of vegetation distribution and flow on fire behavior and plume development for risk mitigation in prescribed burns characterizing multiscale feedbacks between forest structure, fire behavior, and effects.







Juan Cuevas is a Post-doctoral fellow in Prof Simeoni's group. He received his Ph.D. from The University of Queensland, Australia, under the supervision of Dr. C. Maluk and Prof. J. L. Torero. His Ph.D. research focused on determining the critical conditions that lead to the self-extinction of timber and the influence that relevant parameters such as the oxygen concentration in the surrounding atmosphere and the moisture content in the material have over it. At WPI, his research focuses on determining the reliability of fire pattern indicators used in wildland fire investigation.

#### **Current Research:**

##### **Outdoor Gas Emissions Sampling (OGES) system**

*Hsin-Hsiu (Matt), Ali Rangwala*

The goal is to utilize this system to measure combustion product concentrations at discreet points within the smoke plume and create an inverse modeling scheme to estimate the HRR of a fire of any size, particularly ones that exceed the capacity of known calorimeters. This can also be applied to outdoor fires, where existing calorimeters have limited application.

##### **Examining the Influence of Waves on a Burning Fuel Floating on Water**

*Nathaniel Sauer, Mahesh Kottalgi, and Ali Rangwala*

Environmental fuel spills pose significant threats to ocean ecosystems, and in recent times their prevalence has only grown. In-situ burning is a widely utilized method of mitigating these oil spills and is conducted by gathering and burning the spilled oil in-place on the ocean surface. This novel project at WPI aims to examine the influence of surface water waves on the speed and efficiency of a burning fuel floating on water. To complete these experiments, a large wave-tank was designed and built at the WPI Fire Protection Engineering Performance Engineering Laboratory. This wave tank (12 feet long by 6 feet wide by 3 feet tall) holds over 1,000 gallons of water and can generate waves with various parameters for testing.

[https://drive.google.com/file/d/1cye08Y-YvEnYzjXNKS4x\\_T0I54GwiDb\\_/view?usp=sharing](https://drive.google.com/file/d/1cye08Y-YvEnYzjXNKS4x_T0I54GwiDb_/view?usp=sharing)



##### **Study of the Reliability of Fire Pattern Indicators used in Wildland Fire Investigation**

*Juan Cuevas, Albert Simeoni*

As demonstrated by the devastating events over the last few years, wildland fires have a dramatic impact on the environment, human life, and property and can cause significant economic losses. To face this challenge and address the issues related to the ignition of wildland fires, it is necessary to ensure that their origin and causes are accurately determined.

In the United States, in addition to NFPA 921, the Guide to Wildland Fire Origin and Cause Determination are the primary documents that provide guidance on conducting wildland fire origin and causes investigations for government agencies. Both of these documents present systematic approaches to wildland fire investigation based on fire pattern indicators. A fire pattern indicator is a physical object or artifact that displays changes when affected by a fire. An overall fire pattern is derived from the accurate analysis of individual fire pattern indicators and shows the general fire progression. The reliability of the fire pattern indicators is an ongoing discussion. To the best of our knowledge, there are no systematic scientific studies that support any assessment of the indicators.

This research project proposes the development of a first dataset based on experimentation at field and laboratory scales that assesses the reliability of fire pattern indicators related to fire behavior and local fire conditions used in wildland fire investigation to determine the area of origin. This project is conducted in collaboration with the USDA Forest Service and is funded by a grant from the National Institute of Justice, a research, development and evaluation agency of the U.S. Department of Justice.



## Outgoing Students

Li Chang joined WPI for the Ph.D. program of Fire Protection Engineering in 2016. He holds a BS and MS in Safety Engineering from the Beijing Institute of Technology. As one of the research members in the WPI Combustion lab (<https://combustionlab.wpi.edu/>), his research focuses on pool fire-related subjects aiming to improve clean-up techniques used in oil spill accidents. He defended this thesis successfully in Sept, 2021 under the guidance of Prof. Ali Rangwala.

### Thesis Abstract:

In recent decades, the hazard associated with crude oil spills has been a major environmental concern with the increasing demands of offshore drilling and oil tanker transport. Enhancing the burning of hydrocarbon liquid fuel floating on water has been a problem of great interest, as it optimizes oil spill clean-up technique called in-situ burning (ISB). Over the last five years, WPI has been developing a concept named Flame Refluxer™ based on immersed thermally conductive objects to transfer heat generated by the combustion back to the fuel to create a feedback loop. The resulting enhanced heat transfer from flame back to the fuel helps sustain a significantly increased burning rate. This work explores the burning enhancement using immersed conductive objects on a wavy water surface.



The study introduces a novel bench-scale experimental platform capable of simulating ocean-like turbulent conditions in a controllable fashion and investigates the influence of the turbulent water sublayer on dodecane/heptane slick fires with an immersed copper rod by a series of lab-scale experiments. Results show that the turbulent convection at the water sublayer is the most important factor responsible for weakening the burning speed. It can stop the nucleate boiling on the rod's surface by taking away heat from the rod's bottom area. The finding of the experimental studies provides the required knowledge to model the burning rate of the fuel layer, which helps to reveal the thermal behaviors of the immersed copper rod with the turbulent water sublayer. Since the rod placement is designed to enhance the burning efficiency of the floating fuel slick, the results of this study are essential to understand the potential of the immersed conductive object application on in-situ burning in dynamic natural water environments.

*Signed: Juan Cuevas, Worcester Polytechnic Institute*

## CALL FOR CONTRIBUTIONS

To continue succeeding with this newsletter, it is important that we receive contributions from the IAFSS membership at large. Please consider submitting articles, letters to the editor, images, news, announcements or job openings related to fire safety science of IAFSS members. These could be collected from your department, institution, country or region. Please send your contributions to the Editor (Rita Fahy, [rfahy@nfpfa.org](mailto:rfahy@nfpfa.org)).

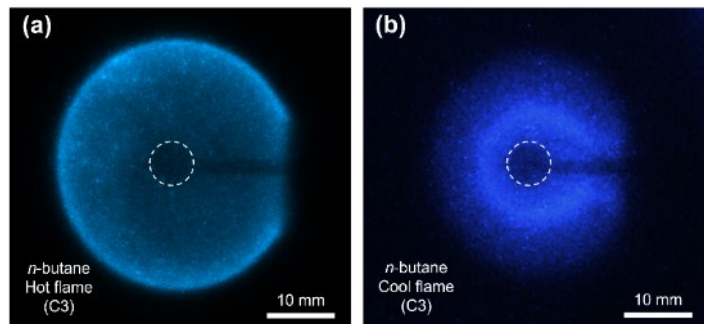
*Letters to the Editor* are most welcome, anytime, in response to newsletter content or any other topic related to the IAFSS.

**For the next issue (No. 48), the deadline for submissions is  
April 30, 2022**

## News from the University of Maryland (USA)

### Unusual Cool Flames Discovered Aboard the International Space Station

Spherical cool diffusion flames burning gases were observed for the first time in June, 2021. Unlike hot flames, cool flames have peak temperatures of just 600 - 1000 K. The flames were observed aboard the International Space Station during tests of the CFI-G experiment. The researchers include Minhyeng Kim, Peter Sunderland, and Kendyl Waddell, all of UMD. The burner was a 6 mm porous sphere fed by *n*-butane diluted with nitrogen. The ambient gas was 40% oxygen in nitrogen at 2 bar. The researchers noticed that after the hot flames extinguished radiatively, cool diffusion flames appeared. The flames were too weak to detect except with sensitive radiometers and an intensified video camera. Measurements in these flames could help improve the understanding of ignition processes in fires and engines.



### Informal Settlement Fire Research

A team of six UMD undergraduates led by Jim Milke has investigated the factors that cause fire safety inequities around the world to help propose solutions. The team examined fire safety measures in workplaces and informal settlements where millions of people live in slum conditions in South Africa, Bangladesh, and Puerto Rico. They partnered with Kindling, a nonprofit that aims to reduce the impacts of fire on people living in informal settlements, displaced persons camps, and emerging cities generally. Among the team's suggestions to reduce workplace and household fires was the use of reliable fire detection systems. Students also developed low-cost, non-technical solutions such as increasing awareness about fire hazards through public education.

### UMD Research Team Wins 2021 Harmathy Award

The Tibor Z. Harmathy Award is presented annually to the student author who led the best Fire Technology paper. It includes a cash prize of \$1,000 from Springer. For 2021 two UMD researchers were authors of the winning paper, which was J.L. Doermann, E.D. Kuligowski, J. Milke, From Social Science Research to Engineering Practice: Development of a Short Message Creation Tool for Wildfire Emergencies, Fire Technology 57 (2021) 815-837.

### Shaheer Ahmad Receives 2021 UL FSRI Fellowship

Shaheer Ahmad, an FPE MS student, has been awarded the 2021 UL Firefighter Safety Research Institute Graduate Fellowship. His research will examine heat transfer through firefighter turnout gear. He will be advised by James Milke.



### Andre Marshall Appointed VPR of George Mason University

Andre Marshall has left UMD to become George Mason University's Vice President for Research, Innovation and Economic Development and President of the George Mason University Research Foundation. He has also joined the faculty of the Volgenau School of Engineering. We are sad to lose him but know he will do great things at GMU.

### Sunderland Named Fellow of the Combustion Institute

Peter Sunderland was named a Fellow of the Combustion Institute in February, 2021.

### Masters Degrees Conferred

During January-September, 2021, these students successfully defended their M.S. theses in Fire Protection Engineering:

- Lucas Crofton, Evaluation of Impact of Novel Barrier Coatings on Flammability of a Structural Aerospace Composite through Experiments and Modeling (Stoliarov).
- Bhatia Deepanshu, Pyrolysis Modeling and Material Property Validation with Flame Heat Feedback Model Application (Milke).
- Kathryn Donlin, Determining Available Safe Egress Time Using a Variable Fractional Effective Dosage Analysis of Heat and Asphyxiant Gases In Single -Story Occupancies (Milke).
- Danielle Knox, Potential Effects of Increased Individual Size on Stairway Egress Time (Milke).
- William Saar, Development of a Comprehensive Pyrolysis Model for Flexible Polyurethane Foam (Stoliarov).
- Karolyn Steranka, Feasibility Analysis and FDS Modeling of Water Mist Fire Suppression Systems for Protection of Aircraft Hangars (Milke).
- Anna Wright, Using a Burning Rate Emulator to Analyze Flame Extinction Time on the International Space Station (Sunderland).

- Hongda Xu, Simulations of Fire Smoke Movement in High-Rise Buildings With FDS (Trouve).
- Hongen Zhou, Development of a Pyrolysis Model for Oriented Strand Board (Stoliarov).

Signed: Peter Sunderland, University of Maryland

## News from York University (Canada)

### Research news

You can follow our research activities at YorkUFire.com ; @galesfiresafety on twitter and yorkufire on Instagram. The YorkU fire lab was pleased to begin re-opening in June of this year. Team members began to systematically clear the backlog of experiments, and take on new experiments and projects. One major project involved the establishment of a living lab on campus to explore aspects of fire protection of heritage properties. While very early in planning, the project involves themes of BIM, design, and sensor based technologies. We anticipate more news to come from this very exciting project for the community in 2022.

We have also recently published a collaborative study in with Kindling (Danielle Antonellis) and Arup (Sandra Vaiciulyte) on Human behaviour in informal settlement fires in Costa Rica. Led by graduate students Sara Arce and Chloe Jeanneret, this study considered real body camera footage as recorded from the fire brigade of a settlement fire in 2019. This paper introduced a methodology for situational analysis and documentation of human behaviour responses based on video footage of informal settlement fires. It provided key insights to how key stakeholders such as the Costa Rican Fire Corps, the police and informal settlement dwellers interact with each other and respond to fires in informal settlements in Costa Rica. These results form a first-stage contextualization of informal settlement fires in Costa Rica, which can be used to inform the Costa Rican Fire Corps, non-governmental organizations and other stakeholders that may be able to support fire safety improvements in Costa Rican informal settlements. We are still actively expanding this study in the coming year supported additionally with field and material scale testing. The full paper can be found here:

- Arce, S., Jeanneret, C., Gales, J., Antonellis, D., and Vaiciulyte, S. (2021) Human Behaviour in Informal Settlement Fires in Costa Rica. Safety Science (Elsevier) 142. <https://doi.org/10.1016/j.ssci.2021.105384>

### Team Growth and News

Congratulations to Tim Young (*Semi-automated Analysis of Pedestrian Behaviour and Motion for Microsimulation of Transportation Terminals*), Georgette Harun (*Heritage Considerations in Fire Safety Engineering*), and Chloe Jeanneret (*Alternative Solutions for Canadian Fire Engineering Design*) for completing their masters theses this summer. Despite the global complications and lab shut down last year, each student managed to complete on time. Both Tim and Chloe will be continuing as doctoral students this fall in our research group. Georgette is remaining to help us with our living lab project this fall before moving onto exciting new endeavors. Congratulations also to Bronwyn Chorlton (*The Thermo-Mechanical Response of Structural Timber in Real Fire Exposures*), who successfully defended her PhD thesis. She now joins FPInnovations.

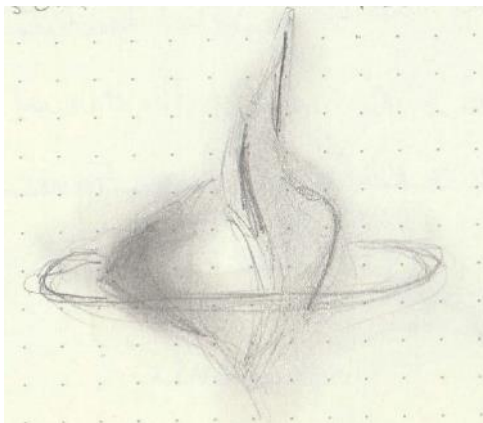


Figure 2 Team member Chloe Jeanneret (an original sketch of the blue whirl by her shown) has helped launched an Eastern Canada Student chapter of SFPE.

Team member Chloe Jeanneret has also formed a new student SFPE chapter in Canada that represents four Canadian universities and aims to operate as a bilingual student chapter. The chapter represents the Eastern Canada location.

We are also very pleased to announce our fire research team's results for the NSERC (federal) and OGS (provincial) student scholarships for 2021-22. This year alone team members have been awarded over \$250k in research scholarships through external programmes. Nine of our team members were successful in this particular round. This includes 2 doctoral NSERC PGS-D awards, 4 masters NSERC CGS and OGS graduate awards, and 3 NSERC USRA awards. Congratulations to Anne, Chloe, Ethan, Hannah, Katie, Melissa, Scott, Seth, and Tim. These students will be studying a range of fire engineering research topics with applied industrial focus. The range of topics ranges from the fire design advancements for steel



Figure 1 Art work illustrates a informal settlement fire and was prepared by team member Natalia Espinosa-Merlano based on a photograph by Paulo Pampolin.



and timber, human behavior and accessibility, heritage structures in fire, BIM for fire design, wildfires, and fires in informal settlements. Our group is very proud of these students and our previous alumni. Over the last six years these amazing people have won 78 major scholarships to date on our team. In the Fall of this year we will be announcing additional fully funded graduate student thesis positions in fire engineering for a 2022-23 intake. The positions will be in the area of timber structures in fire. These positions are being created for people outside our team looking to join us from across Canada.

Stay tuned - a lot more research news from our group is still to be announced shortly!

*Signed: John Gales, York University*

## **News from CERIDES – Excellence in Innovation and Technology, European University Cyprus**

CERIDES – Excellence in Innovation and Technology has been growing steadily in the last few years. CERIDES is now home for 40 Researchers and Faculty working in over 25 projects funded by Horizon 2020, the European Civil Protection Mechanism, National and Private funding bodies.



Summer 2021 was marked by a number of emblematic environmental catastrophes. The August fires in Greece with an unprecedented offer of help from 21 countries, Cyprus, Israel and Turkey fires were important milestones in the wider area of SE Mediterranean. CERIDES is taking active part in and coordinates a number of initiatives that aim to support Governmental and Regional Collaboration.

Below you will find information about some of the current projects that CERIDES participates in.

### **RESPOND-A Next-generation equipment tools and mission-critical strategies for First Responders (funded by H2020)**

On 29 and 30 September, the H2020-funded RESPOND-A Project organized its second training session in Limassol, Cyprus, to familiarize first-responders with the use of RESPOND-A technologies.

In the first week of July 2021, a massive wildfire erupted in Cyprus, burning an area of around 55 square kilometers and causing the death of 4 people. With the support of several other nations which provided assistance and firefighting aircraft (Greece, Israel, Italy, UK), the blaze was fully under control 48 hours later.

“Wildfires are a permanent threat in countries such as Cyprus. It is important for us to be aware of existing innovative technologies that could help us to tackle these disasters more rapidly and effectively” Christophoros STYLIANOU, Head of the Limassol Fire Station

**RESPOND-A (Next-generation equipment tools and mission-critical strategies for First Responders)** is an EU-funded research project aimed at enhancing the capabilities of first responders through the use of innovative technologies. Training is also a key component of the project to familiarize first responders with innovative solutions using realistic use case scenarios.

After a first training that took place fully online in December 2020, this second training was held both online and on-site on 29-30 September 2021. The innovative technologies presented during the training included:

- MAESTRO: a Real-time disaster area management system
- Tag & Trace: Easy-to-use Patients’ Triage & Tracking System
- XBELLO: Secure 5G Application for real-time information exchange
- BELL/DFP: Data Format Fusion System
- UAV-based Communications System
- Interactive multi-view VR360 video tool for enhanced situation awareness
- Next Generation Connectivity Platform





First responders had the opportunity to use and experiment these technologies, namely in a virtual reality (VR) fire scenario and field exercise. This exercise was not only a way for practitioners to experiment with these new technologies, but it is also a great opportunity for technology providers of RESPOND-A to collect feedback on the usability of their solutions.

For more information about the project and our upcoming activities, visit our website [www.respond-a-project.eu](http://www.respond-a-project.eu)

### **Pyrolife (funded by MSCA H2020)**

CERIDES is home to two Early-stage researchers (ESR 11: Judith Kirschner and ESR 13: Pooja Pandey) under the guidance of Prof. George Boustras, that focus in wildfire management policy and governance in Europe.. Pyrolife funded by the Marie Skłodowska Curie Action and Horizon 2020 is a research and training network on integrated wildfire management with its main goal of shifting the focus from reactive fire suppression to active fire prevention. Pyrolife trains 15 early-stage researchers across the globe to pursue cross-disciplinary, wildfire-focused research projects.

For more information on the Pyrolife project, beneficiaries and ESRs, check the following link <https://pyrolife.lessonsonfire.eu/>

### **FIREURISK - Developing a Holistic, Risk-Wise Strategy for European Wildfire Management (funded by H2020)**

FIREURISK is an H2020 project coordinated by our ADAI, University of Coimbra Colleagues. FIREURISK will develop, evaluate and disseminate a science-based integrated strategy to: 1) expand current wildland fire risk assessment systems, including critical factors of risk previously not covered; 2) produce effective measures to reduce current fire risk conditions, and 3) adapt management strategies to expected future climate and socio-economic changes. This will be achieved in close collaboration between researchers, stakeholders and citizens, integrating novel technologies, guidelines and policy recommendations to improve current systems and practices from regional to EU scales. The project will address all wildfire types, with particular focus on mega-fires, the Wildland Urban Interface and fire challenges in the Northern EU. A risk-centred management strategy will integrate wildfire prevention, suppression and restoration practices and policies in a holistic conceptual framework, and implement an operational platform that supports joint coordination, professional training and operational exercises, involving multiple stakeholders and addressing all relevant wildfire management tasks, to improve protection of citizens exposed to wildfires.

FIREURISK will (a) model socio-economic issues and human activity influencing fire ignition, vulnerability and exposure, (b) evaluate the impact of National and EU policies on land use change, rural economy and development, in context of expected future fire regime changes, and (c) consider potential cascading effects linked to wildfire situations. This will allow FIREURISK to deliver innovative risk-informed regional planning approaches that are effective in increasing the resilience of local communities, ensuring safety and enhancing protection of assets and economic activity. The resulting advances in fire risk reduction will be linked to innovative organisational and efficient business models that promote cost-effective bio-economy and nature-based solutions.

*Signed: Prof George Boustras, Director, CERIDES – Excellence in Innovation and Technology*

### **News from ZAG – The Slovenian National Building and Civil Engineering Institute**

On October 1, Grunde Jomaas started as the ERA Chair for the FRISSBE (Fire-safe sustainable built environment) project. FRISSBE, which is hosted by ZAG ([www.zag.si/en](http://www.zag.si/en)), will have regional impacts in terms of research, education, and engineering practice. The team will build a strong interactive ecosystem with the InnoRenew CoE and the University of Primorska, where Grunde Jomaas is now a full professor, as well as with other supporters of the project. A full description can be found on the project website: <https://www.frissbe.eu/>.

An important long term goal of the FRISSBE project is to establish and maintain an internationally recognized research team in the field of fire-safe sustainable built environment and to establish effective and efficient support services within ZAG with the overall aim of supporting research activities and lead ZAG towards scientific excellence in the international sphere, also after the successful completion of the FRISSBE project.

To achieve this goal, we currently plan to hire for the following 11 positions:

- 2 senior researchers (job postings will follow soon)
- 6 postdoctoral researchers
  - We plan to hire 2 postdoctoral researchers in Q2 2022



- We plan to hire 2 postdoctoral researchers in Q1 2023
- We plan to hire 2 postdoctoral researchers in Q1 2024
- 3 PhD students
  - The first 2 PhD students will start on 1st October 2022 (when the student year starts)
  - The third PhD student will start on 1st October 2023 (when the student year starts)



The main workplace for the FRISSBE team will be in the new state-of-the-art fire laboratory in Logatec. A render of the lab is shown (right). It will be operational in the beginning of 2022.

*Signed: Prof Grunde Jomaas, Chair*

## News from University of California, Berkeley

The Berkeley Fire Lab, run by Prof. Michael Gollner <http://firelab.berkeley.edu> and working together with Prof. Carlos Fernandez-Pello, who runs the adjacent Combustion and Fire Processes Lab, are working on a variety of combustion and fire research topics. Some recent updates include:

- Prof. Michael Gollner was recently promoted to Associate Professor with Tenure in the Department of Mechanical Engineering at the University of California, Berkeley
- Dr. Mohammadhadi Hajilou recently joined the lab as a postdoctoral scholar working on fire whirls.
- Kelly Clevenson, Mackenzie Conkling, Siyan Wang and Michael Wright recently joined the laboratory as Ph.D. students.
- PhD Candidate Xingyu Ren was recently awarded the SFPE Student Scholar award and will make a presentation on his recent work on wildfires at the SFPE Annual Meeting.
- PhD Candidate Priya Garg was awarded with Ralph A. Seban Heat Transfer Fellowship and Ernest and Marjory Starkman Fellowship in recognition of distinguished academic records by the department of Mechanical Engineering, University of California, Berkeley. Her work is focused on the quantification of gaseous and particulate emissions from wildland vegetative fuels at different moisture content and under different combustion conditions like flaming and smoldering.
- PhD Candidate Christina Liveretou was awarded an Onassis Foundation Scholarship to help support her PhD. Her work is focused on microgravity flammability in collaboration with NASA and smoldering combustion research.
- Dr. Raquel Hakes Weston-Dawkes recently defended her Ph.D. on analytical analysis of inclined fires and risk modeling for wildland fires. She recently started a postdoctoral scholar position at Sandia National Laboratory.
- Dr. Lauren Gagnon also recently completed her PhD on the burning of wire insulation materials with applications in space exploration atmospheres. She has now joined FM Global's Flammability Team as a postdoc.
- Dr. Sriram Bharath Hariharan recently completed his postdoc on fire whirls at the University of California, Berkeley and started a position at Lucid Motors.

### Conference presentations by group members:

#### 13<sup>th</sup> IAFSS Symposium (April 26-30, 2021)

1. Priya Garg et al. presented a poster titled, "The Effect of Species and Moisture Content on Emissions from Vegetative Fuels".
2. Xingyu Ren et al. presented a work titled, "Temperature measurement of a turbulent buoyant ethylene diffusion flame using a dual-thermocouple technique".
3. Lauren Gagnon "Effect of reduced ambient pressures and opposed airflows on the flame spread and dripping of LDPE insulated copper wires"
4. Zhengxiang Tao "Effect of firebrand size and geometry on heating from a smoldering pile under wind"
5. Franz Richter "Chemical Reaction Neural Networks (CRNN) for Autonomous Biomass Pyrolysis Kinetic Modelling"

#### 12<sup>th</sup> US National Combustion Meeting

1. Autonomous kinetic modelling of biomass pyrolysis with Dr Ji and Prof Deng at MIT was presented. Franz Richter

2. Xingyu Ren et al. presented a work titled, "Downstream heating and flow dynamics of inclined fires."

#### International Conference on Environmental Systems

1. Luca Carmignani presented: "The effect of reduced pressure on the characteristics of spreading flames"
2. Alumna and collaborator Sonia Fereres presented our joint work titled, "Determining the Cause of Reduced Concurrent Flame Spread over Thin Solid Fuels in Low Pressure and Low Gravity"

#### Recent papers accepted:

1. P. Garg, T. Roche, M. Eden, J. Matz, J.M. Oakes, C. Bellini and M.J. Gollner, "Effect of moisture content and fuel type on emissions from vegetation using a steady state combustion apparatus" in the International Journal of Wildland Fire.
2. X. Ren, X. Ju and M.J. Gollner. "Effect of freestream turbulence on the structure of boundary-layer flames" in Combustion and Flame.
3. L. Gagnon, V.P. Carey, C.Fernandez-Pello "Using an Artificial Neural Network to Predict Flame Spread Across Electrical Wires" in the Journal of Energy Resources Technology
4. L. Carmignani, Flame Tracker: An image analysis program to measure flame characteristics, SoftwareX

#### **Other Awards:**

Congratulations to Dr. Sriram Bharath Hariharan, postdoctoral scholar, Joseph Dowling, PhD candidate, and PI Michael Gollner on their Combustion Art submission "Walls of Fire" which was selected for the Technical Merit Award in the 12th US National Combustion Meeting!

#### **Walls of Fire**

by Sriram Bharath Hariharan, Joseph L. Dowling, Michael J. Gollner, Department of Mechanical Engineering, University of California, Berkeley

Fire whirls can form under a variety of different flow conditions. One common flow condition that results in their formation is the presence of multiple line fires, which cause buoyant plumes (walls) to surround a central pseudo enclosure. The low pressure in this region is conducive to the entrainment of swirling flow, resulting in the formation of a fire whirl. This image shows a laboratory study of this configuration, formed using a fuel pool 10 cm in diameter, surrounded by four line fires, all with n-heptane. This image was captured using a Nikon D500 at f/14 with an exposure time of 1/800 s.



The authors thank the Bureau of Safety and Environmental Enforcement (140E0121C0004) for supporting this work.

*Signed: Prof Michael J. Gollner, University of California, Berkeley*

## **News from Luleå University of Technology**

### **Exploring the salmon aquaculture waste from net cleaning facilities as a potential fire-retardant material for Scots pine (*Pinus sylvestris* L.) sapwood**

Due to the new technologies, mass timber systems and environmental benefits there is an increasing interest in high-rise wood buildings around the world. The regulations require that such wooden structures meet prescribed performance for fire-resistance. The conventional wood fire-retardant processing techniques involve vacuum-pressure impregnation or applying fire-proof coatings to the wood surface without modifying the intrinsic properties of material. Studies showed that many compounds containing B, P, Al and N are to be effective fire retardants. Oxides of Si, Mg, Ca, Fe and Cu were also studied as fire retardants. These are supposed to absorb heat and act as flame-suppressing materials.

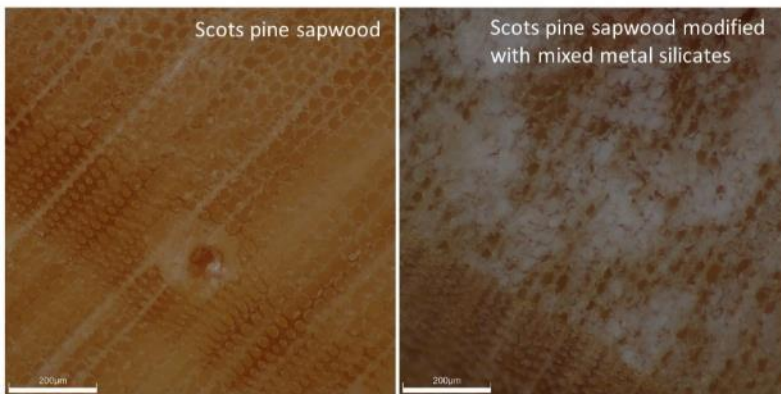
On the other hand, waste resources coming from the fisheries, aquaculture and fish processing sectors are abundant source of such metals. It is expected that the amount of farmed fish in Norway will increase fivefold by the year 2050, and optimizing the exploitation of available waste resources for the recovery of nutrients, energy and biomaterials is therefore vital in the future circular economy society.



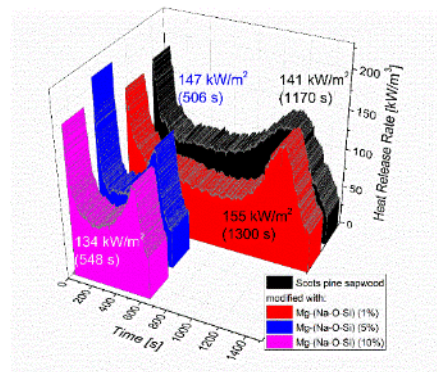
Researchers from Luleå University of Technology working on Swedish Research Council FORMAS project “Utilization of solid inorganic waste from the aquaculture industry as wood reinforcement material for flame retardancy” (grant no. 2018-01198) study the reinforcement of the sapwood of local scots pine (*Pinus Silvestris L.*) with inorganic materials recovered from the salmon farming industry. Project leader Assoc. Prof. Edita Garskaite, Wood science and Engineering Division, together with colleagues Prof. Michael Försth and Dr. Alexandra Byström from Structural and Fire Engineering Division, examined fire retardancy of wood threatened using different formulations, i.e. Scots pine wood impregnated from aqueous solutions containing mixed metal silicates as well as coated with solid valorised aquaculture waste. In this project, we try to find less corrosive, leach-resistant, cost-efficient and environmentally-friendly fire retardant formulations.



Edita near the industrial wood impregnation autoclave used to treat Scots pine sapwood.



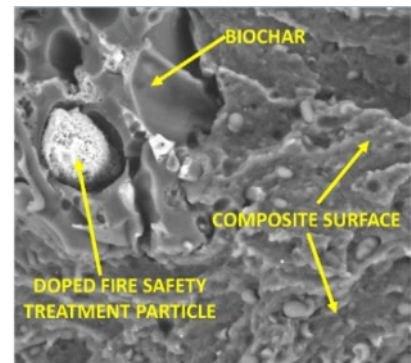
Optical images of Scots pine sapwood, without and with modification by mixed metal silicates.



HRR curves of the scots pine sapwood impregnated with mixed-metal silicates.

### Functionalised biochar for fire-retardant & bio-based composites

Biochar is a sustainable material, which is conventionally used for soil amendment, filtration and contaminant remediation. However, biochar has also been proven to be a potent mechanical reinforcement in composite materials. On the other hand, fire safety of composite materials and structures is critical to safeguard the live of humans and prevent structural collapse. Although various treatments can effectively enhance the fire safety of composites, they have detrimental effects on the mechanical properties. Hence, it is imperative that fire safety treatments should alleviate holistic material/structural properties. In this light, Brandforsk has kindly funded a project where biochar will be used by us as a beneficial trojan horse to deliver fire safety treatments, which can then simultaneously bestow flame resistance and conserve or improve mechanical properties. In essence, we will functionalise biochar wherein fire safety treatment particles will be housed (i.e., doped) inside the many pores of biochar from where they can do their duty to quench flame without interfering with the polymeric matrix.



Doped biochar in composite

### New colleague

Rhoda Afriyie Mensah is a Post-Doctoral fellow at the Division of Structural and Fire Engineering in LTU. She joined the team officially on 1<sup>st</sup> September 2021 and works with Dr. Oisik Das, Prof. Michael Försth and Prof. Gabriel Sas.

Rhoda has considerable knowledge on flammability of polymers and wood. She is one of the few researchers in the world investigating the integration of artificial intelligence in fire safety. Her previous work focused on the use of machine learning techniques for material flammability-parameter prediction. Currently she is working on imparting fire safety in structures using sustainable biochar and bio-graphene. We are very happy and proud to have Rhoda on board our team.

Signed: Michael Försth, Luleå University of Technology



Rhoda performing cone calorimetry tests.

## News from University of Sheffield

### New arrivals

The Department of Civil and Structural Engineering welcomes Dr Martyn S. McLaggan as the new Lecturer in Low Carbon Design. He moves from UQ (Australia) and brings expertise in the fire safety of low carbon materials, particularly cladding and natural materials. He joins the longstanding University of Sheffield Structural Fire Engineering team including Dr Shan-Shan Huang, Prof. Buick Davison, Dr Giacomo Torelli, Prof. Ian Burgess (Emeritus), and Prof. Roger Plank (retired).



### Projects

We have recently started a collaborative research project titled 'Stainless steel reinforced concrete in fire – Is spalling important?' together with Brunel University London (Dr Katherine Cashell), and Zero Waste Works (Dr Harris Angelakopoulos).

The project will conduct fire spalling tests on stainless steel reinforced concrete specimens. The influence of key parameters such as material grade, cover distance and presence/type of fibres (including Recycled Steel Tyre Microfibres - RSTM) will be examined. This information is currently lacking, and is required so that engineers have the confidence to specify stainless steel rebar (with RSTM) in critical infrastructure projects such as tunnels, bridges, flyovers, etc.

The project is funded by the Research, Development & Innovation towards Engineering Excellence Panel of the Institution of Civil Engineers (ICE), UK.

### Conferences

Congratulations to the Eurosteel 2021 organising team! Europe's biggest steel construction conference ran successfully from Sheffield over the first three days of September. Despite the COVID-19 challenges, which caused the conference firstly to be postponed for a year and then changed to an online event, the conference was a huge success! Over 400 delegates from academia and industry came together (virtually) to present the latest innovations in research to support the use of steel in the construction industry.



The local organizing committee was Ian Burgess (Chair), Buick Davison, Shan-Shan Huang, Iman

Hajirasouliha, Danielle Densley-Tingley, Jurgen Becque (who used to be local), Rosie Lynch and Gemma Newsome. Organising committee members chaired many of the sessions, introducing the pre-

recorded talks followed by a live Q&A session, and Danielle chaired a live discussion panel with panellists in the 'studio' in the Diamond (the specialist engineering education facility on campus) and joining remotely.

The Eurosteel2021 email inbox was filled with positive comments and feedback leading Ian to remark: "Despite the fact that I will never again attempt anything similar, we couldn't have had a better team!"

So well done all!

*Signed: Martyn McLaggan, Shan-Shan Huang & Ian Burgess, University of Sheffield.*

## News from LEMTA – OS Feux, University of Lorraine

Twitter: LEMTA (@Labo\_Lemta) / LEMTA-OS Feux (@FeuxOs)

Web site: <https://lemta.univ-lorraine.fr>



**Events.** Our research group on *Fires* in Nancy was of course hampered by the pandemic, as was the fire community as a whole. However, we could work under satisfactory conditions. Our test platform worked properly, allowing us to carry out our experimental studies under almost normal conditions, and the laboratory remained open without restriction.

We recently procured an excellent laser instrument for spatially resolved measurements of size and velocity of droplets and the characterization of flux density of droplets. Moreover, we are soon acquiring a hyperspectral camera which will complete our set of instruments for radiation characterization. Correspondingly, we expect to have new research outputs regarding the understanding of fire problems in this area. Needless to say, any collaboration proposals on the related topics are warmly welcomed by LEMTA!

The exchanges with our external colleagues were mainly done remotely during this year, but we were able to launch new projects and managed to still have some direct contacts. We regret of course that the Symposium did not allow us to see our colleagues from all over the world as much as we would have liked, but we were able to take advantage of the video-conference and chat tools to exchange with them.

**Research .** We are still contributing to the LASHFIRE project for the improvement of fire safety aboard ro-ro ships (with funding from the European Union's Horizon 2020 under grant agreement no 814975). We completed an extensive experimental campaign for the study of fire containment using water mist and fabric curtains in a reduced-scale deck of a ro-ro ship that was 8 meters long, with more than 100 experiments conducted during winter 2020 and Spring 2021. We now have ample data regarding the capabilities of water curtains and fabric curtains for the containment of fires in ro-ro space configurations. A solution that is based on fabric curtains is now being studied at the large scale by our partners at RISE. Moreover, evacuation simulations have been performed using the in-house code AMERIGO to identify the potential weaknesses and improvement possibilities regarding the evacuation of ro-ro passenger ships.



Investigation of Cargo Effects on Fire and Smoke Dynamics in a Fully Open Deck

A second major project dedicated to façade fires, named FIREWALL+, is also under way. Large-scale experiments were planned during the fall with our partners, CSTB and CETHIL laboratory. Small-scale experiments with controlled fuel-supply are also considered, while numerical simulations are planned in cooperation with the group of Prof. Arnaud Trouvé from the University of Maryland.

We have also started a collaboration within the framework of the FIREPLUME project with a consortium involving French laboratories SPE, CORIA and INERIS. This is a project defined after the dramatic Lubrizol factory fire in Rouen in 2019. The topic is mainly focused on the large plume generated by such fires. The goal is to develop a model for the dispersion of pollutants in the atmosphere.

**Focus on under-ventilated fires.** A PhD thesis dedicated to under-ventilated fires is under way by Bouaza Lafdal within the framework of a joint laboratory between LEMTA and CSTB in France. This is a theoretical and experimental study about under-ventilated fires, which are challenging to model using existing Computational Fluid Dynamics (CFD) models. The objective of this work is understanding the effects of under-ventilation on the evolution of a fire and the different associated fire dynamics. The experiments are carried out at LEMTA with hydrocarbon pool fires on a reduced scale (47 cm x 47 cm x 84 cm room), and at CSTB using a gas burner on an intermediate scale (140 cm x 140 cm x 140cm room).



Setup of the small-scale experiments carried out at LEMTA (left) and the intermediate-scale experiments carried out at CSTB (right)



**Prof. Jose Torero (Visiting LEMTA from University College London).** Jose spent 2 months with our group for a research stay during June and July 2021. This offered the possibility to share experience and recent results obtained in the group about thermal degradation, combustion and fire propagation. This was a very nice opportunity of direct exchanges, very much appreciated in a time restricted to remote cooperation!

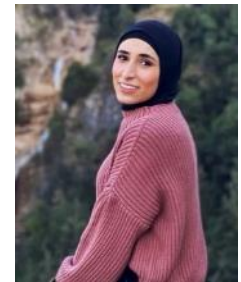
### Arrivals.

Lucie Lapillonne is joining our group as a PhD student. Lucie graduated from the Fluid Mechanics program at the engineering school Polytech Nancy, France, and she has studied computational fluid dynamics in Chalmers, University of Technology of Göteborg, Sweden.



Her work aims to model the interaction of a water mist and a wind-driven fire, with a focus on the firefighting system of ships and submarines. Her thesis will be conducted in collaboration with the shipbuilder firm Naval Group (Lorient, France), our group in LEMTA, and the National Institute of Industrial Environment and Risk (INERIS).

Since December 2020, Mariam Abdo has started her PhD research entitled «modelling of wood log combustion in stoves», a CIFRE thesis funded by Fonte Flamme company and carried out in collaboration between LEMTA, LERMAB, and INERIS. Mariam graduated from the «Energétique et Environnement» master program at the Sorbonne university Paris, France, with a mechanical engineering master's degree from the Lebanese university-Faculty of Engineering, Branch 1, being part of the double degree programme.



The purpose of her study is the development of a model that covers the entire combustion process in stoves, considering all the reactions and phenomena starting from the pyrolysis of wood under the effect of temperature, until the emission of smoke. This will help develop a tool that can handle different designs of combustion chambers, subsequently improving the design and performance of such devices.

Finally, Lucas Terrei is back to our laboratory for a one-year postdoctoral research position. He will continue his work on wood thermal degradation after his PhD defense in 2020 on the same topic.

*Signed Dr. Davood Zeinali and Prof. Pascal Boulet, at LEMTA laboratory, University of Lorraine and CNRS.*

## News from the Fire Safety Team at Arcadis (UK)

The Fire Safety Team at Arcadis continues growing. We are 12 people across the UK, and we have expanded our team to India, where our colleague Satish Keshkar recently joined our team in our office in Mumbai. He is a Fire Engineer with experience in international fire codes and British codes. We have three new Fire Engineers joining soon in November in our Cambridge office in the UK.

Our colleague Sam Greene based in the London office; UK has been promoted to Associate Technical Director. He is leading the Fire Safety & Façade Investigation expertise in the team: <https://view.ceros.com/arcadis/fire-safety-and-facade-investigation/p/1#61557e1ed04ef>

The Fire Safety and the CDM teams at Arcadis, which work together, are developing expertise on the current Building Safety Bill/Golden Thread using a digital platform. As part of this, R&D will be also promoted. Further information to be shared soon.

We continue our partnership with The Fire Safety Engineering Group, FSEG, at The University of Greenwich. Some of our fire engineers are already trained with the FSEG computer models and we are planning to engage part of the team to get this expertise next year.

And for those who might be interested in reading about some connections between Cosmology and Fire Dynamics please see link:

<https://www.linkedin.com/pulse/some-random-reflections-cosmology-fire-dynamics-rodriigo-machado/>

keep safe,

*Signed: Dr. Rodrigo Machado Tavares, Head - Fire Safety Team – Arcadis*

## News from UL's Fire Safety Research Institute

As UL's Fire Safety Research Institute (FSRI), we advance fire safety knowledge to address the world's unresolved fire safety risks and emerging dangers. As part of Underwriters Laboratories, the non-profit organization within the UL enterprise, we are committed to sharing our fire safety insights with everyone to advance UL's public safety mission of providing safe living and working environments for people everywhere.



Through advanced fire science, rigorous research, extensive outreach, and education in collaboration with our international network of partners, we impart stakeholders with the information, tools and resources that enable them to make better, more fire-safe decisions that ultimately save lives and property. Please see below for links to our latest published reports and peer-reviewed journal articles.

### FSRI Research Reports:

*Study of Firefighter Line of Duty Injuries and Near Misses*

[Click here](#) to read our partner research report "UL 9540A Installation Level Tests with Outdoor Lithium-ion Energy Storage System Mockups"

### FSRI Peer-Reviewed Journal Articles:

*Cardiovascular and Chemical Exposure Risks on Today's Training Ground*

[Click here](#) to read the "Characterizing exposures to flame retardants, dioxins, and furans among firefighters responding to controlled residential fires" peer-reviewed journal article published in the International Journal of Hygiene and Environmental Health.

[Click here](#) to read the "Effects of firefighting hood design, laundering and doffing on smoke protection, heat stress, and wearability" published in Ergonomics.

[Click here](#) to read the "Heat Release Rate Characterization of NFPA 1403 Compliant Training Fuels" published in Fire Technology.

[Click here](#) to read "Testing of liquids with the cone calorimeter" published in the Fire Safety Journal.

### Translating Science into Strategy for the Fire Service

The FSRI Fire Safety Academy (FSA) is an online learning management system equipped with numerous training courses designed for real-world application. As the fire environment continues to evolve and increase challenges for the fire service, training is more important than ever. Firefighting is a science, and the more the fire service can learn about fire dynamics and how their tactics impact the fire, the more effective their tactical decisions will become. The FSA is one of the major ways FSRI is getting the research to the street and to one of our core stakeholder audiences. [Click here](#) to create a free account and check out the available courses.



**FIRE SAFETY  
ACADEMY**

### FSRI Fellowship Program

*FSRI Welcomes Sixth University of Maryland Fellow Student: Shaheer Ahmad*

Shaheer received his bachelor's degree in Fire Protection Engineering (FPE) from the University of Maryland in 2021. During his time at Maryland, Shaheer was a member of the National Fire Protection Association (NFPA) sponsored Fire Protection Engineering Ambassadors, College Park Scholars, and volunteered as a research assistant in the UMD FPE labs.



### FSRI Welcomes Three Post-Doctoral Researchers

*Dushant*

Dushyant Chaudhari is a post-doctoral researcher with UL's Fire Safety Research Institute (FSRI). He completed his Ph.D. in Mechanical Engineering from the University of Maryland in 2021. His Ph.D. research involved multi-scale experiments and semi-empirical modeling to investigate pyrolysis, material flammability, and flame spread process of wall-lining materials. His background is in chemical engineering with a master's degree from Texas A&M University where he worked with Mary Kay O'Connor Process Safety Center (MKOPSC) to investigate CFD modeling of LNG pool fires. He is originally from India where he completed his bachelor's degree from Visvesvaraya National Institute of Technology (VNIT).



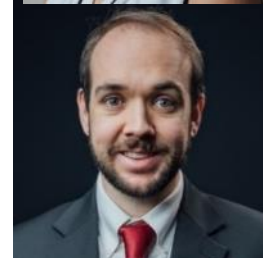
### *Mahsa Lotfi Marchoubeh*

Mahsa Lotfi Marchoubeh is a post-doctoral researcher with UL's Fire Safety Research Institute (FSRI). She has a M.Sc. degree from Isfahan University of Technology, where she specialized in detection of industrial contaminants in urban waters. For her Ph.D. at the University of Arkansas, she developed analytical chemistry techniques to detect and differentiate molecules in complex biological samples. She has also worked as a consultant for steel making and pharmaceutical industries where she has helped develop methods for analysis of environmental samples.



### *Conor McCoy*

Conor is a Post-Doctoral Researcher with UL's Fire Safety Research Institute (FSRI). He joined the team in 2021 after completing his Ph.D. in Mechanical Engineering with the University of Maryland. He also has an M.S. and B.S. in Fire Protection Engineering from the University of Maryland. While working on his master's degree, Conor researched methods to improve the reproducibility of refrigerant flammability limit testing and developed a revised apparatus and procedure. His doctoral research concerned characterization of flame heat feedback and oxidative pyrolysis for simulation of bench scale fire tests. His research interests are material flammability, pyrolysis modeling, and flame spread.



*Signed: Steve Kerber, PhD, PE, Fire Safety Research Institute, Underwriters Laboratories, Inc.*

## **News from the Building Research Institute (ITB) - Poland**

ITB was present at the recent IAFSS Symposium, with our Dr Grzegorz Kimbar presenting work on full-scale external fire tests of a free-standing steel silo. This paper is an outcome of an extensive testing programme on the fire behaviour of free-standing silo's, which is continued at the ITB and more results will be published in the near future.

Two of our colleagues have obtained their PhD's at the ITB. We welcome Dr Piotr Turkowski and Dr Bartłomiej Sędlak to the scientific community of fire science. Dr Turkowski has researched the fire protection of CFRP bonds used to strengthen structures, and Dr Sędlak was interested in how scale affects the outcomes of fire testing of curtain walls. Both are employees of ITB, who performed their experimental research at the ITB Fire Testing Laboratory in Pionki. We wish them all the best in their future scientific career! Furthermore, we are awaiting the Doctoral Thesis of Mr Paweł Roszkowski, who is finalizing his research on the fire behaviour of trapezoidal steel profiles used on roofs.

In the summer, we have welcomed intern Diego Alvarez Coedo of Universidad Pontificia Comillas. Under the supervision of Dr Wojciech Węgrzyński, he was performing his research on multi-scale modelling of tunnel fires.

We have performed 84 small scale experiments with the ITB 1:23 scale tunnel model, varying longitudinal velocity and tunnel angle. We hope this research helps the designers of road and railway tunnels use their computational resources more efficiently. In September, we welcomed Dr Paulina Jamińska-Gadomska, post-doc in grant OPUS19 "Wind effects on building fires in a multiparametric risk assessment with numerical modelling", lead by dr Wojciech Węgrzyński. Dr Jamińska is an experienced wind engineer who will help us understand the complex interaction between wind and fires in buildings.



*Figure 3. Dr Węgrzyński and Diego Alvarez Coedo in the front of small-scale tunnel model*

In the laboratory, we have finished a major experimental research project for the OFR Consultants – the STA SIG-CLT WP6 task. In this project, we have performed four large scale experiments on a CLT slab (protected and



unprotected) better to understand the fire dynamics in such a configuration. The measurements included the mass loss rate of 28 sq.m. slab, multiple heat flux measurements and over 100 thermocouples, giving us a rich database for modelling fire behaviour of CLT slabs. As the experiments are performed in midst of a pandemic, we could not host our guests in the heat of the lab. However, all the experiments were transmitted through MS Teams meeting, which for most of the participants was considered as the best remote meeting, so far. In the next quarter, we will start WP5 of the same project, focusing on small compartments' fire dynamics. We hope these results will reach a greater audience soon.



Figure 4. STA SIG-CLT experiments in WP6

We are also finishing the construction of the corridor testing facility, consisting of 30 m long full-scale corridors with three compartments. This facility is equipped with modern smoke control solutions, allowing multiparametric fire experiments for corridor ventilation setups typical for Poland and the UK. The experimental facility is accompanied by a digital twin – a multiparametric CFD model with which 1000 individual simulations have been performed so far. Once operational, this facility will provide priceless data for numerical modelling validation and grow our understanding of fire protection of evacuation corridors.

From other news, our Dr Wojciech Węgrzyński was accepted as an associated member to the Building Physics section of the Polish Academy of Sciences, where he gave an introductory lecture on "Role of Fire Safety Engineering in Building a Sustainable Future". Furthermore, Dr Węgrzyński was also invited to the IAFSS Sub Committee for Research.

In addition to the activities carried in ITB, Dr Węgrzyński has also started a Fire Science Show podcast, where important topics of fire science and engineering are discussed. So far, 20 guests were interviewed on the show, covering topics from combustion fundamentals, tools of Fire Safety Engineering, performance-based based-engineering to evacuation and human behaviour. All the episodes may be listened for free at [www.firescienceshow.com](http://www.firescienceshow.com) or on any podcast listening app. The project is gaining momentum and has already surpassed 8 000 total listens of its episodes. We hope this project will achieve long-lasting effect in the fire community, promoting evidence-based fire science and technology within the broader society of fire protection professionals.



Figure 5. Fire Science Show run by Dr Węgrzyński of ITB

Signed: Wojciech Węgrzyński, Building Research Institute

## News from NFPA and the Fire Protection Research Foundation

### 2021 Foundation Medal

The Foundation Medal recognized the Fire Protection Research Foundation project completed in the prior year that best exemplifies the Foundation's fire safety mission, technical challenges overcome, and collaborative approach to execution that is the hallmark of all Foundation projects. The 2021 Foundation Medal was awarded to Jensen Hughes and the Naval Research Laboratory for the project: *Evaluation of fire protection effectiveness of fluorine free firefighting foams*.

### Notice of New Fire Protection Research Foundation Reports

- *Proceedings: Preparing for Disaster – Workshop on Advancing WUI Resilience* – The objectives of this Research Foundation workshop were to identify immediate and realistic actions to resolve research and market gaps between wildfire risk and WUI disaster resilience; and outline the steps required to execute development of holistic, accessible, and sustainable solutions. The proceedings can be found [here](#).
- *Proceedings: Cybersecurity for Fire Protection Systems Workshop* – The primary objectives of this workshop were to engage with industry stakeholders to clarify, confirm, add or refine detailed information and deep insight based on the field experience associated with cybersecurity issues within fire protection systems. The proceedings can be found [here](#).
- *An Analysis of Firefighter Breathing Air Replenishment Systems* – This project reviewed the literature on firefighter air replenishment systems (FARS) to provide an understanding of FARS, its use, cost, inspection, testing and maintenance requirements and summarizes the existing code requirements. The report can be downloaded [here](#).
- *Fireground Exposure of Firefighters: Literature Review* - This report assimilates the existing peer-reviewed literature into a framework to understand the matrix of carcinogen exposure risks firefighters face in the course of their job tasks on the fireground. The report can be found [here](#).
- *Review of Impact of Medications on Older Adult Fall and Fire Risk* – This report identifies the relationship between medication use and fall and fire risks in older adults and assimilates the findings to inform message development. The report can be found [here](#).

### Reports from the Applied Research Group

Several reports on aspects of the U.S. fire problem have been completed recently and posted on our website. The topics include poverty and the risk of fire, fire safety in the U.S. since 1980, intentional fires, fires started by hot workhome heating fires, They can all be found at <https://www.nfpa.org/News-and-Research/Data-research-and-tools/US-Fire-Problem>.

## News from OFR Consultants

OFR continues to be involved with various fire engineering degree programmes within the UK and further afield. We have our on-going sponsorship of Mahdi Heshmati through Dr Shan-Shan Huang at Sheffield University on their work on sustainable steel-timber hybrid structures in fire. We are funding Antonela Čolić to pursue her PhD through Prof. Luke Bisby at the University of Edinburgh examining the performance of adhesives used in the manufacture of CLT panels. OFR has recommitted to being a funding partner of the IMFSE programme for the next 3 years. Our staff are also involved with providing input in the programmes at the University of Edinburgh, Sheffield University, the University of Manchester and ETH.

OFR's involvement with the Structural Timber Association (STA) supporting best practice for fire safety when constructing with mass timber has continued. Currently we are in the middle of a campaign of large-scale tests being carried out through Wojciech Węgrzyński at ITB in Poland. Some results have been made available through recent publications but there is a lot more yet to come. At the same time we are developing our experimental programme as part of a research partnership to provide technical input into the statutory guidance for fire safety in England.

Finally, we are delighted to be the winner of the Construction News 2021 Consultancy of the Year Award. The judges emphasised OFR's commitment to research, supporting practical solutions for mass timber and engagement with academic institutions as key differentiators.

*Signed: Michael Spearpoint, OFR Consultants*

## News from the National Institute of Standards and Technology (NIST)

### **Quantifying structural response to real fire exposure**

The National Fire Research Laboratory (NFRL) is conducting a multi-year experimental study on full-scale composite floor systems under realistic large enclosure fires simulated with natural gas burners. The test program is aimed at generating technical information and data essential for the development and validation of predictive tools and advancing fire safety design and assessment for steel-framed buildings. Two of four planned experiments have been completed to date. <https://www.nist.gov/el/fire-research-division-73300/national-fire-research-laboratory-73306/steel-concrete-composite>

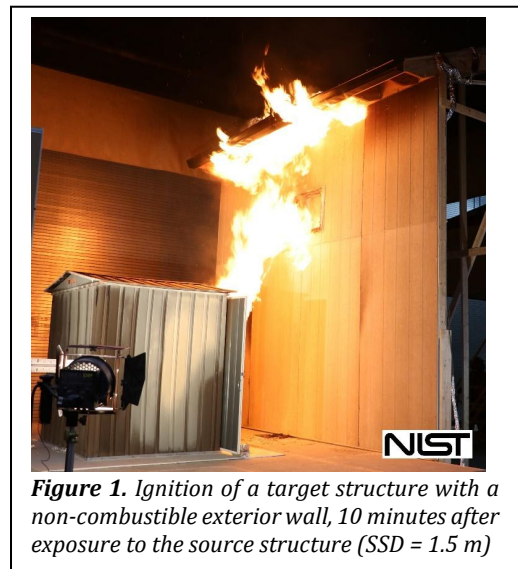


### **NIST Technical Note 2135: Progression of the 2018 Camp Fire**

After publication of the Fire Progression Timeline in Spring 2021, researchers continue analysis of data collected after the November 2018 Camp Fire in Butte County, CA. The Fire Progression Timeline report (NIST Technical Note, TN 2135) details the progression of the Camp Fire and other fire behavior findings (including civilian burnovers) during the first 24 hours of the incident during which nearly 20,000 structures were destroyed, and 85 people perished, in Concow, Paradise, and Magalia, CA. The current analysis is related to notification, evacuation, traffic, and temporary refuge areas, and builds on the foundation of the fire progression determined in TN 2135. More information and the reports to date can be found at the project website: <https://www.nist.gov/el/fire-research-division-73300/wildland-urban-interface-fire-73305/nist-investigation-california>.

### **Impact of structure separation in WUI fires**

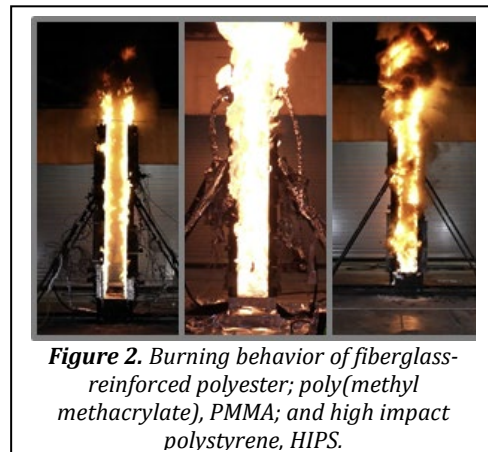
NIST is a technical lead on a three-phase collaborative project among the California Department of Forestry and Fire Protection (CAL FIRE), the California Building Industry Association (CBIA), the United States Forest Service (USFS), and the Insurance Institute for Business and Home Safety (IBHS). The project aims to assess structure-to-structure fire spread for structures located in the WUI. The spacing between the source and target structures will be varied to identify safe structure separation distance (SSD). During the first phase, 15 full-scale experiments were conducted at NIST to quantify the effects of shed sizes, construction types, fuel loading, and separation distance on the ignition of primary structures. <https://www.nist.gov/el/fire-research-division-73300/wildland-urban-interface-fire-73305/structure-separation-experiments>



*Figure 1. Ignition of a target structure with a non-combustible exterior wall, 10 minutes after exposure to the source structure (SSD = 1.5 m)*

### **Quantifying the impact of material composition on fire growth over combustible solids**

In collaboration with the Nuclear Regulatory Commission (NRC), a series of 52 full-scale fire growth experiments was recently conducted on 2.45 m tall panels of sixteen unique combustible solids including: natural and synthetic polymers, copolymers, fiberglass-reinforced composite materials, porous polymer foams, and electrical cables. Measurement data obtained in these tests include: time-resolved heat release rate, gaseous species production (CO, CO<sub>2</sub>, and soot), radiative heat flux at a distance, and spatially-resolved flame to surface heat transfer. These tests are the first part of a multi-stage experimental series (which will include mg- and g-scale measurements for material property determination) designed to quantify the impact of material composition on ignitability, fire growth rate, and peak fire size.

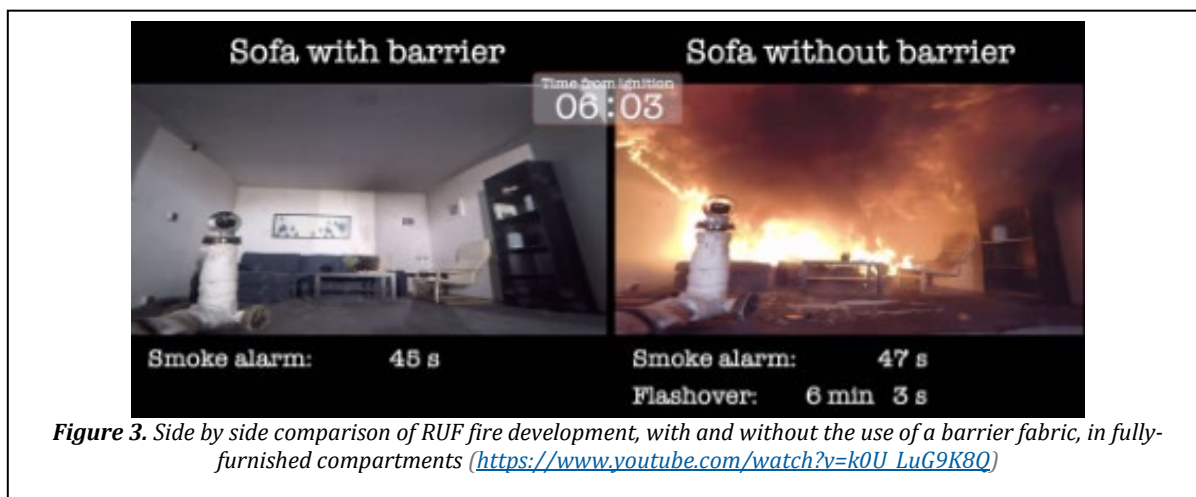


*Figure 2. Burning behavior of fiberglass-reinforced polyester; poly(methyl methacrylate), PMMA; and high impact polystyrene, HIPS.*

### **Helping U.S. industries reduce fire losses due to residential upholstered furniture (RUF) fires**

This research has provided data that were used to (1) provide methodology and guidance on mitigation strategies (to reduce RUF fire losses) that do not rely on chemical fire retardants, (2) develop bench-scale tests to predict full-scale performance, and (3) maintain and develop standard reference cigarettes required for smoldering resistance classification. More information is available at: [www.nist.gov/el/fire-research-division-73300/flammability-reduction-73304/low-heat-release-upholstered-furniture](https://www.nist.gov/el/fire-research-division-73300/flammability-reduction-73304/low-heat-release-upholstered-furniture).





**Figure 3.** Side by side comparison of RUF fire development, with and without the use of a barrier fabric, in fully-furnished compartments ([https://www.youtube.com/watch?v=kOU\\_LuG9K8Q](https://www.youtube.com/watch?v=kOU_LuG9K8Q))

### **Measuring the impact of elevated temperatures on the performance of portable radios and accessories**

This research provided data - performance requirements and test methods - that was used by the National Fire Protection Association (NFPA) for development of its Standard on Two-Way, Portable RF Voice Communications Devices for Use by Emergency Services Personnel in the Hazard Zone (NFPA 1802), which was issued in January 2021.

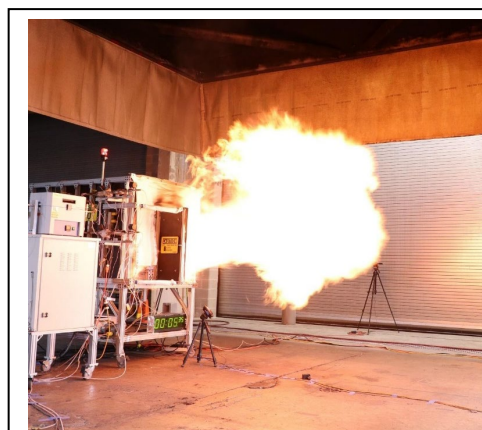
### **Assessing firefighter exposure to PFAS**

There is growing evidence that firefighters are exposed to per- and polyfluoroalkyl substances (PFAS), some of which are known carcinogens. The source of the PFAS may be from firefighter gear (FFG) construction materials or their manufacturing process, deterioration of the FFG while in use, and/or deposition on the FFG while at a fire scene. This research effort is designed to quantify which PFAS are present in FFG and to determine the conditions under which they are released to the wearer.



### **Towards better prediction of backdraft and flashover**

As part of the NIST Smart Firefighting project, research is being conducted on backdraft and smoke explosion phenomena in a 2/5<sup>th</sup> scale compartment to improve firefighter safety. An initial series of 200 experiments with methane, propane and propene fuels has been concluded to assess conditions that produce backdrafts in the compartment. Additional experiments with solid fuels and water suppression are underway and a modeling effort is beginning.



**Figure 4.** Backdraft from excess propane fuel after allowing a steady 25 kW fire to extinguish by closing the compartment door, then opening it up some time later and activating an electric spark ignition source in the back of the compartment.

NIST has also developed a machine learning-based model that can predict the future potential occurrence of flashover within a multi-compartment structure. While accounting for realistic fire and vent opening conditions, the current model provides reliable prediction of flashover even when temperature data over 150 °C is completely lost in the room of fire origin due to sensor failure. The model was trained with synthetic data generated from thousands of CFAST fire model simulations. Specifically, bidirectional long short-term memory was utilized to learn the complex relationship between flashover conditions and surrogate temperature signals, and an attention mechanism was used to neglect temperature signals with less significance. The model compared favorably to full-scale multi-compartment fire experiment results. Recent results of our AI-based model were presented at the 35<sup>th</sup> Association for the Advancement of Artificial

Intelligence Conference (<https://ojs.aaai.org/index.php/AAAI/article/view/17736>).

### **The CFAST fire data generator, CData**

NIST has released a new module for the Consolidated Fire and Smoke Transport (CFAST) model, CData, a tool to help users conduct Monte Carlo analyses using CFAST simulations. CData supports several statistical analyses with the statistical software R to provide several built-in tools to analyze the data. 'Convergence of the mean' allows the user to make a determination if enough cases have been run. The histogram generator and the empirical probability density function allow users to look at the distributions of both input and output variables. The decision trees tool can be used to look for the most important variables in determining the value of a particular output variable. These tools as well as the R software distributed with CData will allow users to do a significant amount of analysis of data that is generated (<https://doi.org/10.6028/NIST.TN.1889v5>).

*Signed: Isaac T. Leventon, National Institute of Standards and Technology (NIST)*

### **WTC Blog Post**

Richard G. Gann, retired chief of the NIST Fire Science Division, has written a blog about his work as leader of the WTC towers' fire reconstruction effort. The link to the post is <https://www.nist.gov/blogs/taking-measure/reconstructing-fires-brought-down-wtc-1-2-and-7>.

*Signed: Mark Esser, NIST*

### **Samuel L. Manzello Presented at USA National Academies of Sciences, Engineering, and Medicine Workshop on Wildland-Urban Interface (WUI) Fires**

How do fires at the wildland-urban interface (WUI) differ from wildland fires? And how does understanding these differences change how we mitigate fires and their impacts on families and communities? On Tuesday, June 8, 2021 an all-day virtual information gathering workshop that will help inform the study committee as they identify information gaps and future research needs in the chemistry of fires at the wildland-urban interface. Samuel L. Manzello (NIST) was an invited presenter and panelist at this workshop. The specific goals of this workshop were to hear from leaders in the field in order to better understand (1) the composition of residential materials and their combustion products, (2) the sources of emissions and potential exposures, (3) the chemical processes involved, and (4) data gaps and research needs that remain. The event was recorded, and all presentations are free to download. To see these and learn about the committee's work, please see here: <https://www.nationalacademies.org/event/06-08-2021/the-chemistry-of-urban-wildfires-a-virtual-information-gathering-workshop>

*Signed: Samuel L. Manzello, NIST*

## **PUBLICATION NEWS FROM MEMBERS**

### **Featured in Science**

A recent paper by Sayaka Suzuki and Samuel L. Manzello, *Investigating Coupled Effect of Radiative Heat Flux and Firebrand Showers on Ignition of Fuel Beds* in *Fire Technology* (2021):

<https://link.springer.com/article/10.1007%2Fs10694-020-01018-5> was selected as Editors' Choice of Science, Following the firebrands (13 Nov 2020: Vol. 370, Issue 6518, pp. 806):

<https://www.science.org/doi/10.1126/science.2020.370.6518.twil>

### **Firebrands Generated from Shirijo Castle Fire**

A fire started in Shurijo Seiden, or the main hall of Shurijo Castle, Naha-city, Okinawa, Japan on the morning of October 30th, 2019. The fire resulted in loss of 8 structures and many important Okinawan cultural assets. The original Shurijo Castle was destroyed many years ago and a replica was constructed and rebuilt to be as close as possible to the original building. The replica was fabricated mainly from wood (*Chamaecyparis taiwanensis*). Firebrands were reported during the fire. In this study, firebrands from Shurijo Castle was collected and analyzed. The data was compared with those from other investigation as well as experimental data. Please see the recent paper published in *Fire Technology*: <https://link.springer.com/article/10.1007%2Fs10694-021-01176-0>

### **Dr. Vyto Babrauskas Releases Two New Books**

Vyto Babrauskas, the author of *The Ignition Handbook*, widely used by fire investigators, fire departments, researchers and attorneys, is excited to announce the release of two landmark books on fire safety - *Electrical Fires and Explosions* and *Smoldering Fires*.

After 10 years of research, peer review and scientific data, *Electrical Fires and Explosions* is the first-ever book to comprehensively cover the scientific and technical aspects of electrical fires and failures, along with electrical explosions. About half of all house fires start as smoldering fires. By the time the fire services have arrived, many of these will have transitioned into a flaming stage, but their origin and early development will have been in the smoldering mode. Thus, for fire investigators and any other personnel interested in understanding real fires, smoldering is of major concern. *Smoldering Fires* is wholly focused on providing practical advice on the subject.

For details, check out Vyto's website: <https://doctorfire.com>

## AWARDS to MEMBERS

### Sayaka Suzuki Selected for 2021 International Association of Wildland Fire (IAWF) Early Career Award in Fire Science

The International Association of Wildland Fire (IAWF) Early Career Award in Fire Science is given to recognize a promising early-career professional who has demonstrated outstanding ability in any field of wildland fire science. Since its initiation in 2016, the award has been bestowed on five individuals. Selection of this award was based on open nominations. This year, a sub-committee comprising of seven fire scientists and managers from around the world with a wide variety of expertise and backgrounds evaluated each nominee in the areas of ability and impact, as well as their contribution to the diversity and inclusivity of the wildland fire science field. Sayaka Suzuki was selected as one of the winners in 2021. Please see more details:

<https://www.iawfonline.org/members/dr-sayaka-suzuki/>

## REPORTS on PAST CONFERENCES

### Summary of the 2<sup>nd</sup> International Symposium on Lithium Battery Fire Safety (ISLBFS) – 31 Oct-3 Nov 2021, Heifei (China)



State Key Laboratory of Fire Science (SKLFS) at University of Science and Technology of China (USTC) hosted the 2<sup>nd</sup> International Symposium on Lithium Battery Fire Safety (ISLBFS) on Oct. 31 to Nov. 3 in 2021. The China Energy Storage Alliance (CNESA) and Chemical Safety Committee, Chemical Industry and Engineering Society of China (CIESC), co-hosted this

distinguished symposium. The Symposium was a success regarding the quality of the papers and posters presented. Nearly 400 representatives from 6 countries and more than 80 research institutes gathered together online and offline to discuss the fire safety and prospects of lithium battery.



Before this symposium on Oct. 31, a salon on Energy storage accident analysis and safety countermeasures was chaired by Liang Tang, the manager of CNESA. In this salon, Zhenhua Yu, executive vice chairman of CNESA, and Xinjie Qiu, President of State Grid Anhui Electric Power Research Institute, delivered speeches successively. Zhenhua Qian, chief product engineer of Envision Energy Storage, Shuquan Zhang, director of energy storage business department of Beijing high tech investment Co., Ltd., Qingsong Wang, Professor of USTC, Huang Li, general manager of Anhui Zhongke Jiu An New Energy Co., Ltd., proposed thoughts and prospects on the safety and suppression technology of energy storage system from different aspects. In addition, the salon played the video of investigation report of the Risk Assessment Laboratory of UL Fire Safety Institute on the accident of lithium battery energy storage system in Arizona.





At last, the opening ceremony of the Experimental Center of the State Key Laboratory of Fire Science with Anhui Zhongke Jiu An New Energy Co., Ltd. was grandly held at the salon. Professor Qingsong Wang, chairman of the Symposium, chaired the opening ceremony of the symposium on the morning of the Nov. 1<sup>st</sup>. Professor Naian Liu, on behalf of the SKLFS, USTC, the executive vice chairman Zhenhua Yu, on behalf of the CNESA, Professor Jinhua Sun, on behalf of the CIESC, delivered speeches in succession.



Invited to attend this symposium, Professor Partha P. Mukherjee of Purdue University, Professor Guillermo Rein of the Imperial College London, Professor Hong Li of Institute of Physics, Chinese Academy of Sciences, Professor Rui Xiong of Beijing Institute of Technology, and Professor Chi-Min Shu of National Yunlin University of Science and Technology made plenary reports online. The experts focused on the thermal runaway mechanism and fire safety prevention and control technology of lithium-ion battery, and comprehensively explained from the aspects of lithium plating safety, fire mechanism, prevention and control, material modification to improve the intrinsic safety of battery, intelligent operation and life prediction of electrochemical energy storage system, and electrolyte additives.



56 oral presentations and 28 posters were presented in the following six streams in the field of lithium battery safety: Thermal runaway and propagation, Heat generation and numerical modeling, Abuse condition and venting, Capacity fading and life prediction, Thermal management, Fire extinguishing and safer materials. It covers almost the research hotspots of lithium battery fire safety. All participants actively discussed during and after the symposium.

The selected papers are recommended to the Fire Technology and Journal of Loss prevention in the Process Industries of the Lithium Battery Fire Safety Special Issue for peer review.



At the closing ceremony of the Symposium, Professor Qingsong Wang of the SKLFS, USTC, the chairman of the symposium, summarized the preparatory process of the 2<sup>nd</sup> International Symposium on Lithium Battery Fire Safety.

The local organization committee is very honored to have hosted this prestigious symposium and to receive so much positive feedback from the participants. The symposium would not have been possible without the hard work of the staff at and the volunteer students SKLFS, USTC. Finally, Professor Wang looks forward to the future



development of lithium battery fire safety, and hopes that the 3<sup>rd</sup> International Symposium on Lithium Battery Fire Safety will have a good vision and meet you again.

Signed: QingSong Wang, University of Science and Technology of China

## UPCOMING CONFERENCES

### 10th International Seminar on Fire and Explosion Hazards (ISFEH10) – 22-27 May 2022, Oslo (Norway)

The International Seminar on Fire and Explosion Hazards has become one of the important international events for fire and explosion engineering and science. The knowledge of technical aspects of fire and explosion hazards is the basis for safe design and operation of systems and structures and emergency response strategies in case of incidents or accidents. Understanding the physical effects that can cause harm is vital to reduce consequences and risk during incidents or accidents leading to fire and explosions. This knowledge is especially critical when new energy carriers are being introduced in to society. The ISFEH 10 conference is a place to share research on physical effects of hazards, prediction methods for consequences, applied safety analysis methods, mitigation methods, emergency response strategies, and many other topics.

The conference will be held at the Radisson Scandinavia Hotel in Norway's capital Oslo. The hotel is located next to The Royal Palace in the centre of the city. Travel details can be found at: <https://isfeh10.org/general-information/travel-information/>

More information on the conference can be found at: <http://isfeh10.org>

### Nordic Fire & Safety Days (NFSD) – 21-22 June 2022, Lund (Sweden)

The Nordic Fire & Safety Days is a biannually conference carried out by the Nordic universities and research institutes dealing with risk and fire safety.

At The Nordic Fire & Safety Days you will have the opportunity to get information on different aspects within fire research. The days will focus on risk and fire research in the Nordic countries. The conference language is English.

The topics are, but are not limited to:

- Fire dynamics
- Fire chemistry
- Fire detection and suppression
- Forensics
- Structural fire safety
- Offshore fires
- Transportation
- Management of rescue service
- Operation of rescue service
- Multi hazard control
- Safety management
- Health and environmental risks
- Societal activities and resilience
- Risk and innovations
- Safety of fossil free energy carriers
- Residential fires
- Decision-making
- Evacuation
- Crowd management
- Human behavior

More information on the conference can be found at: <https://www.ri.se/en/nfsd>

### SEMC 2022: 8<sup>th</sup> Int. Conf. on Structural Engineering, Mechanics, and Computation – 5-7 September 2022, Cape Town (South Africa)

SEMC is a renewed structural conference indexed in Scopus and Web of Science, dealing with broad engineering problems, also of interest for the fire engineering community, such as: Structural Analysis and Design, Design for Fire Resistance, Design for Blast and Impact, Structural Failures, Structural Optimisation, Structural Foundations and Tunnels, Structural Safety and Reliability, Structural Risk Analysis, Life-Cycle Performance of Structures.

The next edition of the conference SEMC 2022, which will be held in Cape Town, South Africa, from 5 to 7 September 2022, also envisages *a special session on the Behaviour of Structures in Fire (SS05)*, organized by Prof. Mario Fontana (Swiss Federal Institute of Technology, Switzerland) and by Prof. Markus Knobloch (Ruhr-Universität Bochum, Germany).

This special session aims at reviewing progress in the area of structural fire safety and providing a forum for the dissemination of knowledge and exchange of ideas to make use of innovations and advances gained in the field of structural fire safety. Amongst others, the session will address the following topics: Constitutive modelling of building materials in fire; Behaviour of single members in fire; Global behaviour of structures in fire; Fire tests; Numerical simulations.

More information on the conference can be found at: <http://www.semc.uct.ac.za/>

## CALLS FOR PAPERS/ABSTRACTS

### 10th International Seminar on Fire and Explosion Hazards (ISFEH10)

The 10th International Seminar on Fire and Explosion Hazards will be arranged in Oslo, Norway, from May 22nd to 27th, 2022, at the Radisson Hotel Scandinavia.

Due to the uncertainty regarding travel arrangements under Covid-19, we will not call for separate abstract submission before the full paper deadline. The deadline for draft paper submission will be the **10 January 2022.**

Papers are invited in all areas of fire and explosion studies, mitigation and prevention, including but not limited to:

- Combustion fundamentals of fires and explosions
- Gas and dust explosions
- Deflagration, DDT, detonation and their mitigation
- Hydrogen safety
- Battery safety
- Industrial risk and sustainability
- Material flammability and flame retardancy
- Fire suppression and mitigation systems
- Combustion in microgravity
- Fire and explosion modeling and computer codes
- Critical and transient combustion phenomena (ignition, extinction, flame spread)
- Industry-specific fire and explosion research: renewable energy, maritime, aerospace, oil and gas, nuclear, process industry
- Wildland fires
- Fire toxicity and pollutants
- Evacuation

Information will be updated on the conference website; <http://isfeh10.org>.

### Nordic Fire Safety Days (NFSD)

The Nordic Fire & Safety Days is an event carried out by the Nordic universities and research institutes dealing with risk and fire safety. The days put focus on risk and fire research in the Nordic countries. Contributions from other countries are more than welcome. The conference language is English. It will take place June 21 - 22, 2022, in Lund, Sweden.

The website is open for abstract submission. Both abstracts on research and development, and innovative solutions, processes and methods in construction projects are welcome to be submitted. A template for the abstract (2 pages) can be found [here](#).

NFSD 2022 has the following deadlines:

- January 31<sup>st</sup>: Abstract submission (1700 words)
- March 31<sup>st</sup>: Decision for acceptance
- June: Presentation at the NFSD conference

### 21<sup>st</sup> International Water Mist Conference (IWMC)

The 21st International Water Mist Conference will take place in Madrid, Spain. The conference dates will be 9th and 10th November 2022. The conference venue will be the Elba Madrid Alcalá Hotel.

The call for papers will be published on 17th January 2022. Another important date will be 16th May which is the final date to submit abstracts and thus apply for a speaker slot. Furthermore, the conference webpage will be activated on this day. On 1st July, IWMA will publish the conference programme.

Deadline for submissions to apply for the IWMA Young Talent Award is 29th April. In 2022, this award will go to the author of the best master thesis dealing with water mist.

<https://iwma.net/events/detail/iwmc-return-to-spain>

## UPCOMING EVENTS – 2022

[Ed. Note: this list is incomplete. Please check the list on the IAFSS website when it is restored: [iafss.org](http://iafss.org)]

### 2022

- |           |  |
|-----------|--|
| May 22-27 | 10 <sup>th</sup> International Seminar on Fire and Explosion Hazards (ISFEH10) – Oslo (Norway) - <a href="http://isfeh10.org">http://isfeh10.org</a>   |
| Jun 21-22 | Nordic Fire & Safety Days (NFSD) – Lund (Sweden) – <a href="https://www.ri.se/en/nfsd">https://www.ri.se/en/nfsd</a>   |
| Sep 5-7   | 8 <sup>th</sup> International Conference on Structural Engineering, Mechanics and Computation (SEMC 2022) – Cape Town (South Africa) - <a href="http://www.semc.uct.ac.za/">http://www.semc.uct.ac.za/</a> |
| Nov 9-10  | The 21st International Water Mist Conference – Madrid (Spain) - <a href="https://iwma.net/events/detail/iwmc-return-to-spain">https://iwma.net/events/detail/iwmc-return-to-spain</a>                      |



## JOB POSTINGS ON THE IAFSS WEBSITE

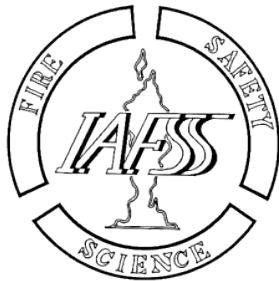
You can find the current job postings at the bottom of the front page of the IAFSS website – [www.iafss.org](http://www.iafss.org).

## CALL FOR CONTRIBUTIONS

To continue succeeding with this newsletter, it is important that we receive contributions from the IAFSS membership at large. Please consider submitting articles, letters to the editor, images, news, announcements or job openings related to fire safety science of IAFSS members. These could be collected from your department, institution, country or region. Please send your contributions to the Editor (Rita Fahy, [rfahy@nfpfa.org](mailto:rfahy@nfpfa.org)).

*Letters to the Editor* are most welcome, anytime, in response to newsletter content or any other topic related to the IAFSS.

**For the next issue (No. 48), the  
deadline for submissions is  
April 30, 2022.**



<http://www.iafss.org>

### 2021-2023 OFFICERS AND COMMITTEE MEMBERS OF THE IAFSS

#### EXECUTIVE COMMITTEE

##### Chair:

Dr Brian Meacham, USA  
[brian@meachamassociates.com](mailto:brian@meachamassociates.com)

##### Vice-Chairs:

Prof Longhua Hu, China  
Prof Elizabeth Weckman, Canada  
Prof Jennifer Wen, UK

##### Secretary:

TBD

##### Treasurer:

Prof Margaret Simonson McNamee, Sweden

##### Immediate Past Chairman:

Prof Patrick van Hees, Sweden

##### Executive Members:

Prof Ritsu Dobashi, Japan  
Dr Jason Floyd, USA

##### IAFSS COMMITTEE:

Prof Luke Bisby, UK  
Prof Pascal Boulet, France  
Prof W-K Chow, Hong Kong, China  
Prof Ritsu Dobashi, Japan  
Dr Rita Fahy, USA  
Prof Charles Fleischmann, New Zealand  
Dr Jason Floyd, USA  
Prof Edwin Galea, UK  
Prof Michael Gollner, USA  
Prof Kazunori Harada, Japan  
Prof Longhua Hu, China  
Prof Brian Lattimer, USA  
Prof Naian Liu, China  
Prof Cristian Maluk, Australia  
Prof Ken Matsuyama, Japan  
Prof Margaret Simonson McNamee, Sweden  
Dr Brian Meacham, USA  
Prof Bart Merci, Belgium  
Prof Yuji Nakamura, Japan  
Prof Arnaud Trouvé, USA  
Prof Patrick van Hees, Sweden  
Dr Yi Wang, USA  
Prof Elizabeth Weckman, Canada  
Prof Jennifer Wen, UK