International Association for Fire Safety Science

A charity registered in England and Wales no 800306

Fire Safety Science News

http://www.iafss.org

March 2013, Newsletter No 34 Editor-in-Chief: Guillermo Rein

Children evacuating down the stairs during a fire drill in a nursery school in Santander (Spain)

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: c/o Interscience Communications , West Yard House ,Guildford Grove, London SE10 8JT, UK
Tel: + 44 (0) 208 692 5050 **Fax:** + 44 (0) 208 692 5155 **Email**: iafssmembers@dial.pipex.com

TABLE OF CONTENTS

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, trending research, opinions, and controversial topics in the field. A digital archive of previous issues can be found online.

EDITORIAL

We illustrate the cover of this issue with a photo taken during the evacuation drill of the nursery school Colegio Altamira, in the town of Camargo, Santander (Spain) in May 2012. It was taken by Arturo Cuesta, from the GIDAI Group at University of Cantabria, who adds "*The photo shows that a high percentage of children need to use the hand rails of the stair during an evacuation drill. Parameters describing human behavior during evacuation are age dependent. This is especially important for children that are 3-6 years old, a key period for the development of movement skills, for which evacuation data is scarce*".

For this issue, I invited four Featured Articles. The first article reports on the urban fires caused by the October 2012 Hurricane Sandy in New York. These recent fires also captured the attention of the international media worldwide (and were even linked indirectly to climate change). The second article is on the new version of Fire Dynamics Simulator (FDS) that will be released soon. FDS has become a very important tool for fire safety science and news of the last version is received with expectation. The third article focuses on the early history of fire testing going back to the 1790's. It reminds us of the dangers of focusing excessively on artificial testing environments while ignoring the real fire behavior. For the last Featured Article, I made sure to include in this issue what was missing in the last one; an overview of why flame retardants are important for fire safety. Two other articles, submitted independently by the plastic industries in response to articles in the last issue, join this debate. This on-going debate, started because of a series of articles in the Chicago Tribune, needs a much stronger presence of the fire safety science. It is my hope that *Fire Safety Science News* could contribute towards a larger participation of IAFSS members in public discussions.

The deadline for the submission of material to the next issue (No.35) is July 10, 2013. On top of the usual news and events pieces, we are preparing a series of Featured Articles on education of Fire Safety Engineering. If you are interested in contributing, please contact the Editor in Chief with your proposal.

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

Signed: Guillermo Rein, Editor-in-Chief, Imperial College London.
g.rein@imperial.ac.uk

LETTER FROM THE CHAIR

I would like to open this letter by congratulating Dr Guillermo Rein on his appointment as the Editor-in-Chief of *Fire Technology* (FT), succeeding Dr Jack Watts, who successfully led the journal over a number of years. Guillermo is also the Editor-in-Chief of this Newsletter, the job that he has been doing splendidly well. FT is an important journal in our field, enjoying wide circulation among fire safety practitioners, reaching out very effectively to applied fire safety community. The journal accepts papers in every area of fire safety science and engineering. I would like to encourage IAFSS members to contribute their manuscripts to FT. As you know, the IAFSS membership enjoys free subscription to the journal.

Two exciting developments have recently taken place. First, the Association has a brand new website, run by a dedicated web team grouped around Prof Michael Gollner of the University of Maryland and Mr Terry Fay of Hughes Associates. When you visit the IAFSS website, you will see sliding announcements in the front page, reflecting what is recent and important in the life of the Association. You will also notice recent news, with the top three items displayed in the front page and then archived as appropriate, when no longer current. There are links to our Digital Archives, *Fire Technology*, Newsletter and upcoming events with deadlines displaying automatically as events approach, and to the 11th IAFSS Symposium. At the bottom, you will note links to open positions in fire safety science and engineering. If you would like to have a news item posted, please write to Michael.

The other is the finalisation of the Call for papers for the 11th IAFSS Symposium, the most important triennial event in the life of our Association. Many of you might have realised the uncertainty in planning of the Symposium as a consequence of the earthquake that struck Christchurch in February 2011, with the aftershocks in July and December 2011. It was the most damaging and the most expensive natural disaster in the history of New Zealand, also affecting the operation of the University of Canterbury, the site of the next Symposium. I am thankful to the Organising Committee and the University of Canterbury for their sustained efforts to make it possible for the Symposium to remain in Christchurch. Please pencil in your diaries the deadline of 15 May 2013 for paper submission. For the first time, the Program Committee has decided allowing submission of late papers until 30 May. Though, when considering papers' acceptance, the preference will be given to the manuscripts submitted prior to 15 May. Posters' abstracts will be due shortly before the Symposium (deadline 31 Oct 2013) affording poster presentations to cover the most recent research findings.

If your research interests are in the broad area of physical, chemical, economic and social ramification of wildland fire behaviour and wildland fuels, then please consider attending the 4th Fire Behaviour and Fuels Conference held in St. Petersburg, Russia, between 1st and 4th July, 2013. Likewise, if your research focus lies in the field of fire and explosion safety, including experiments, theory, modelling and case studies, then please reflect on travelling to Providence in Rhode Island for the 7th International Symposium on Fire and Explosion Hazards, scheduled for between 5th to 10th May, 2013. Both conferences are of very high calibre, with quality of papers that you would normally expect from those printed in the Proceedings of the IAFSS Symposia. Because of this consideration, IAFSS has contributed funds to support awards for the best papers accepted for presentation and for the inclusion in the proceedings of both conferences.

Prof Jose Torero, the Editor-in-Chief of the Association's *Fire Safety Journal* and the Vice-Chair Europe/Africa of IAFSS, moved to Australia, to the University of Queensland, from the University of Edinburgh in the UK, to take up the position of the Head of School of Civil Engineering. For this reason, Jose has resigned from the Vice-Chairmanship, remaining a member of the Committee. The Committee has elected Prof Patrick van Hees from Lund University, an active member of the Educational Sub-Committee, to replace Jose as the Vice-Chair Europe/Africa. Jose has made important contribution to the Association, over several years, and I would like to express my heartfelt thanks to him.

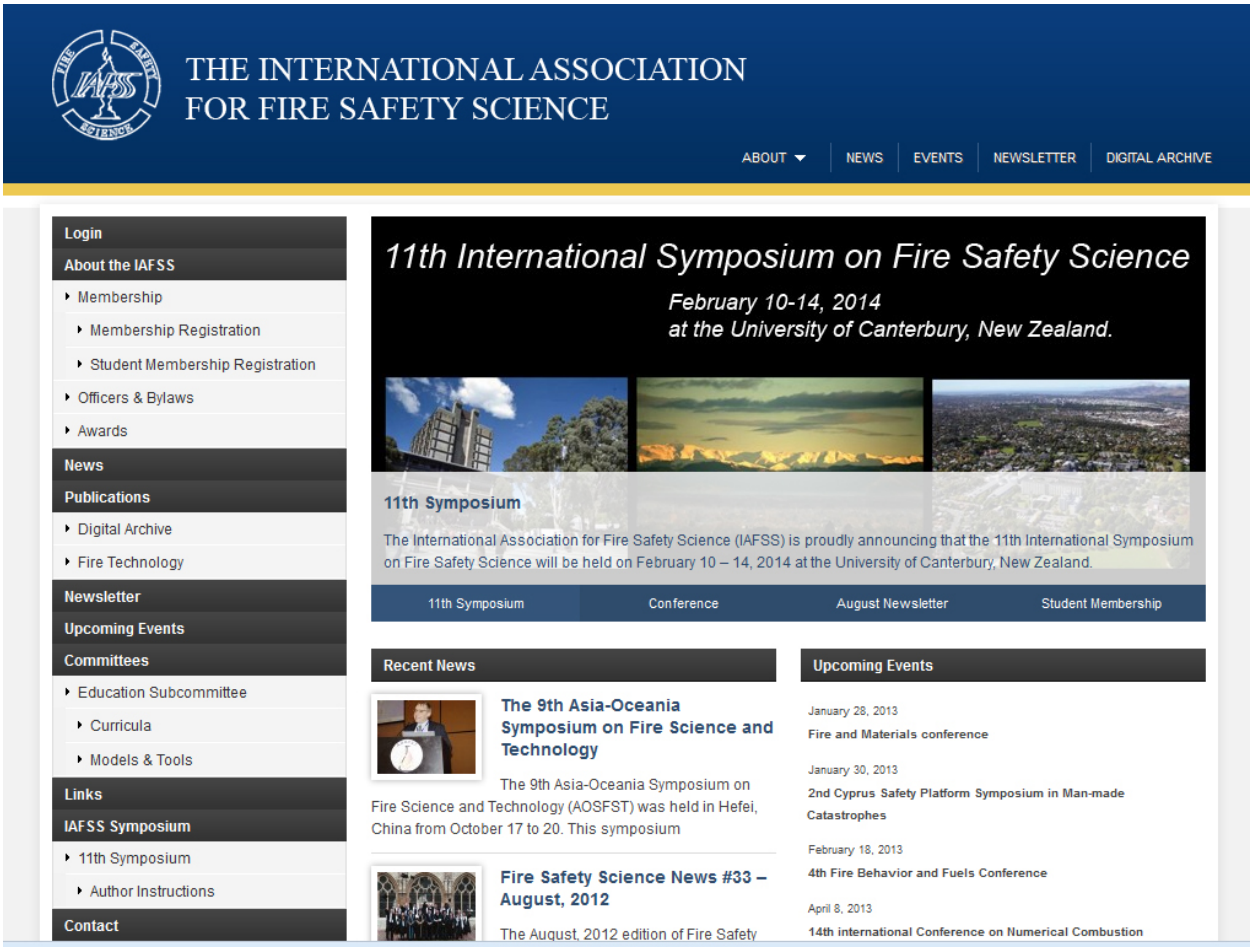
The IAFSS Committee held its interim meeting in October 2012 in Hefei, China, in conjunction with the 9th Asia-Oceania Symposium on Fire Science and Technology. The Committee has resolved to allow unobstructed access to the Digital Archives of the Association, on a trial basis, until February 2014. In the past, the access was also free but the users had to register before accessing publications in the Archives. The Committee has also supported the initiative of Prof George Boustras of the European University of Cyprus in Nicosia to host 2015 European Symposium of IAFSS (2nd European Symposium on Fire Safety Science). The next interim meeting of the Committee will be held at Interflam, June 2013, at Royal Holloway, University of London, UK.

I would like to conclude my correspondence by encouraging you to read the Newsletter back to back. There are new Featured Articles carefully selected by the Editor-in-Chief and scrutinised by the Editorial Board, on subjects of importance to fire safety, as well as many, many news items from every corner of the globe known for its research into fire safety science and engineering.

Signed: Bogdan Dlugogorski, Chair IAFSS, University of Newcastle, Australia

NEWS FROM IAFSS

New IAFSS Website



We are happy to announce that a brand new website at **http://www.iafss.org** has recently been released. This website includes recent news, open positions, upcoming events, membership registration, educational resources and newsletters, as well as member-only access to *Fire Technology*. The digital archive, including the IAFSS Symposium Proceedings, AOFST Proceedings and Fire Research Notes, is available through this website. Please visit the site and explore all the features, including information on the upcoming 2014 IAFSS Symposium.

We are also looking for interested IAFSS members to join the website team. We could use additional help, especially in the area of content editing and generation. Please email webmaster@iafss.org if you have comments on the website or are interested in contributing.

Signed: Michael Gollner, University of Maryland

Call for papers for the 11th International Symposium

The International Association for Fire Safety Science (IAFSS) is proudly announcing that the 11th International Symposium on Fire Safety Science will be held on February 10 – 14, 2014 at the University of Canterbury, New Zealand.

The Symposium is the premier fire safety science meeting in the world and has been organized triennially since 1985 by the IAFSS. The program will have parallel sessions for the presentation of fully peer-reviewed papers over the five days of the Symposium, including invited lectures from the world's top fire science researchers. Symposium activities will begin on Sunday, February 9 with several workshops in the afternoon and a Welcome Reception in the evening. The Symposium will also have poster sessions which will provide an excellent opportunity to interact individually with researchers about their most recent work. Students are encouraged to

participate and awards will be made for the best student posters. In addition to the technical sessions, numerous social activities are planned to cater for informal meetings with colleagues and friends. There will be a rich array of entertainments and tours in the companion program and there is much to see in the Canterbury region and beyond.

The University of Canterbury (UC) is located in Christchurch, the gateway to New Zealand's amazing South Island. Nestled between the Pacific Ocean to the east and the Southern Alps to the west; the University campus is close to many tourist attractions in the Canterbury region and the entire South Island. The Symposium will be held in the lecture theatres centrally located on the campus of the University. The University is just 10 min from the Christchurch international airport providing many direct flights to New Zealand and international destinations.

Research of Interest

You are invited to submit a contribution that advances scientific understanding and/or presents new ideas in the entire spectrum of fire safety science. The topic areas include:

- Ignition, Flame Spread
- Compartment Fire Dynamics
- Fire Chemistry and Toxic Hazards
- Flame Retardants and Advanced Materials
- Structural Fire Performance
- Smoke Control and Detection
- Suppression
- Forest (wildland) fires
- Explosions and Industrial Fires
- Fire Risk Analysis and Statistics
- Evacuation and Human Behavior
- Fire Safety and Sustainable Design
- Special Applications (Codes and Standards; Fire Safety Management; Fire Safety and Security; Fire Forensics)

All accepted and presented papers will be included in the Symposium Proceeding, *Fire Safety Science*, and will be electronically published by IAFSS. All papers will have DOI's assigned and will be part of the CrossRef system, including citation indexing.

Manuscripts should be submitted electronically, beginning May 1, 2013, through the Symposium author web page located on the IAFSS website. The submission deadline for papers is May 15, 2013. Papers submitted after May 30, 2013, will not be considered. Papers submitted between May 15 and 30 will be reviewed; however, timely submissions will be given preference in determining acceptance. Submitted full papers will receive at least two independent peer reviews. The submission deadline for poster abstracts is 31 October 2013.

Timeline for Full Papers

May 15, 2013 – Submission deadline for full papers
August 15, 2013 – Letter to authors announcing paper acceptance/declination
September 30, 2013 – Deadline for submission of the revised paper and the rebuttal
October 15, 2013 – Deadline for technical approval of the final manuscript by Program Committee
November 30, 2013 – Final submission deadline for photo-ready copy

Symposium Chair: Prof W-K Chow, Hong Kong Polytechnic U, China.

Host Committee Chair: Prof C Fleischmann, U Canterbury, New Zealand.

Proceedings Editors: Prof P van Hees, Lund U, Sweden, Dr R Jansson, SP Fire Technology, Sweden, and Prof D Nilsson, Lund U, Sweden.

Awards Committee: Mr D Brein, Chair, Karlsruhe IT, Germany, Dr C Beyler, Hughes Associates, USA, Prof M Delichatsios, U Ulster, UK, Dr M Spearpoint, U Canterbury, New Zealand, Prof T Tanaka, Kyoto U, Japan.

English Language Mentoring Program: Dr R Alpert, Alpert Fire Protection Science, USA,

Program Committee: Dr Y He, Chair, U Western Sydney, Australia, Prof A Trouvé, Co-Chair, U Maryland, USA, Dr P Tofilo, Poster Chair, Main School of Fire Service, Poland, Prof J Capote, Workshop Chair, U Cantabria, Spain, and Prof B Merci, Workshop Chair, U Ghent, Belgium.

Members: Prof A Buchanan, U Canterbury, New Zealand, Prof W K Chow, Hong Kong Polytechnic U, China, Prof B Dlugogorski, U Newcastle, Australia, Prof R Dobashi, U Tokyo, Japan, Prof N K Fong, Hong Kong Polytechnic U, China, Prof M Fontana, ETH Zürich, Switzerland, Prof E Galea, U Greenwich, UK, Prof G Hadjisophocleous, Carleton U, Canada, Prof Y Hasemi, Waseda U, Japan, Dr S Hostikka, VTT, Technical Research Centre, Finland, Prof Y Hu, U Science Technology China, China, Dr H Ingason, SP Fire Technology, Sweden, Prof B Kandola, U Bolton,

UK, Prof V Kodur, Michigan State U, USA, Dr E Kuligowski, National Institute Standards Technology, USA, Prof B Lattimer, Virginia Tech, USA, Dr G Linteris, National Institute Standards Technology, USA, Prof N Liu, U Science Technology China, China, Prof A Marshall, U Maryland, USA, Prof B Meacham, Worcester Polytechnic Institute, USA, Prof V Molkov, U Ulster, UK, Prof V Novozhilov, U Ulster, UK, Dr E Oran, Naval Research Laboratory, USA, Prof B Porterie, IUSTI Marseille, France, Prof A Rangwala, Worcester Polytechnic Institute, USA, Dr G Rein, Imperial College London, UK, Prof C Shen-Wen, Central Police U, Taiwan, Prof A Simeoni, Worcester Polytechnic Institute, USA, Dr M Simonson McNamee, SP Fire Technology, Sweden, Dr M Spearpoint, U Canterbury, New Zealand, Dr A Stec, U Central Lancashire, UK, Prof S Stoliarov, U Maryland, USA, Prof T Tanaka, Kyoto U, Japan, Prof J Torero, U Queensland, Australia, Prof S Tzu-Sheng, Central Police U, Taiwan, Dr C Wieczorek, FM Global, USA, Dr J Yang, National Institute Standards Technology, USA, Prof B Yao, U Science Technology China, China.

NEWS FROM AOAFST

2012 LIFETIME CONTRIBUTION AWARDS

During the 9th Asia-Oceania Symposium on Fire Science and Technology (AOSFST) organized by the Asia-Oceania Association for Fire Science and Technology (AOAFST) and held in Hefei, China from October 17 to 20, a Lifetime Contribution Award was instituted to recognize the persons who have made outstanding contributions to the development of Fire Science and Technology. Prof. Weicheng Fan, chairman of AOAFST during 1995-2000, and Prof. Toshisuke Hirano, chairman of AOAFST during 1992-1995, were rewarded the first Lifetime Contribution Award of AOAFST.

Prof. Toshisuke Hirano

Prof Toshisuke Hirano was one of the founders of AOAFST, which was known as AAFST (Asian Association for Fire Science and Technology) before 1995. In 1995, AAFST expanded in its region to include Oceanian countries and changed the name to AOAFST. Prof. Hirano was its first chairman from 1992 to 1995.

Prof Hirano is a very well-known expert in the fields of combustion and fire research. His achievements in those fields have been presented in more than 170 original papers and 65 review papers. Because of his contribution to the communities of combustion and fire research, he has been elected to be the Chairman or President of the following institutions, Combustion Society of Japan (1989-1994), Asia-Oceania Association for Fire Science and Technology (1992-1995; 1995-Honorary President), International Association for Fire Safety Science (1997-2002), Japan Association for Fire Science and Engineering (1999-2001). His contribution to the Japanese Government is enormous. Based on his knowledge, he has been frequently nominated as a member (in many cases, chairman) of committees or advisor by Japanese Governmental organizations.

Because of his achievements, Prof Hirano has been given major awards by various organizations. Those include Award for Prominent Contribution (Japan Association for Fire Science and Technology, 1985), Dionizy Smolenski Medal (Poland Academy of Science, 1997), Award for Prominent Contribution in Science (Japan Institute of Energy, 1999), The International Science and Technological Cooperation Award of the People's Republic of China (2003), and The Bernard Lewis Medal (The Combustion Institute, 2004).

Prof. Weicheng Fan

Prof Weicheng 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 of describing the interactions of flow, heat transfer and combustion in fires, and also developed the net modelling 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, and Fire Safety Journal, to name a few.

Prof. Fan has also contributed to the technological research in fire safety. His technologies have been successfully applied to hundreds of large and high-rise buildings in China. He even won three times of China National Award for Science and Technology Progress. In recent years, Prof. Fan successfully established a Chinese national emergency system for fires and other disasters. For his great 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 the State Key Laboratory of Fire Science (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 together initiated the establishment process of Asia-Oceania Association for Fire Safety Science and Technology (AOAFST) in 1991. Prof. Fan was the Chairman of AOAFST for six years (1995-2000). Now AOAFST has developed rapidly to be the most important branch of IAFSS. Prof. Fan also held the Executive Member of IAFSS and the Vice Chairman of FORUM. He contributed nearly 30 invited/plenary speeches in symposiums of fire safety community.

Signed: NaiAn Liu, State Key Laboratory of Fire Science, and Wanki Chow, Hong Kong Polytechnic and Chairman of AOAFST

NEWS FROM MEMBERS

News from Arup

Arup fire engineers internationally continue to conduct their own fire research or collaborate with universities and research institutes, often on the application of fire science to fire safety engineering practice.

Arup's Structures in Fire group recently published a paper on their practice of fire performance of structures for composite steel structures in the journal *Fire Technology* (*Recent Lessons Learned in Structural Fire Engineering for Composite Steel Structures*). It documents recent project experience on commercial buildings and describes how potential structural weaknesses, driven by the demand for an optimized ambient design, have been identified and can potentially be remedied in the future.

At the 1st International Conference on Performance-Based and Life-Cycle Structural Engineering held in Hong Kong from 5-7 December 2012, Arup presented some recent work on the specification of fire resistance periods for buildings in a paper entitled "Structural Fire Design – Many Components, One Approach". The work allows a fire resistance period to be determined based on the risk of failure, and a number of fire scenarios including parametric and travelling fires. This approach has been applied successfully on a number of projects around the United Kingdom.

The Arup Foundation co-funded work on the social issues around fire safety and the built environment and has appointed Dr Graham Spinardi as a Senior Research Fellow at the University of Edinburgh. The Arup Foundation also continues to support, along with the Royal Academy of Engineering, Dr Luke Bisby as the Senior Research Fellow in Structures and Fire at the University of Edinburgh.

In Australia, the "Invest in Arup" research and development fund has given approval to a short term international research project entitled, "Are pressurisation systems for smoke control required in high rise buildings?". It involves the Melbourne Singapore and Hong Kong offices. This work will examine the requirements for zone pressurization and stair pressurization systems in high rise building codes and examine their effectiveness, complexity, reliability and costs to provide a basis for judging their value for money compared with other fire protection systems. The idea is to mobilize a range of Arup fire and mechanical engineers internationally to get a global perspective on these issues.

During 2012, Dr Barbara Lane has been made a Fellow of Arup for her international contributions to fire safety engineering and design of the built environment, and particularly for her leadership in the field of fire performance of structures. And Peter Johnson has recently been inducted as a Fellow of the Australian Academy of Technological Sciences and Engineering (ATSE) for his contribution to the development of performance based fire safety engineering, and his work on building and infrastructure projects internationally.

Signed: Peter Johnson and Angus Law, Arup

News from the University of Cantabria

Prof. Dr. Jorge A. Capote Abreu, Founder and Director of the GIDAI Research Group at Universidad de Cantabria, is retiring. After a relevant trajectory in the professional field, developing large international construction projects, especially in Africa, Latin America and Middle East, Prof. Capote jined in 1992 as a visiting professor at the University of Cantabria and started an intense teaching program, transmitting his experience in the design and construction of industrial complexes to engineering students. In 1994, he founded the GIDAI research group that was gradually focusing on the scientific aspects of Fire Safety. His research was characterized by an extraordinary capacity to generate funds for research, a constant effort to internationalize research activity, and relevant scientific production in international journals and scientific events. However, beyond the figures and notable merits that guarantee an excellent trajectory, we should emphasize the training of hundreds of researchers and professionals over the last 20 years. To testify in a modest gratitude for this experience and dedication during these 20 years in GIDAI Group, the Rector of the Universidad de Cantabria gave him a Plaque of Recognition during the recent Congress FCM2012.

PhD completion

Arturo Cuesta completed his doctoral thesis "Methodological approach for the characterization of evacuation behaviour of people in singular scenarios" on November 2012. The study proposes stochastic approaches for simulating people actions and decisions that can have a great impact in evacuation process. The proposed methodology was applied to passenger trains and a new specific evacuation model (EvacTrain®) was developed and validated for these particular scenarios. The research was conducted under several projects funded by the Spanish government and RENFE Operadora (the Spanish rail operator), and supervised by Prof Capote and Dr Alvear.

Pyrodesign

The understanding of reaction process of materials under high thermal stresses is an outstanding issue for the development of our society, both for industrial applications where the focus is put in obtaining energy with the better efficiency and for materials design where that knowledge is used to improve the material performance against new fireproofing requirements.

The goal of this project is the implementation of a software tool that makes a "comprehensive description" of fire reaction of a building material (single or composed) by using micro scale test such as thermogravimetry (TGA) and differential scanning calorimetry (DSC). This "comprehensive description" consists in a set of physical-kinetics parameters able to characterize, for current CFD codes, the mass loss rate of material against different thermal stresses. The duration of the project will be of three years, starting in the first season of 2013 with the selection of materials and the complete calibration of equipment (range of temperatures, heating rates and atmospheres). Along the first year will be carried out the entire micro scale testing schedule (STA) and some of validation tests (ISO 5660 and ASTM 2058). The research project "PyroDesign®: Physical – kinetics modeling of materials in fire" has been granted by the Ministry of Economy and Competitiveness of Spanish Government.

Signed: Mariano Lázaro, Universidad de Cantabria

News from University of Canterbury

After 3 ½ years as the Arup Post-doctoral Fellow in Fire Engineering, Kai-Yuan Li has left the university for an academic position with the University of Science and Technology of China (USTC). In his time at the University of Canterbury, Kai was involved in experimental and analytical research on smoke management systems, fire and human behaviour, fire plume development, effects of sprinklers on fire development and performance-based fire protection design and evaluation.

Mike Spearpoint and PhD student Kevin Frank visited Rotorua for the annual FireNZ conference organised by the Fire Protection Association of New Zealand (FPANZ), the New Zealand Chapter of the Society of Fire Protection Engineers (SFPE) and the New Zealand Branch of the Institution of Fire Engineers (IFE). Six of the invited speakers on the programme were Canterbury fire programme graduates. Mike is on the SFPE executive committee who were the 2012 recipients of the Gold Chapter Excellence Award. All the committee members were even awarded their own personal 'gold' medal (bought at the local $2 shop by the chapter president Debbie Scott who is also a Canterbury fire engineering graduate).

Mike and Kevin also got the chance to visit the recently upgraded National Training Centre for the New Zealand Fire Service (NZFS) which includes a four-storey building that can automatically generate fire scenarios (see photo), a mock-up urban street, a petrol station forecourt, several residential houses and a train carriage. The impressive state-of-the-art facility is used to train fire-fighters at all levels as well as people from other agencies such as the Police, Civil Defence.

In October, Mike and Kevin took part in a one-day South Island fire investigators field day at Woolston Fire Station. Investigators from the NZFS (from Timaru, Blenheim and the West Coast as well as Christchurch), the Police and private investigators carried out a number of exercises and discussions. Topics covered included the reasons why power boxes might cause fires, the ease of ignition of children's toys by matches and lighters and what happens if a live clothes iron is allowed to rest on its own cable after falling on some carpet. The group also examined what happens if a piece of rag is caught in the engine of a running car and the ignition likelihood of car seats. The photo shows the unsurprising results that occur if a car seat is ignited and the fire is allowed to develop.

Reuben Costello, one of our MEFE students, won bronze at the World Fire Fighting Games in Sydney. His medal came in the under 30 stair climbing competition, after running up 1440 steps of the Sydney Tower in 16 min and 2 s in full fire fighting gear (including helmet and breathing apparatus).

Mike Spearpoint received the University of Canterbury Student Association (UCSA) Postgraduate Supervisor of the year 2012 award.

Signed: Michael Spearpoint, University of Canterbury

News from University of Central Lancashire

The University of Central Lancashire has recognised the phenomenal achievements of Dr Anna Stec, through the award of a Readership in Fire Chemistry and Toxicity. In a department of around 70 academic staff, there are only two professors and four readers, thus Anna is already one of the senior academics. In addition to co-editing the definitive Fire Toxicity reference work, and publishing over 60 papers, she has been awarded £ 1.1 million in research funding. (In a typical UK University around 25% of tenured academics are professors, and a further 10% are readers - in international contexts UCLan's Readers can use the title "associate professor").

In addition we are delighted to welcome Dr Jianqiang Mai, MIFIRE, CEng to the Centre for Fire and Hazard Science. Dr Mai was awarded his PhD from Tokyo Institute of Technology and continued research on fluid flow at Heriot Watt University, then UCLan. Since 2007 he has worked for the fire safety industry in consultancy companies, undertaking engineering projects. He brings industrial experience of CFD, Combustion and Fire, Fluid Mechanics of Fire, and Computational Engineering to the University.

The fire group at UCLan has successfully recruited three PhD students, Ashleigh Lyons, Antony Christou and Mohammad Heidari to develop fire safe materials based on carbon nanotubes for the EU DEROCA project.

UCLan is delighted to announce that they will be hosting the Royal Society of Chemistry's Fire Retardant Technologies (FRT 14) from the 14th to 16th April 2014. This international conference will showcase the latest developments in fire safe materials.

Signed: Richard Hull, UCLan

News from Technical University of Denmark

On Wednesday, April 17 2013, the 3rd Fire Safety Day, which is a collaboration between the Fire Safety Group at the Technical University of Denmark and the Department of Fire Safety Engineering and Systems Safety at Lund University, will be held at DTU's Lyngby Campus outside Copenhagen. More information can be found at the website.

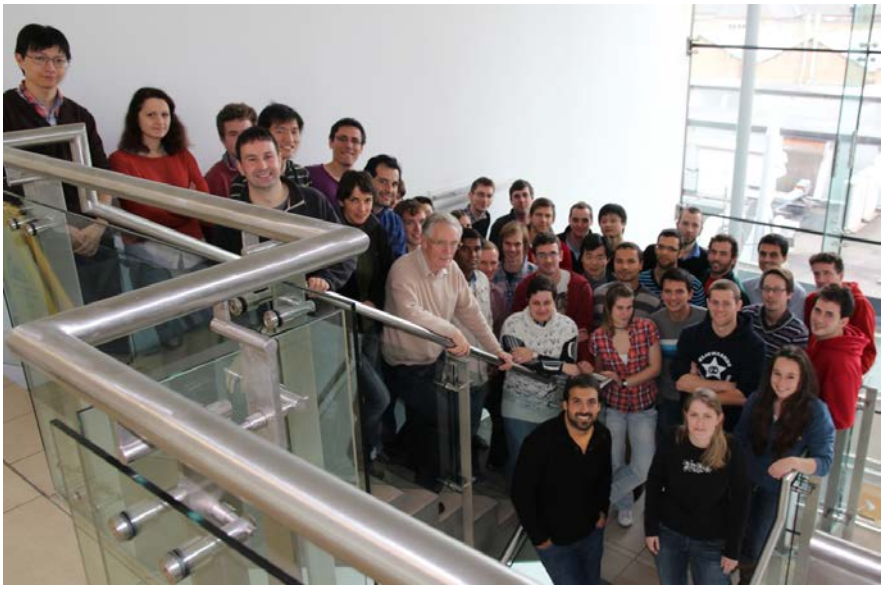
A new group of students started the Master of Fire Safety (MFS) program this January. The MSF is a two-year part-time program, where the students take 9 classes and finish with a thesis project the final semester. The classes that are offered this spring are Fire Dynamics, Fire Chemistry and Building Fire Safety. While the new students are arriving, a large group of students are in the middle of their final projects. The range of topics is large, but central topics are within the main competencies of the faculty, which are evacuation, structural fire safety and material flammability. Two studies on material melting and ignition are the first thesis projects to be performed in full using the DTU Fire Lab. The large exhaust hood (3m by 3m) has been integral in those studies, as smaller experimental modules and scaled rooms, such as the 1/5 scale of the ISO 9705 Room, are all placed under it. Most of the projects will be presented with posters at the upcoming Fire Safety Day.

Several new MSc projects are also about to start in February, and it is exciting that two projects, with Ghent University and Imperial College London, are collaborations within the IAFSS network. Other students are co-hosted by companies, something that testifies to the continued relevance of fire safety engineering as a profession.

Signed: Grunde Jomaas, DTU

News from University of Edinburgh

It is a time of change at Edinburgh. Prof José Torero, formerly the BRE / RAEng Chair of Fire Safety Engineering and Director of the BRE Centre for Fire Safety Engineering moved to Australia in September 2012 to take on the challenge of being Head of the School of Civil Engineering at the University of Queensland in Brisbane. Also, as reported in the last IAFSS newsletter, Dr Guillermo Rein moved to a new post at Imperial College London. These changes have not diminished our group, rather, we consider that our group has simply expanded geographically, and these changes have given us the



opportunity to recruit more staff. Interviews for the post of 'Lecturer in Combustion and Fire Dynamics' are happening soon, and I hope to be able to announce the newly appointed Chair in Fire Safety Engineering and lecturer in the next newsletter.

2012 saw Dr Kate Anderson, Dr Nicolas Bal, Dr Adam Ervine, Dr Freddy Jervis and Dr Joanne Knox graduating with PhDs in Fire Safety Engineering, five postgraduate students graduating with MScs in Structural and Fire Safety Engineering and twelve undergraduate students graduating with MEng degrees in Structural and Fire Safety Engineering. Several of the IMFSE students who graduated at Ghent last summer had studied in Edinburgh for part of their degrees. Last semester saw ten students starting the Structural and Fire Safety Engineering MSc course, a new batch of students on the IMFSE course, nine undergraduates entering their final year on the fire course and three new students working towards PhDs in Fire.

We are pleased to announce that Dr Graham Spinardi has been appointed as Senior Research Fellow on the Integrating Technical and Social Aspects of Fire Safety Engineering and Expertise (IT-SAFE) project. This is a prestigious interdisciplinary project designed to improve fire safety and the quality of the built environment through better integration of social and engineering research, supported by the University of Edinburgh, The Ove Arup Foundation, and the Royal Academy of Engineering. See IT-SAFE website for further details.

We will be conducting a series of large-scale fire tests throughout February 2013, as part of the "Real Fires for the Safe Design of Tall Buildings" project. The EPSRC-funded research aims to develop and validate a methodology that can adequately and realistically introduce the effects of fire into modern tall building design. The current test series has been developed to increase our understanding of fire dynamics in open-plan spaces, typical of modern tall buildings. The tests will be conducted in a large purpose-built compartment at BRE in Watford which will be highly instrumented. They have been designed to gradually build in complexity, collecting data on travelling fires for model development, verification and validation and will be accompanied by an extensive modelling study. The University of Edinburgh is partnered with a number of entities on this project, including: Arup, AXA, BRE, Buro Happold, Communities and Local Government (UK), CTBUH, FM Global, Foster + Partners, Glasgow Housing Authority, London Fire Brigade, Lothian and Borders Fire and Rescue Service, NFPA, NIST, Scottish Building Standards Division, SOM, Strathclyde Fire and Rescue, RMJM, VTT, WPI and Zurich. Regular updates from these tests will be published on our Twitter feed @EdinburghFire.

You can follow us on our Blog, Twitter, Facebook page and YouTube channel. See our website for details.

Signed: Ricky Carvel, University of Edinburgh

News from The International Forum of Fire Research Directors

The International Forum of Fire Research Directors has selected Dr John L deRis to receive the Sjölin Award for 2013. The Sjölin Award recognizes an outstanding contribution to the science or an advance in the state of the art in fire safety engineering practice of extraordinary significance. It is presented each year to the individual or group of individuals whose effort is primarily responsible for or traceable to the specific advance.

In this case, the Forum is recognizing the outstanding contributions over the past 40 years of Dr deRis. He has been one of the world's leading researchers in fire science, with work ranging from the first experimental studies of flame spread and pool fires, to the latest theoretical developments for use in detailed computational fluid dynamics based numerical fire modeling. His work has advanced the state of the art in fire safety engineering practice by supplying new, usable knowledge for assessing and reducing fire risk for a broad spectrum of fire hazard applications ranging from pool fire physics, pressure scaling, to material flammability, to thermal measurements for research, development and certification. Among his many contributions, the most notable is his work on flame radiation and heat transfer in the pyrolysis and flame zones, an essential part of characterizing fire spread and growth. His work forms the basis for common fire safety engineering practice worldwide and is an essential part of any fire research related education. John also has been instrumental in mentoring young scientists, and collaborating with other well-established researchers worldwide. His extensive list of co-authors and professional colleagues illustrates his ability to work cooperatively and the desire of researchers around the world to benefit from his expertise. Starting in 1966, Dr. deRis spent his entire professional career in the research group of FM Global, from where he retired in 2011. He continues to work closely with young scientists who are eager to learn from him, and apply their knowledge to make greater contributions to fire research that improve safety.

For 2013, the Sjölin Award will consist of an honorarium of $2,000 and a plaque that will be handed out at the next symposium of the International Association of Fire Safety Science, 10-14 February 2014, University of Canterbury, Christchurch, New Zealand.

Signed: Russ Thomas, NRC-CNRC and Chair of FORUM, and Franco Tamanini, FM Global.

News from Ghent University

In September 2012, four full-scale fire tests have been performed in an apartment block in the city of Ghent, Belgium, under supervision of Prof. Bart Merci (Ghent University). Sofas and bookshelves served as fire load in the multiple-room fire scenarios. The rooms have been equipped with thermocouple trees, heat flux meters and velocity probes. Moreover, multi-view video footage has been added. In addition to the provision of a set of experimental data for the validation of fire modeling tools (two-zone and CFD models) in multi-room configurations, as well as the evaluation of video analysis techniques for flame size and smoke layer height detection, an important objective is the assessment and further development of inverse modeling techniques used for real-time predictions of the fire development. The tests have been coordinated by Dr Tarek Beji and Dr Steven Verstockt. For the data collection, a fruitful collaboration has been set up with the University of Edinburgh (coordinated by Dr Cecilia Abecassis Empis), relying upon their experience with the Dalmarnock Fire Tests of 2006. The data, labeled RABOT2012, are being processed and will be made available to the community as soon as possible. First results will be presented during the upcoming 'International Seminar on Fire and Explosion Hazards' in May 2013 and journal papers will be submitted in Spring 2013.

Signed: Bart Merci, Ghent University

News from The Hong Kong Polytechnic University

It has been surveyed that large amounts of combustibles were stored in residential buildings. The fire load density was >1,400 MJ/m^2, much higher than the upper limit of 1,135 MJ/m^2 allowed in the local fire codes. On the other hand, there are open kitchens in small residential flats in supertall buildings in Hong Kong. As reported recently by Wong and Fong (2012 ISFSE Guangzhou) even an electric induction cooker can ignite an oil pan for deep frying. Therefore, sprinklers might be required in some residential buildings with special features such as open kitchens.

Prof W.K. Chow, Director of Research Centre for Fire Engineering, Department of Building Services Engineering, The Hong Kong Polytechnic University is working with a team of officers in the Fire Services Department on requiring sprinklers in tall residential buildings. The current practice and research reported in the literature were surveyed first. Experimental studies were carried out with support from the Hong Kong Institution of Engineers – Fire Division and a local testing laboratory Research Engineering Development Façade Consultants Limited (RED). Full-scale burning tests were carried out in a burn room of floor area 10 m^2 and height 2.5 m. Tests were

carried out using wood crib and furniture over a range of fuel loads, with and without sprinklers, some following BS EN 12845.

Detailed studies will be reported later. This is the first time the academics, authority and industry work closely together on an in-depth research project in Hong Kong. The work was supported by a research grant from the Hong Kong Institution of Engineers.

Signed: W.K. Chow and N.K. Fong, The Hong Kong Polytechnic University, and T.K. Tam and Y.K. Woo, Fire Services Department of Hong Kong.

News from EU International Master of Science in Fire Safety Engineering

The simultaneous second and third editions of The "International Master of Science in Fire Safety Engineering (IMFSE)" are running well. After an intensive semester, the students returned to their home countries to celebrate Christmas. They could enjoy the holidays to reload energy for their current semester 2 in Lund (first year students) or their semester 4 in either one of the partner institutes (second year students).

In the meantime, the first cohort of freshly graduated fire safety engineers has found its way to the engineering market. These IMFSE graduates are now implementing their Fire Safety knowledge worldwide both in academic as in industrial settings.

The deadline for the IMFSE edition 2013 students to apply was mid-January 2013. By the end of February 2013, the best applicants had been selected for admission in the programme and some of them for one of the prestigious scholarships.

Signed: Elise Meerburg, IMFSE, Ghent University

News from Imperial College London

Dr Guillermo Rein, Head of the Haze Lab at Imperial College London, is the new Editor-in-Chief of *Fire Technology* since Jan 2013, taking the stead from Jack Watts who expertly led the journal since the 1980s. *Fire Technology* is published by Springer in conjunction with the National Fire Protection Association (NFPA). His first step was to renew the Editorial Review Board and choose the best associate editors. The immediate objective is to increase its scientific impact (~ impact factor) while maintaining its large industry readership. The following was written in his first editorial:

"Whether science precedes technology, or as often observed the inverse order is found, the two of them must communicate and feed to each other if we are to reduce the worldwide burden of fire hazards. This journal wants to bridge the gap. Fire Technology will continue pushing forward the frontiers of knowledge and technology, and help reduce the unworthy obstructions to progress in fire prevention and public safety."

Signed: Guillermo Rein, Imperial College London

News from Lund University

Education

The spring semester started in the middle of January at Lund University. The department of Fire Safety Engineering and System Safety currently run one bachelor program in Fire Safety Engineering and three masters programs. The masters program topics are: Risk Management and Safety Engineering, Human Factors and System Safety and in Fire Safety Engineering (in collaboration with the university of Gent and University of Edinburgh). Our different educational programs are strongly linked to the research that we conduct at the department.

Approximately 20 PhD students are currently connected to the department and half of these are conducting research related to fire safety engineering. Five new PhD students have joined the department in Spring 2013 within the FIRE TOOLS project. This project will provide a training network for the industrial PhD students who will carry out research with a focus on creating computing simulation methodologies, tools and models to increase the usability of fire tests conducted on building materials, products and construction elements which act as building linings, building content or fire barriers by using fire simulations. More specifically, they will address the determination of the fire properties of building products, content and barriers, in order to assist companies, based on advanced computational models and predictions, to simulate and predict the fire performance of materials, products and structures earlier in their product development processes and more on a continuous scale instead of traditional fire classes. A fundamental part of performance-based design is to analyse the fire protection in the building in regard to a probable worst-case or realistic fire; therefore, it is important to investigate how different building components responds to these types of fires. The industrial partner in this project is the Danish Institute for Fire Technology (DBI). A total of 41 students presented their final MSc and BSc theses in Fire Safety Engineering during the last semester. Several of the theses are available online and in English.

Research

The METRO project was finalized in 2012 and the project results were presented at a final seminar in December. METRO is a Swedish multidisciplinary research project about infrastructure protection with the goal to make underground rail mass transport systems safer in the future. The department of Fire Safety and System Safety have mainly been involved in the second work package (WP2). The focus of WP2 has been to investigate how train passengers can be safely evacuated in case of an emergency in underground mass transportation systems, e.g., underground railway tunnels, trains, and stations. Particular focus was placed on examining way-finding behaviour, and different way-finding systems have been tested in small- and medium scale experiments in the study. It has also been investigated how various groups of passengers, such as senior citizens and people with disabilities, physically manage to evacuate. More information on the project and links to all accessible publications in the project can be found on: www.metroproject.se.

Another research project that have been finished during late 2012 is the project called: ”Why do some fires grow large?”. The project has aimed to find factors that lead to that some fires develop into large fires and investigate whether there are specific characteristics of large fires in different types of objects. The project has resulted in three reports dealing with three different types of objects (buildings). The first report deals with fires in school buildings, the second deals with attic fires in apartment buildings and the third deals with fires at nuclear power plants. These three reports are summarized in one final report, that is available at the department website. This project will be followed up during 2013 with a new project on fires within building constructions (e.g. in cavities), which was approved at the end of 2012.

Researchers from the department will be presenting research conducted by the fire safety group at several national and international conferences during 2013. Among others the department did present four papers at the Fire and Materials Conference in San Francisco and will present another four papers at Interflam in London. For example, the photo by Martin Nilsson shows a study of testing methods for hypoxic air to be presented in one of the papers at the Fire and Materials Conference.

The next Fire safety Day will be held in Copenhagen on the 17th of April 2013. This is an annual conference organized jointly by the Technical University of Denmark and Lund University.

Appointments and awards

From January 1st, 2013, a change in management at the department has occurred. The department is now jointly managed by Prof. Kurt Petersen, Dr. Berit Andersson and Prof. Patrick van Hees. Research on systems safety and risk management is covered by Prof. Kurt Petersen. Research on fire safety engineering is covered by Prof. Patrick van Hees. Education is covered by Dr. Berit Andersson. The new management group would like to thank Robert Jönsson for all the efforts and achievements during his period as manager of the department.

Docent Stefan Svensson will join the department as associate professor in February 2013. Stefan took his PhD at the department in 2002 and has worked at the Swedish Rescue Service agency and the Swedish Civil Contingency agency since 1990. Stefan will be primarily responsible for the fire laboratories at the department, but he will also lecture bachelor and master students, supervise PhD students and take part in the research.

Prof Patrick van Hees has been appointed as European vice chair of IAFSS. He is also proposed by BSI to be the next ISO TC92 chairman. ISO TC92 is dealing with standardisation of fire safety standards.

Signed: Nils Johansson Lund University

News from University of Maryland

Andre Marshall, Arnaud Trouvé, and Peter Sunderland, Associate Professors of FPE, recently received a National Science Foundation Grant Opportunities for Academic Liaison with Industry (GOALI) award for the project "Towards Predicting Fire Suppression Performance: Quantifying Fire-Spray Interactions." They seek to equip engineers with tools required for performance-based fire suppression analysis and design, perhaps leading to new technologies and engineering practices for life safety and infrastructure protection. This work partners with FM Global and United Technologies Research Center.

Prof Andre Marshall is PI on a new NSF grant named "MRI: Development of Spatially-resolved spray scanning system." The team seeks to develop an instrument capable of precisely characterizing engineered sprays to develop models to describe their behavior and to leverage this understanding for advancements in spray technology. They are focusing on both large-scale sprays (e.g., sprays used in fire suppression applications) and small-scale sprays (e.g., sprays used in microelectronic applications).

Prof Andre Marshall is working with colleagues to develop advanced spray systems, work for which he was recently featured in the publication International Innovation. He is working with colleagues to form a startup company called Custom Spray Solutions as part of the NSF Innovation Corps Program. The company is based on a software solution that came out of Marshall's NSF PECASE research.

Prof Peter Sunderland was interviewed for the Oct. 31, 2012, national television broadcast of ABC World News with Diane Sawyer. The topic was explosion hazards of natural gas leaks following Hurricane Sandy. The video can be viewed online.

Pat Baker, program management specialist in FPE, received a UMD Distinguished Service Award. The award is one of the most prestigious for staff on campus and recognizes exceptional performance, leadership, and service. Baker also received the 2011-2012 USM Board of Regents Staff Award for Outstanding Service to Students.

Signed: Peter Sunderland, University of Maryland

News from University of Newcastle

Supported by an equipment grant from the Australian Research Council, the University of Newcastle has acquired a sophisticated 7200 GC/MS Q-TOF EI/CI (Gas Chromatograph/Mass Spectrometer, Quadrupole-Time of Flight, Electron Impact/Chemical Ionisation) made by Agilent for structure elucidation of chemical species, trace detection and quantitation of pollutants formed in chemical fires, especially heavy organic molecules, such as mixed polyhalogenated dibenzo-p-dioxins and dibenzofurans (PXDD/F), chlorinated naphthalenes, polychlorinated and polybrominated products of decomposition of flame retardants and sulfur-analogues of PCDD/F. When installed, this instrument was first of its kind in Australia and one of about 40 around the world. In addition, a custom-made high-resolution TOF-MS has been ordered from Kore Technology Limited, and is under construction in the UK. It is expected that, this instrument will arrive in Australia in early April 2013. The instrument will have a dual inlet system, including an on-board PDMS membrane to enhance the detection sensitivity. It will be fitted with a large flight tube and reflectron, to give a high mass resolution capability, especially to resolve (i) CO and N2 as distinct peaks (minimum resolution of 2500 at m/z = 28); (ii) CO2 and N2O as distinct peaks (minimum resolution of 4000 at m/z = 44); and, (iii) H2S in the presence of 16O18O.

The Australian Research Council has awarded a Discovery Project to Profs Dlugogorski and Radny to study fires of halogenated industrial chemicals and their impact on the Australian environment. Recent large fires of industrial chemicals in Australia led to significant environmental pollution. In this project, the researchers will develop sophisticated techniques to assess pollutants formed in fires of commonly used industrial chemicals. It is anticipated that, the results will find immediate applications in training fire brigades in their response to

chemical fires. On a related subject, Dr Altarawneh will deliver a plenary presentation titled “Mechanisms of pollutant formation in fires” at the 7th International Symposium on Fire and Explosion Hazards, to be held in Providence, RI, USA in May this year.

Well-deserved congratulations go to Drs Juita, Luis Lucas, Mark Rayson and Sindra Summoogum who completed their PhD studies in 2012, working on, respectively, spontaneous ignition of linseed oil, pyrolysis of biomass, mitigation of NOx formation in explosions, and formation of pollutants in fires of pyrethroid pesticides. The students were co-supervised by Profs Dlugogorski, Kennedy and Mackie. Juita and Luis pursue academic carriers in Australia and Mozambique, whereas Mark and Sindra work as industrial researchers in Australia and Mauritius.

Signed, Bogdan Dlugogorski, The University of Newcastle, Australia

News from NIST

Dick Gann’s retirement

Richard Gann retired in November 2012 after 40 years of service at National Institute of Standards and Technology (NIST, formerly the National Bureau of Standards), leading and performing research that has significantly improved fire safety in the U.S. and around the world. Dr. Gann joined the National Bureau of Standards in 1976 as a Research Chemist. During the next six years, he successively became Head of Fire Chemistry Research, Head of Exploratory Fire Research, and an NBS Program Analyst. In 1984, he was a Senior Executive Fellow at the John F. Kennedy School of Government, Harvard University. From 1982 until 1999, he led the Fire Science Division in developing the scientific and engineering understanding and metrology for fire research. In 1999, Dr. Gann stepped aside from the Division management to focus his efforts on a small number of high impact projects: standards for reduced ignitions by cigarettes, removing dependence on the ozone-depleting halon fire suppressants, and developing a scientifically sound strategy and basis for including the effects of smoke in fire safety decisions.

Dr. Gann has over 110 personal publications, 350 supervised publications and 400 presentations to university, professional, industrial, and government audiences. He is or has been a member of the Editorial Advisory Boards of *Combustion and Flame*, *Fire Technology*, and *Fire and Materials*, all prime archival journals in their fields. While a member of the *Combustion Institute*, Dr. Gann was Program Chairman of the 23rd International Symposium on Combustion, Vice-Chairman of the Publications Committee, and Program Chairman, Treasurer and Chair of the Eastern States Section. He belongs to the American Chemical Society and the ASTM Committee on Fire Standards. He chairs the National Fire Protection Association Toxicity Technical Advisory Committee and is an alternate member of the Fire Test Committee. He chaired the Technical Groups under the Cigarette Safety Acts of 1984 and 1990 and the Technical Committee of the Halon Alternatives Research Consortium. He is a member of Phi Beta Kappa, Sigma Pi Sigma, and Sigma Xi. He serves as Chair of the ISO TC92 SC3 Subcommittee on Fire Threat to People and the Environment. Dr. Gann was the Technical Program Manager for the Department of Defense's Next Generation Fire Suppression Technology Program.

In 2002, Dr. Gann and five NIST colleagues were awarded ASTM's Simon H. Ingberg Award for "*the original and comprehensive work in research, testing and analysis they performed to create the sound scientific basis for ASTM Standard 2187, Test Method for Measuring the Ignition Strength of Cigarettes.*" This method was adopted by the State of New York as the basis for the world's first law requiring less fire-prone cigarettes and has since been adopted by 49 other states, Australia, and Canada as the basis for similar regulations. In 2005, Dr. Gann received one of the first (Congressman) John Joseph Moakley Awards for his leadership in promoting fire-safer cigarettes.

Dr. Gann has been awarded two Department of Commerce Gold Medals, one for development of scientific methods for ignition propensity of cigarettes and selection of alternatives for ozone-depleting fire suppressants and one for his role in the investigation of the World Trade Center disaster. In 2005, he received the E.U. Condon Award for writing the Final Report on the Collapse of the World Trade Center Towers. In 2007, Dr. Gann was recognized by the International Forum of Fire Research directors (FORUM) with their Sjolin Award for contributions to the science and advances in the state of the art in fire safety engineering practice of extraordinary significance. In 2011, Dr. Gann was awarded the U.S. Presidential Rank Award, the most prestigious recognition of professionals in the U.S. government. Dr. Gann will continue to be associated with NIST as he continues his research into his retirement.

Signed: Anthony Hamins, NIST

Bill Grosshandler's retirement

Bill Grosshandler retired from National Institute of Standards and Technology (NIST) in September 2012 after 21 years of service. Bill was the Deputy Director for Building and Fire Research of the Engineering Laboratory (EL) at NIST, where he managed and led research in the areas of construction and materials, building environment, and fire protection.

Bill received his Ph.D. in Mechanical Engineering from the University of California, Berkeley. Before joining NIST, Bill served for 16 years as an assistant, an associate, and a full professor in the Department of Mechanical and Materials Engineering of the Washington State University in Pullman, WA, including three years at the National Science Foundation as Director of its Thermal Systems Program. He also held visiting appointments at Factory Mutual Research Corporation (now FM Global) and the University of Poitiers in France.

Bill began his NIST career in August 1991 as the Leader of the Exploratory Fire Technology Group in the Fire Measurement Research Division in the then Building and Fire Research Laboratory. Prior to his appointment as EL Deputy Director, Bill was Chief of the Fire Research Division in the Building and Fire Research Laboratory.

Bill served on the Board of Directors of the Combustion Institute, the editorial advisory board of *Progress in Energy and Combustion Science*, advisory boards for the Fire Protection Engineering Departments at the University of Maryland and Worcester Polytechnic Institute, the Research Advisory Committee of the Fire Protection Research Foundation, and was active in the ASME Heat Transfer Division, an Associate Technical Editor of the *ASME Journal of Heat Transfer*, and a Fellow of ASME. He was Chairman of the International Forum of Fire Research Directors (FORUM), served on the UL Fire Council, and was a member of the Science Advisory Committee of the National Association of State Fire Marshals.

Bill was the author of RADCAL, a computer code widely used by the fire and combustion research communities to calculate flame radiation using a narrow-band spectral model. During his tenure at NIST, Bill played a critical role in conceiving, planning, and overseeing fire research. His leadership was vital in the design and construction of NIST's National Fire Research Laboratory, a unique facility that will be used to perform structural performance in fires under well defined and controlled test conditions to advance performance-based engineering design. Bill's career at NIST was marked by several landmark accomplishments including helping to lead the NIST World Trade Center Disaster Investigation and leading the investigation of the 2003 Station Nightclub Fire in Warwick, Rhode Island. Bill was awarded two Silver Medals and a Gold Medal for distinguished achievement in federal service from the U.S. Department of Commerce.

Bill will be truly missed by his friends and colleagues at NIST and in the fire and academic communities. We all wish Bill a happy retirement.

Signed: Jiann Yang, NIST

News from Université de Poitiers

P' Institute, part of the Université de Poitiers, France, is composed of three departments, each being divided in several research axes. The topics of heterogeneous combustion and porous media are studied by several working groups. One of those is specialized in teaching and research in the field of fire safety. More precisely, the main aim of this team, which employs one professor, four senior lecturers, two postdocs, one engineer, five PhD students and several trainees, is to describe on the one hand the chemical and physical phenomena occurring in a solid in case of thermal irradiation in order to develop pyrolysis models and on the other hand the chemistry part in the gas phase of fires that play an important role on the fires dynamic particularly in under ventilated environments.

The team is currently investigating the following topics:

- The description of solids matrices' thermal degradation with pyrolysis models: This work both experimental and numeric is focused on the characterization of the thermal degradation of different combustible materials, under different ventilation and irradiation conditions. Developing kinetics models of degradation for each studied material must lead to create a global pyrolysis model. To this end, the team's work is based on a multi-scale approach and must take into account the characterization of the thermal, physical and chemical properties evolutions. Moreover, a part of the work is concerning a better understanding of the Arrhenius law and its application to thermal degradation modeling.

- Experimental and numerical study of the effects of both a thermal and a mechanical aggression of composites materials. The objective is to understand the effect of a load on the thermal decomposition and combustion process and to determine the residual mechanical properties of a composite during its degradation and combustion.

- The description of chemical emissions kinetics formation which is based on the characterization of gaseous pyrolysis and combustion products of different combustibles studied, in order to create polluting emissions databases, function of the combustibles and experimental conditions. This work also concerns the investigation on pollutant kinetics mechanisms and their integration in combustion simulation codes.

For managing this research, different experimental devices are used such as Thermo Gravimetric Analysis coupled to Differential Scanning Calorimetry, Cone calorimeters ISO 5660, Tubular furnace, LIFT ISO 5658, Radiant panel, Fourier Transformed Infra-Red, Gaseous Chromatography Mass Spectrometer, Micro Gaseous Chromatography Mass Spectrometer and Horiba multi-components gas analyser. Furthermore, to simulate fire's behaviours, numerical codes are used, such as Fire Dynamics Simulator, Gpyro and Open Foam.

The main applications of the studies concern principally the current and frequently used materials in dwelling (wood, plywood, PU, PE, etc), but also others combustibles more complex used in industry and transport (aeronautical, railway, road) such as composite or multi-layer materials. Moreover, several research axes must lead to a better understanding in fire behaviour with different ventilation conditions and especially in under ventilated environments where the oxygen concentration can be lower than 21% and where thermal degradation conditions and gaseous species produced can be radically modified. Through these studies two different goals are aimed at: the first one is to go further into the development of pyrolysis models in under ventilated environments, and the second one to study the gases formation kinetics and the ignition and extinction conditions for this kind of fires. Finally, the workgroup tries to explore new themes such as the link between thermal degradation and mechanical properties (up to now, this kind of work has only been led for some composites materials).

As the subjects covered by the workgroup are linked in many fundamentals fields, the partnerships with other universities or research groups are very important. Thus, links are developed with the University of Edinburgh, Laboratoire National de métrologie et d'Essais, Institut Universitaire des Systèmes Thermiques Industriels (Marseille University), Laboratoire d'Energétique et de Mécanique Théorique et Appliquée (Nancy University), to name a few. The workgroup also develops collaborations with industrial groups such as AREVA, EADS and Air Liquide for example. Moreover, partnerships are also developed with firemen. This kind of collaboration allows fire-fighters to learn the fundamentals of fire phenomena, and researchers to understand better real fires.

Signed: Fabien Hermouet, P' Institute, Université de Poitiers

News from Universitat Politècnica de Catalunya

Two new PhD students have joined the Center for Technological Risk Studies (CERTEC) at the Universitat Politècnica de Catalunya: Giovanni Camacho (Mexico) and Behruz Hemmatian (Iran). Also a PhD student from the Naval Architecture and Ocean Engineering Department of the University of São Paulo, Adriana Miralles will be visiting us for one year, starting March 1.

Prof. Joaquim Casal from the CERTEC was awarded the Narcis Monturiol Medal by the Generalitat de Catalunya (Catalonian Government) with for his achievements and contributions in the field of industrial safety.

The first edition of the course "Fundamentals of combustion and fire dynamics" started in February 2013 at the Universitat Politecnica de Catalunya within the Master's degree on Chemical Process Engineering.

On November 8, 2012 Prof. Elsa Pastor and Prof. Eulalia Planas delivered the Lecture "Infrared Monitoring: Connecting Wildfire Behaviour to Ecological Systems" within the Michaelmas Seminar Series at the Oxford Centre for Tropical Forests, University of Oxford.

Signed: Eulalia Planas, UPC

News from San Diego State University

Flame Stabilizer: A new flame spread study apparatus called the Flame Stabilizer where a downward spreading flame is turned stationary by moving the fuel upward through a PID control system is now operational. The frozen flame can be probed with temperature and carbon-dioxide sensors with an x-y linear motion system.

Flame Tower: A 6 m tall vertical chamber has been constructed at SDSU inside which a sample holder can be remotely controlled to move up or down a rail at any desired speed (up to about 2 m/s). A fuel sample, thus, can be subjected to a desired flow with a known relative velocity profile. By moving the sample up at about the speed of the buoyant flow, it may be possible to create a situation similar to the diffusive environment of a microgravity environment.

Narrow Channel Apparatus: A new Narrow Channel Apparatus (NCA) is complete and testing has begun on thin fuel samples to determine spread rates and flammability limits in spacecraft cabin atmospheres. The NCA suppresses buoyancy to simulate microgravity flow conditions. This is the first NCA in which the pressure and the oxygen concentration can be varied to achieve spacecraft atmospheres.

Couette Flow Apparatus: A unique Couette Flow Apparatus was built that achieves a linear velocity profile in a small gap that better approximates that velocity profile seen by an actual microgravity fire, as compared to the parabolic profile obtained in the NCA. Preliminary flame testing has been completed and some design changes are being implemented to improve the apparatus. In addition, the channel is being modeled using NIST's Fire Dynamics Simulator.

Prof Bhattacharjee received a JSPS Fellowship to present his work on flame spread at several universities in Japan including Hokkaido University, Gifu University, Toyohashi University, Gifu University, Technical Meeting of Japan Combustion Institute at Nagoya, Hirosaki University, and Nagaoka University of Technology.

Signed: Fletcher Miller and Subrata Bhattacharjee, San Diego State University

News from State Key Laboratory of Fire Science

Special fire behaviors and problems of fire safety engineering for high-rise buildings is a crucial topic attracting more and more attentions due to the serious fire disasters in recent years especially in China and Far East. A new National Key Basic Research Program of China (973 program) has been approved (five years, 2012-2016) by the Ministry of Science and Technology of China to meet this special fire safety demand with a funding of nearly 36 million RMB (5.7 million US$). This program entitled "Fundamental Research on Fire Prevention and Control for

City High-rise Buildings" is chaired by State Key Laboratory of Fire Science (SKLFS), University of Science and Technology of China (USTC).

Beijing TVCC building fire during Feb. 9 2009. Photo from Wikipedia.

Prof. Jinhua Sun from SKLFS serves as the Principal Investigator of the research team which covers USTC, Tsinghua University, Tongji University, China Academy of Building Research, Anhui University of Architecture, and (TianJin, ShangHai, SiChuan, ShenYang) Fire Research Institute of Ministry of Public Security of China. The research focus will cover both fundamental and engineering aspects of high-rise building fire safety, including combustion behaviour and safety design of facade thermal insulation material, high-rise building facade fire spread and control, safety of building structure components in fire, smoke transportation and control, as well as efficient evacuation strategy design. It is expected that this program will help promote the innovations in both the fundamental researches of fire dynamics and the applied researches for new fire technologies and codes, directly toward fire safety of high-rise buildings. During the International FORUM of Fire Research Directors Annual Meeting of 2012 (held in Hefei, October 13-16, 2012), a workshop on Fire safety of high rise building was organized by SKLFS, in which new progress of this program was systematically reported and the current research demand was extensively discussed with FORUM members and other international scholars.

Signed: NaiAn Liu and Longhua Hu, State Key Laboratory of Fire Science

News from SP

Close collaboration between SP and SINTEF

SP Technical Research Institute of Sweden and the Norwegian Research Institute SINTEF have signed an agreement concerning close collaboration between SP Fire Technology and SINTEF NBL AS, a wholly owned subsidiary of SINTEF. The Agreement states that SP and SINTEF will own and run NBL together, with SP as the majority owner. At this point SP and SINTEF will invest in equipment and personnel in the Norwegian fire laboratory in order to create added value and new opportunities for our clients. Björn Sundström, Manager of SP Fire Technology, will be appointed to the NBL Board of Directors. NBL is active in the field of fire research, fire safety engineering and fire research. The laboratory, located in Trondheim, has large experimental facilities and a strong business of unique character. The Swedish-Norwegian collaboration will create a resource that is one of the largest in Europe.

European technical specification for FR treated wood products

A European technical specification on the long term fire durability of fire retardant wood products was published in 2012, CEN/TS 15912 Durability of reaction to fire performance - Classes of fire retardant treated wood-based product in interior and exterior end use applications.

It is needed since fire-retardant treatments may considerably improve the reaction to fire properties of wood-based products and may result in the highest fire classification achievable for combustible products, e g European class B. However, the reaction to fire performance may be reduced by exposure to wet and/or humid

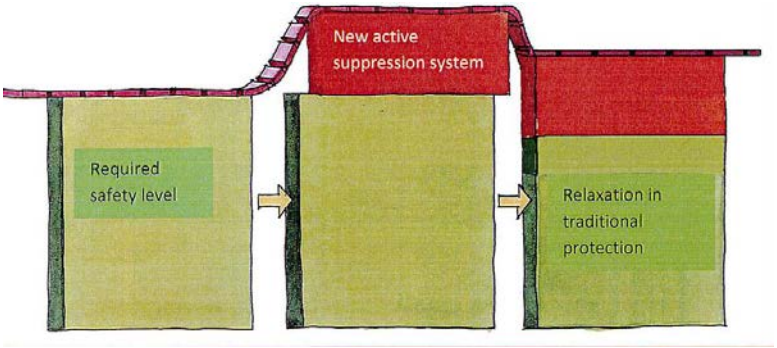
conditions and the ability of treatments to continue to perform even when exposed to these conditions needs to be demonstrated.

Two aspects of fire durability of the fire-retardant treatment of wood-based products are considered. One is the risk for high moisture content and migration of the fire-retardant chemicals within the wood product and salt crystallisation on the product surface. These hygroscopic properties of the treated wood-based product are evaluated by exposure to high relative humidity. The other aspect is the risk for decreased fire performance due to loss of the fire-retardant chemicals by leaching in exterior applications, e g facade claddings. Maintained fire performance after weathering needs to be verified.

The Technical Specification is based on a Nordtest standard NT Fire 054 and on experience from North America, ASTM D3201 and ASTM D2898. The technical specification CEN/TS 15912 will be further developed to a full European standard.

Nordic technical specification on Fire safety engineering

A technical specification is being developed within INSTA, the Inter Nordic Standards organisation, INSTA prTS 950 Fire Safety Engineering – Verification of fire safety design in buildings. It is intended to be used as a reference document for building authorities and for use in connection with regulations. It also provides verification methods for complying with functional requirements for practitioners. The aim is to create a more consistent and uniform performance-based design process, and to give guidance on performance criteria. It has a specific focus on the use of sprinklers in fire safety design, and is applicable to buildings within the limitations of the respective verification method.



This technical specification is based on research on verifying fire safety design in sprinkled buildings at Lund University and has been extended to cover verification of fire safety design alternatives more generally by previous Nordic work (NKB, 1994) and work done by ISO on fire safety engineering. Background documents are available online for verifications and case studies. INSTA prTS 950 is out on enquiry until 11 February 2013.

Signed: David Lange, Björn Sundström and Birgit Östman, SP

News from Tomsk State University

Dr Alexander Filkov, Associate Professor at Tomsk State University (one of the National Research Russian Universities) is currently visiting Worcester Polytechnic Institute, USA, as a Fulbright Scholar. His project is titled "Transition of burning regimes in wildland fires: Application to home ignition by firebrands and embers". The visit will be from January to July 2013 at WPI's Fire Protection Engineering Department and he will carry out his research with Prof. Albert Simeoni.

The main purpose of the project is to improve the knowledge about the reasons and conditions of building ignition from burning particles caused by forest fires, as well as to conduct specific experiments to determine the conditions for spreading of wildfires at the wildland-urban interface (WUI). This research is experimental. The influence on the flammability of building material design, building design (edges and corners), kind of building material (decks and insulation materials), as well as external conditions (temperature and moisture content of building materials) will be investigated.

This project is the result of a strong collaboration between the University of Corsica, France (where Prof. Simeoni worked before) and Tomsk State University that led to a joint grant from the Russian Foundation for Basic Research and the French National Center of Scientific Research.

WPI is actively collaborating with Tomsk State University, and organize jointly with the International Association of Wildland Fire and IAFSS the *4th Fire Behavior and Fuels Conference*. In addition to the US edition (in Raleigh), the Russian edition of the Conference will be held in St. Petersburg, Russia, on July 1-4th, 2013.

Signed: Alexander Filkov, Tomsk State University

News from University of Ulster

List of graduates

FireSERT at the University of Ulster UK would like to compile an updated list of all the graduates of its Fire Safety Engineering Master course over the years including current address, affiliation , telephone and email. Please kindly forward your response to our secretary Heather Griffiths: H.Griffiths@ulster.ac.uk

Summary of FireSERT

With a prominent long established national and international research profile, FireSERT is a significant constituent of the Built Environment Research Institute. Staff were awarded in 1999 a £5.5 million JIF project to build and equip a purpose designed environmentally-friendly, large-scale fire safety engineering research facility. The facilities developed are exceptional. A 600 m^2 burn hall allows full-scale fire research to be undertaken. A 20 MW large-scale combination wall and floor furnace (3 x 3 x 4 m), intermediate and small size furnaces facilitate investigations over a wide range of scales. These facilities are complemented by a well-equipped fire dynamics and chemistry laboratory furnished with TGA/FTIR/DSC/MS and two cone calorimeters. In addition, extensive dedicated computer facilities are available. A specific set of laboratories are also available for the investigation of human behavior fire, allowing fundamental work to be undertaken on human responses and evacuation simulations.

The four core areas of activity are fire dynamics and materials, structural fire engineering, fire modeling and human behavior. Staff have attracted significant project funding from the UK research councils, government, the European Union and industry. The current portfolio is about £4 million and includes major projects in Material flammability of nanocomposites and fire dynamics (Marie Curie, FP6, FP7, and EPSRC), Structures (FW7 and EPSRC) and Human behavior in WTC (EPSRC). Staff plays an active role both nationally and internationally having developed extensive links and collaborations with other leading researchers from all over the world including the USA, Europe, Australia and the Far East. In FireSERT can advise on Fire Safety Engineering and design and construction of buildings and structures. We also offer a range of MSc, DPhil and CPD programs in Fire Safety Engineering.

Signed: Michael A. Delichatsios, University of Ulster

News from Worcester Polytechnic Institute

New UL Fire Protection Engineering Lab

Worcester Polytechnic Institute (WPI) has received two recent grants totaling $1 million for its new Fire Protection Engineering Laboratory, recently opened in the Gateway II building in Gateway Park. Underwriters Laboratories Inc. (UL) has pledged $750,000 to the construction and support of the new large-scale engineering laboratory, while the Richard H. Lufkin Memorial Fund, Bank of America, N.A., Trustee, recently awarded WPI a $250,000 grant that will outfit this laboratory with a suite of state-of-the-art measurement devices. UL and WPI have established a relationship encompassing research, education, technical collaboration and other initiatives intended to advance the science of safety. The large-scale engineering laboratory will be named the UL Fire Protection Engineering Lab at WPI and will be more than triple the size of the current lab, affording space for industry-centric projects and research. The U.L. large scale engineering lab complements the previously dedicated Honeywell Fire Fundaments Lab and earlier grants received from Kidde, RJA, Siemens, Aon and others.

New Projects

Fire Protection engineering Profs Rangwala and Simeoni received a $400K (1 year award) from the Department of Interior (DOI) to investigate the impact of an oil spill in the Arctic environment.

Profs David Cyganski, James Duckworth, Kathy Notarianni and John Orr received the Fire Marshal's Award 2012 at the 23rd Annual "Firefighter of the Year" ceremony held in Mechanics Hall in Worcester. The Commonwealth of Massachusetts recognized WPI for its outstanding work to increase firefighter safety. The award was presented by Governor Deval Patrick, Lt. Gov. Timothy Murray, Public Safety and Security Secretary Mary Elizabeth Heffernan, and Fire Marshal Stephen Coan. The WPI faculty received a standing ovation by full-house attendees at the historic Mechanics Hall. The team formed by our colleagues has been conducting innovative research on the most pressing challenges facing firefighters such as positional and directional determination in an extremely dense, rapidly-changing dangerous and unfamiliar environment where every second counts. The work attracted significant interest and support nationally and received major awards from several federal agencies, including the U.S. Department of Homeland Security and the Federal Emergency Management Agency (FEMA). They have also been working closely with the Worcester Fire Department and the Massachusetts Firefighting Academy.

Prof. Simeoni received additional funding for his research on wildland fires through the U.S. Department of the Interior, the U.S. Forest Service and the company FM Global. In the frame of the DOI grant, two field experiments will be conducted in the New Jersey Pine Barrens to measure fire-spread and environmental properties. Then, the Fire Dynamics Simulator will be used to test its ability to represent fire-spread in pine stands submitted to different degrees of fuel treatment. The work with the U.S. forest service is about the modeling of wind/vegetation interaction, and the FM Global project initiated a study on the fundamentals of porous fuel and flow interaction during combustion.

The landmark $5 Million project, Full-Scale Structural and Nonstructural Building System Performance during Earthquakes and Post-Earthquake Fire, involved earthquake and post-earthquake fire testing of a five-story test specimen built at full-scale on the nation's largest outdoor shake table at the Englekirk Structural Engineering Center at the University of California, San Diego. This academia-industry-government collaborative was generously supported by the National Science Foundation (NSF Award 0936505), the California Seismic Safety Commission (CSSC), the Society of Fire Protection Engineers Scientific and Educational Foundation (SFPE E&SF), and numerous industry and organizational partners (see the project website). For those interested in preliminary outcomes of the project, the CSSC commissioned a 29-minute documentary about the project, with a focus on building earthquake resilient hospitals in the future. The UCSD-TV produced video is available online. Supported by NIST, the project Quantification of Fire Risk, Performance Levels, Design Fires and Acceptance Criteria for Use in Performance-Based Codes and Fire Safety Design investigates how fire risk, building performance expectations, design scenarios and fires, and acceptance criteria for performance-based fire design are currently characterized and reflected in building codes, guidance documents and in practice, and is developing new approaches for how each component might be better addressed in the future. It involves guidance on risk characterization, how to develop risk-significant scenarios, how to develop design-basis fires for consequence analysis, and how to represent vulnerability criteria as a function of direct and indirect losses to targets of concern.

After graduating from the Technical University of Braunschweig, Germany, with a PhD in Fire Protection Engineering in May, 2012, Dr. Cornelius Albrecht started his six-month post-doctoral fellowship at WPI in October with a full scholarship from the German Academic Exchange Service. His research is focused on risk-informed uncertainty quantification and optimization of fire protection systems using probabilistic methods. He is also looking into the utilization of cloud computing for high-throughput numerical problems in fire protection engineering.

Prof Xianfeng Chen is visiting WPI for one year and will be working in the area of dust deflagrations with Prof Rangwala. Prof Chen is the head of the department of Mining and Safety Engineering, Wuhan University of Technology. His major field is industrial fire and explosion protection engineering with a research interest related to gas and dust flame propagation and microstructure. He has experimentally investigated the phenomenon of laminar-turbulent transition of gas and dust flames in a restricted pipe using high speed schlieren images. Professor Chen's one year visit is sponsored by the Chinese Science Council (CSC).

Student Accomplishments

Kulbhushan Joshi successfully defended his PhD dissertation titled, Factors governing spontaneous ignition of combustible dust. Kulbhushan is currently working as a research engineer in Babcock power.

Scott Rockwell successfully defended his PhD dissertation titled, Influence of Coal Dust on Premixed Turbulent Methane-Air Flames in Fire Protection Engineering. A summary of his major findings were recently published in Combustion and Flame (S. R. Rockwell and A. S. Rangwala, "Influence of Coal Dust on Premixed Turbulent Methane-Air Flames," Comb. Flame 2012). Scott is currently working as an Assistant Professor at Eastern Kentucky University's Fire and Safety Engineering Technology.

In December 2012, Alberto Alvarez successfully defended his PhD dissertation, *An Integrated Framework for the Next Generation of Risk-Informed Performance-Based Design* (PBD). His research reviewed decades of worldwide experience using standards, codes and guidelines related to performance-based fire protection design for buildings, from which he identified shortcomings in the interpretation, application and implementation of current approaches, and recommends a set of fundamental changes. The dissertation is available online. Alberto has embarked now on a six-month post-doctoral fellowship at WPI, where he will be working on a web-based platform known as the Vulcan Initiative which is aimed at facilitating development and implementation of his integrated PBD framework.

Ph.D. candidate Haejun Park is conducting a research to develop a framework in which architects and fire protection engineers collaborate more effectively based on a holistic perspective of fire safety performance, such that the influence of architectural design features on actual fire-induced phenomena (building responses, human behaviors, fire phenomena) can be better captured by fire protection engineers

Ph.D. candidate Majed Almejmaj is conducting research on the effects of cultural and social differences between the West and Saudi Arabia on emergency evacuation behavior, response and movement. In particular, he is exploring Saudi cultural and gender attributes that could affect cue perception, response and decision-making, pre-movement activities and movement.

Signed: Albert Simeoni, Ali Rangwala, Brian Meacham and Kathy Notarianni, WPI

Are you a member of the IAFSS? If not, you should be!

Student Membership is now FREE

International Association for Fire Safety Science

You are invited to be a member of a professional association that is committed to facilitating communication and providing leadership for the Fire Science and Engineering Community.

Membership of the IAFSS provides international networking opportunities.

Membership Benefits

- Discount off conference registration fees
- Access to contact information for all IAFSS members
- Subscription to *Fire Safety Science News*
- Eligibility to hold a Management Committee seat
- Eligibility for Student Awards
- Opportunities to Influence progress in fire safety around the world
- Reduced subscription to *Fire Safety Journal*
- Free access to the journal *Fire Technology*

Membership fees only £25 per calendar year. Free to students

Visit our website for more information and sign up today!

www.iafss.org

IAFSS
West Yard House, Guildford Grove, London SE10 8JT, UK
Tel: +44 020 8692 5050 Fax: +44 20 8692 5155
Email: iafssmembers@dial.pipex.com

A charity registered in England and Wales no 800306

FEATURED ARTICLE

Fires During the 2012 Hurricane Sandy in Queens, New York: A First Report

by Charles R. Jennings

John Jay College of Criminal Justice
The City University of New York, USA

The topic of fire during hurricanes has received scant attention in the scholarly fire engineering community and even in the trade press. While common sense clearly suggests that damage attendant to a hurricane and hazards of utilities and temporary measures for their restoration would produce heightened risk, particularly following an event, a casual review of scholarly indexes shows scarcely any mention of the topic. Hurricane Sandy will be remembered for its widespread swath of destruction. The images of fire-scarred Breezy Point, a community in New York was but one of several large fires that caused unprecedented damage in the City of New York on October 29-30, 2012.

While calls for emergency services were heightened throughout the City, the geography of the Rockaway Peninsula and its location on the southeastern border of the City made it the most severely exposed (along with Staten Island) to the storm's effects. Remarkably, there were no deaths or significant injuries reported to responders or residents in these historic fires.

Figure 1. Damage following the fires in Breezy Point. Looking north from the area of origin.

One point that is common to all these fires was flooding. The bulk of the Rockaways were inundated throughout this event. However, because flooding was a result of both ocean tidal and storm surge effects, the water levels rose quickly and varied throughout the events. At their heights, water levels were sufficiently high as to prevent movement of even heavy vehicles – preventing the intervention of the local fire services – the Fire Department of New York (FDNY).

The other factor critical to these events was wind. With gusts reported up to 75 miles per hour (120 km/h) and sustained winds coming from the southeast, fire spread was driven by wind currents.

Breezy Point

Breezy Point is a beach enclave technically self-administering, located on the easternmost tip of the Rockaways. Originally established as a seasonal beach resort, it began with modest cottages and several resorts along the beach. Over time, it grew in to more substantial year-round occupation and many of the original cottages were improved or replaced with multi-story homes of conventional design. The physical plan of the fire area consisted of closely spaced dwellings separated by as little as a few feet (~1m) -- with decks, porches and other features making a nearly- continuous field of combustibles. The street plan (refer to map) consisted of alternating narrow streets and smaller, paved paths designed to be navigated on foot or in compact service vehicles. Construction was almost exclusively timber framed, with older cottages typically built on pilings and more recent homes equipped with masonry or poured concrete foundations and basement stories.

First reported at 1830, the fire was first reported at 173 Ocean Avenue. The extraordinary conditions faced by responders during the storm were illustrated by FDNY Assistant Chief Joseph Pfeiffer's recollections about reaching the blaze. He reported winding through darkened streets, turning back to avoid fallen trees, driving through water, and ultimately having to stop as he crossed the Marine Park Bridge, which links Brooklyn to the Rockaway Peninsula over Jamaica Bay. "*There was three feet of water on the far end of the bridge. I had to park my fire department sedan, and ended up boarding an Engine Company to ride into the scene. Water was up to the headlights as we drove toward the glow.*"

Figure 2: left) Map of fire limits in Breezy Point; right) Map of fire limits in Belle Harbor

Companies operating relied on drafting standing water in a large parking are on the north side of the blaze, and made use of hydrants – some of which were used only after firefighters made connections by diving into the floodwaters and connecting hoses by feel amid the storm. Figure 2 (left) shows the view of the damage looking north from near the point of origin.

Driven by the strong winds coming directly off the ocean, the fire spread from house to house in the densely packed enclave. Chief Pfeiffer credited stopping the fire to being able to position resources ahead of the moving fire, and being ready to exploit an opportunity when winds shifted early in the morning of the 30th. He cautioned that had the winds not shifted, that the fire could well have continued to the west. The fire was declared under control at approximately 0630 on the 30th. The fire destroyed some 126 homes and damaged another 22. The effects of manual fire suppression efforts are apparent as the demarcation of destroyed and damaged homes is very clear (Figure 2 left).

Belle Harbor

Figure 3. Photograph of Building of origin on Beach 129 Street in foreground, looking to the northwest.

The Newport Avenue fire is perhaps the most interesting from the perspective of fire spread. Occurring in a predominantly residential neighborhood of detached 1-2 family dwellings, this fire was also driven by the wind, and exhibited a remarkable path of travel. Although timber frame buildings appeared to fare poorly, there were notable examples of fire extending into and through masonry structures as well.

Figure 2 (right) shows the pattern of damage for this fire. The fire began on Beach 129 Street in a 2-family timber frame house (Figure 3), extended to an adjacent brick exterior 2-family house, driven by winds it moved across backyards, possibly into a detached car storage structure and spread to three houses in a row on Beach 130th Street. The last of these houses was a masonry exterior home on the corner of Newport Ave and Beach 130 Street. The fire, driven by high winds, spread via a likely combination of flying brands, across the Newport Avenue (shown running left to right across the photo) and into a 2-story masonry-faced commercial building housing a restaurant. Despite its being detached, and surrounded on three sides by streets or a parking lot, the fire spread in two directions count – northward along Beach 130 Street, and across the west side of Beach 130 Street, where it consumed an additional 16 buildings[1]. Thirty-two buildings were destroyed in all. The fire was stopped mid-

[1] The official number of buildings was determined by counting addresses destroyed – the count made after the fire by the author relied only on foundations and aerial imagery to establish a count.

block with a brick-walled home suffering significant fire damage on the west side of the street, and a large timber frame home suffering damage to vinyl siding on its façade. The home on the east side of the street had a larger space between the fire and the other houses on the block. Fire suppression stopped this fire from spreading further, and like the others, firefighting was delayed because of high water levels.

Rockaway Beach Blvd.

The Rockaway Beach Boulevard fire occurred in a commercial strip of buildings predominantly of ordinary construction (masonry exterior walls and timber interiors with some incidental steel structural members). The buildings ranged in height from 1 to 3 stories.

Interestingly, the fire spread was constrained by its location adjacent to a rail yard, which prevented its spread to the north. A masonry building with no windows abutting the building of origin prevented spread to the east, while a gap of roughly 3 feet (0.9 m) and fire service intervention limited spread on the western end of the block, although the building exposed suffered some damage, mainly scorching of its façade. This building was of brick and timber joist construction, which likely prevented the propagation of the fire and permitted successful intervention by fire services. Sixteen buildings were destroyed. Figure 4 shows damage resulting from this fire.

Figure 4. Map of fire area, Rockaway Beach Boulevard.

Summary

Three concurrent large fires in a relatively small geographic area of an island is highly unusual in New York City. The spread of fire between brick or stone facade buildings was worthy of further study, as was the transmission of fire across a wide thoroughfare in the Belle Harbor fire. The extraordinary efforts of the FDNY were instrumental in stopping these well-developed fires and point out the need for well-staffed and equipped fire services during extreme events not commonly thought to be "fire" emergencies.

References and Acknowledgments: Information on cause and origin and numbers of buildings damaged or destroyed came from FDNY Media Advisory "Fire Marshals Determine Causes of Several Major Fires from the Night of Super Storm Sandy – Including Breezy Point Fire Which Destroyed 126 Homes" December 24, 2012 online. Field investigation and photography was assisted by Chaim Roberts of the Christian Regenhard Center for Emergency Response Studies at John Jay College. Mapping was donated by Tom Vaughan of Manitou, Inc., Peekskill, NY. We acknowledge the assistance of several members of the FDNY who provided information to support this effort.

FEATURED ARTICLE

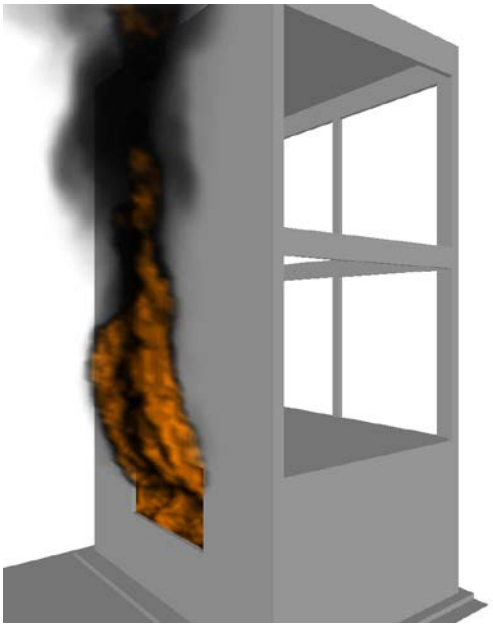
Version 6 of FDS and Smokeview to be released in 2013

by Kevin McGrattan[1], Randall McDermott[1], Jason Floyd[2],
Simo Hostikka[3], Glenn Forney[1], Kristopher Overholt[4], and Craig Weinschenk[1]

[1] NIST, USA
[2] Hughes Associates, USA
[3] VTT, Finland
[4] University of Texas at Austin, USA

A major new release of Fire Dynamics Simulator (FDS) and Smokeview is currently undergoing beta testing and should be released officially in early 2013. FDS is a computational fluid dynamics (CFD) model of fire. Smokeview is a complementary program that is used to visualize the results of FDS. This is the sixth major release of the software since it was first officially released in 2000. Details of recent developments are discussed in the FDS-SMV Developer Blog. A summary is provided in this article.

The Hydrodynamics Model



Hydrodynamics is the foundation of any CFD code, especially a reacting flow code like FDS. Chemical species cannot react until they have mixed, and (in a diffusion flame) they cannot mix until they have been transported. The velocity field, therefore, plays a critical role in fire dynamics. In a large-eddy simulation (LES) code like FDS, other things being equal, the model for the turbulent viscosity determines the behavior of the velocity field and hence to a large extent the dynamics of the fire.

In FDS versions 1 through 5, the turbulent viscosity was obtained from the constant coefficient Smagorinsky model developed in 1963. This technique is overly dissipative, meaning that simulating realistic plume dynamics on a relatively coarse numerical grid is difficult. The first attempt to improve the situation was to implement the dynamic form of the Smagorinsky model. While this model added about 20% to the cost of computing the velocity field, in theory this cost could be recovered by achieving more accurate results (statistically) with coarser grid resolution. While the dynamic model produced very realistic-looking flames at moderate grid resolution, if the resolution was too coarse (often inevitable in engineering calculations), the flow field could be unphysical. The solution to this dilemma came in a simplified form of Deardorff's model. Deardorff's original model solves a transport equation for the subgrid-scale kinetic energy (sgs ke). This strategy is expensive, but it allows for the inclusion of complex subgrid physics, like unresolved buoyancy production. We avoid this cost by employing a simple algebraic model for the sgs ke based on the scale similarity model of Bardina. The result is a model that is cheap and performs reasonably well at both coarse and fine resolution.

While the Deardorff model is significant, the defining change of FDS 6 is a new scalar transport scheme. Prior versions used a simple central differencing scheme for the convective terms in the mass and energy transport equations. This scheme was easy to implement and robust, but it exhibited spurious values of temperature, density, and species concentration in regions of the flow with steep gradients, like at the flame envelope where temperatures may change 1000 °C between two grid cells. While this well-known artifact did not affect overall accuracy of the model, it was still disconcerting to users to see below ambient temperatures just outside of the flame envelope. In FDS 6, we implemented another approach: total variation diminishing (TVD) scalar transport. This is a fancy way of saying "we use just the right amount of upwinding." Pure upwind schemes are too dissipative (translation: inaccurate), but TVD schemes are specially designed to track scalar discontinuities with minimal dispersion error (wiggles) and minimal dissipation (numerical diffusion). This effectively solved the spurious temperature problem.

Combustion

FDS version 2 through versions 5.1 had two options for modeling combustion. The default was to assume that fuel and oxygen react when mixed, regardless of the temperature. This required tracking only a single scalar

quantity, the mixture fraction, and no other explicit species transport equations were needed. The second option was to define all the primitive gas species and use Arrhenius rate reactions. Starting with FDS 5.2, we changed from the mixture fraction approach to a lumped species approach. A lumped species is simply an equivalent gas species that represents a mixture of gases that are always transported together in the same ratio. Air could be considered to be a lumped species consisting of 79 % N_2 and 21 % O_2 (and trace amounts of other gases). One can also lump the products of combustion which means that FDS only keeps track of the fuel and product species (air being whatever is not fuel or products).

This was motivated by a few factors. First, it is more flexible and mathematically convenient. Second, satisfying user requests to track toxicant and irritant products like HCl and HCN (in order to compute quantities such as the fractional effective dose) would have been more difficult within the mixture fraction framework. Lastly, a more flexible set of species inputs would assist other development efforts to make the combustion model more flexible. For many typical fire applications, much of the new combustion machinery is not needed and one can specify a predetermined design fire with little change from past versions. However, for topics such as CO production, under-ventilated fires, suppression, and soot growth and oxidation, the new chemistry and combustion framework will make it easier to explore alternative reaction schemes.

Radiation

The major challenge in computing the gas phase thermal radiation is the calculation of the emission source term. As the spatial resolution of typical fire simulations is too coarse to enable the detailed resolution of the flame temperature field, the source term cannot be based on the local absorption coefficient and fourth power of the local cell temperature alone. In FDS versions 2 through 5, a prescribed fraction of the local heat release rate was used as the source term in grid cells where combustion occurs. In FDS 6, the prescribed radiative fraction is still used but in a slightly different way -- the spatial distribution of the radiative emission is based on the fourth power of the resolved cell temperature field, but the correct global radiative emission is ensured by applying a correction factor that forces the global average emission to be equivalent to the prescribed radiative fraction times the integrated heat release. The purpose of this method is to achieve a more accurate distribution of heat fluxes along the height of the flames. This change has resulted in more accurate predictions of near-field radiative heat flux for various experimental datasets in the FDS Validation Guide.

Another change in FDS 6 is the inclusion of radiative absorption properties for fuel gases other than methane. These properties are based on measurements by Wakatsuki et al. [1], and the implementation in FDS was done by Vivien Lecoustre. This may improve the radiation calculations in detailed flame simulations or fuel-rich fires. Also, a capability has been added for the user to define the spectral refractive index of the condensed phase particles and droplets. These changes may not have a great influence in typical fire applications but can become useful in special cases, including the use as a research tool for combustion and radiation.

Pyrolysis

The basic one-dimensional heat transfer and pyrolysis model for solid surfaces remains almost the same in FDS 6. However, several of the input parameters have been changed to expand the functionality and readability of the input file. The most significant change deals with the swelling or shrinking of the surface layers. This requires a slightly different treatment of the pyrolysis reactions' residue materials. In previous versions, the bulk density of the residue, such as a char layer, was determined by the density of the initial material layer and the effective yield of the material from one or more reactions producing it. Now, the layer thickness will be adjusted so that the residue material has the density specified in the input file. For example, if the original material has a density of 500 kg/m^3 and is converted into a new material with a density of 1000 kg/m^3, the new layer thickness will be half of the old.

Ventilation

In previous versions of FDS, one could only specify pre-defined inlet and outlet flows (i.e., temperature, species, and velocity/mass flow were explicitly defined in the input file). There are situations where those FDS inputs were not sufficient to model the behavior of a building: smoke can move through ducts to remote compartments and reduce their visibility, heating and cooling systems will turn on and off as temperatures change which will impact the movement and temperature of smoke, facilities that must maintain negative pressures can lose that ability as filters clog with soot, and in a multi-compartment ventilation system the pressurization of a compartment due to a fire will change the flow rates in the system. To address these limitations and improve the ability of FDS to model buildings, an HVAC (Heating, Ventilation, Air Conditioning) sub-model was added, based on the solver in MELCOR, a US Nuclear Regulatory Commission (USNRC) code for analyzing containment buildings. This model treats an HVAC system as a collection of nodes and junctions. A junction represents a duct, and a node represents where two or more ducts connect or where a duct is connected to the remainder of the computational domain. The model solves equations for the conservation of mass, energy, and momentum of the

HVAC system. For each junction, a velocity is predicted and for each node a pressure, temperature, and set of species mass fractions is predicted.

Verification and Validation

In recent years, we have formalized the process of developing and releasing new versions of FDS and Smokeview. The key to this process is a set of calculations that we divide into two categories: (1) relatively short, simple, verification cases that we use to verify the code is properly solving the governing equations, and (2) relatively long, sometimes complex, validation cases that we use to validate the physics of FDS by comparing with experiments.

The verification cases are the examples distributed with each software download. Using a procedure that is commonly referred to as continuous integration, an automated script runs all of the sample cases and regenerates all of the plots for the FDS and Smokeview User's Guides, plus the FDS Verification Guide, every night. This allows us to catch simple coding mistakes that we inevitably make as we develop new routines. Since they take over week to complete, the validation cases (about 800) are run with each new release on our 256 core Linux cluster at NIST. FDS version 1 in 2000 did not have a formal process of verification and validation (V&V). While we developed test cases and made comparisons to experiments, it was not done systematically. We felt that papers published by ourselves and others would suffice, but we soon learned that this was not the case. This lesson was reinforced when we began working with the USNRC on a V&V of five different fire models that are commonly used by the nuclear industry [2]. The most important lesson we learned is that published results using older versions of the software cannot be used to justify the use of a model to the authority having jurisdiction (AHJ). We cannot republish our validation papers with the release of each new version, so we decided to develop and maintain our own versions of the V&V guide that the NRC published. Now the FDS Verification and Validation Guides are the key volumes that quantify the robustness and accuracy of the model. When we say that FDS can or cannot do something, what we really mean is that we have documented calculations that show the range and accuracy of the model for a particular application.

Visualization

The original design of FDS and Smokeview was for FDS to solve the governing equations and for Smokeview to visualize the results. This distinction has become blurred in version 6 with some of the modeling now performed by Smokeview to enable more realistic visualization of smoke and fire. An algorithm for solving the radiative transport equation has been implemented using a technique known as volume rendering. A series of rays (one ray for each computer screen pixel) are cast from the observer's point of view to the back of the computational domain. The radiative transport equation is then used to determine the opacity and radiance (color) from the given soot density and gas temperature. This algorithm is implemented on the GPU (graphics processing unit) making realistic frame rates feasible. A snapshot of this technique is shown in the figure. Smokeview also now performs fractional effective dose (FED) computations allowing one to visualize slice or isosurface.

Summary

Many of the changes described in this article will not be readily apparent to most users of FDS and Smokeview. The input parameters have not changed significantly, and the basic framework of developing and analyzing cases has not changed. However, these improvements will enable us to continue doing advanced research in fire behavior and thermal science while at the same time providing a useful tool for fire protection engineering. Since releasing the software in 2000, we have tried to maintain a balance between practical applications and academic research. FDS 6 will help us maintain this balance for years to come. Work continues to improve the ability to model flame spread, under-ventilated combustion, near-field radiation, and detailed water sprays. Work is also progressing on generalizing the geometry so that we can move away from rectilinear obstructions while still maintaining rectilinear meshes. This technique, known as the Immersed Boundary Method, will give users the flexibility to define a wide variety of building geometries. In addition, we will explore the use of Adaptive Mesh Refinement (AMR) to enable us to concentrate fine grids where they are needed, like a moving flame front.

REFERENCES

1. K. Wakatsuki, G. Jackson, J. Kim, A. Hamins, M. Nyden, and S. Fuss. Combustion Science and Technology, 180:616–630, 2008.
2. K. Hill, J. Dreisbach, F. Joglar, B. Najafi, K. McGrattan, R. Peacock, and A. Hamins. NUREG 1824, USNRC, 2007.

FEATURED ARTICLE

Structural Fire Testing in the 18th Century

by John Gales

The University of Edinburgh, UK

A digitisation project to archive early fire test reports (with both structural fire engineering and fire dynamics considered) is underway at the University of Edinburgh and the digitised documents will soon be publicly accessible. This collection of historical documents forms the basis of our current understanding in fire science and engineering and provides context for many current research questions. Summarised below is one fascinating example of the records that will be preserved in the archive. The following accounts illustrate some of the issues with using fire test results obtained in small compartments to design fire protection for large compartments in real buildings. Today, 200 years later, fire scientists and engineers still wrestle with how real fires influence real structures.

Charles Mahon can be considered as one of the first scientists to test and attempt to rationally understand the behaviour of a building exposed to fire. In 1777, at the age of 25, Mahon developed principles and a system for fire protection of timber buildings. His hypothesis was that a plaster made of water, sand, lime, and hay could be applied to timber elements to provide fire protection. Given that party walls had begun to show good ability at stopping horizontal fire spread, Mahon concerned himself with the ability to stop vertical fire spread in a building by compartmentalising rooms. Given the damage caused by conflagrations at the time, Mahon aimed to halt the progress of fires without reliance on water. In his words [1]:

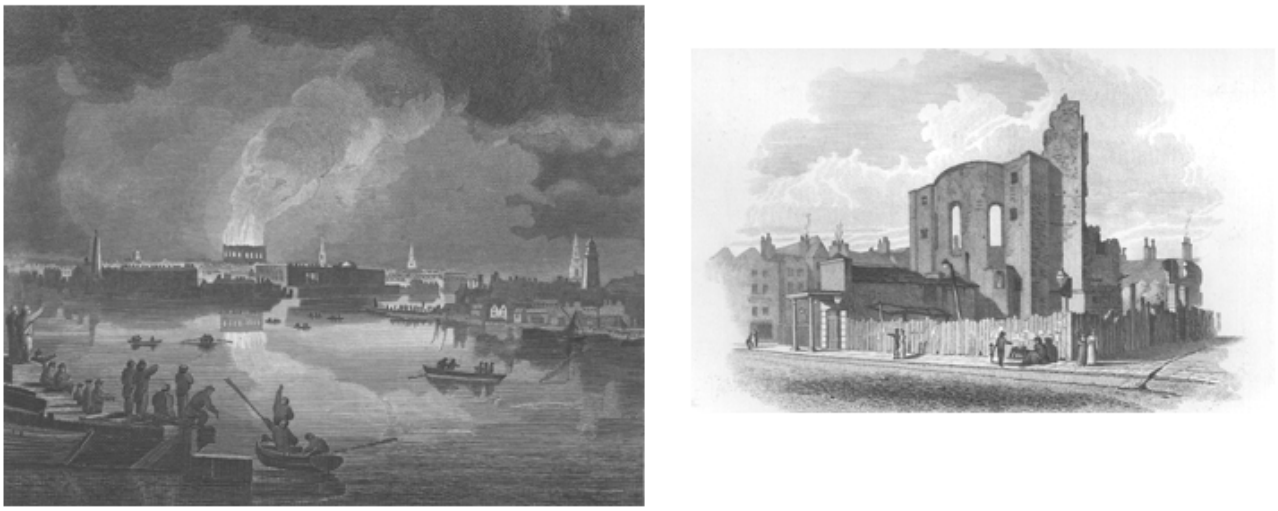
"… to show how effectually even a wooden building, if secured according to my new method would stop the progress of the flames on that side, without any assistance from fire-engines." – C. Mahon

Mahon constructed a two-storey structure (compartments of approx. 8m x 5m), and tested it under exposure to fire. The lower room of the building was filled with wood shavings and furniture pieces then set alight. Neither pyrometers nor thermocouples were available at the time to measure temperatures – Mahon also never reported the duration of the fires. There was therefore no quantitative way to measure heat transmission through the floors or walls. Mahon instead attempted to demonstrate the 'lack' of heat transmission through the floor in what must be considered a very peculiar manner. During the test, and incredibly, Mahon entertained guests on the floor above the fire compartment. Delegates included William Pitt (previously Prime Minister of the United Kingdom), the President of the *Royal Society*, the Lord Mayor of London, and several foreign ministers – each guest was given ice cream to enjoy as the fire raged below them [2]. The fire was sufficiently hot to melt the windows on the lower room. The floor boards of the lower room remained intact, but were charred – however more importantly to Mahon and his guests, no discomfort was experienced as they socialized and ate ice cream directly above the inferno. Indeed, it was alleged that some of the guests decided to walk around the room barefoot during the experiment to test whether they could feel heat from the fire. Little science in this experiment existed outside qualitative observation; no quantitative analysis of the fire or the structural reactions were made.

Mahon's fireproofing plaster was not patented – probably owing to its similarity to other common plasters used at the time. However, applying plaster for the purpose of fire protection (and indeed considering the need for fire protection) was deemed novel during the Georgian era. The plaster was advocated for use in construction by the Associated Architects Committee in 1793 [3] based upon the results of repeated fire tests conducted by a group of researchers headed by Henry Holland. However, Mahon's test conditions were not replicated identically in these tests. Holland's research group changed the composition of the plaster by adding plaster of Paris, screened rubbish, brick debris, coal ashes and other materials in order to make strong cement. They also procured a Georgian town house (dimensions unavailable) and subjected each room to compartment fires. Holland varied the fuel load in each room by using charcoal, tar and wood. The ventilation conditions were also varied to control flaming during these 'repeat' tests. No measurements were made to assess the severity of the test fires; however the duration of each test was recorded and ranged between 1 and nearly 4 h. Some observations suggested issues with the plaster's ability to withstand fire (the plaster was found to dry out and crumble), but it was felt that, since the fires did not propagate to adjacent rooms, the performance of the plaster was satisfactory. Holland concluded, without attempting to experiment and giving no justification, that the amount of fire protection should be doubled in buildings requiring more security from fire. Quoting the report:

"In buildings that require a more than ordinary degree of security,… [Any] means of prevention, must be doubled; in which case, the committee are warranted to say, that it will effectually resist the strongest fire." – H. Holland

In 1794, Mahon`s plaster (as well as several other fireproofing technologies of the time) was used in the construction of floors and stairs in the mostly timber-framed Drury Lane Theatre (Theatre Royal) in London. Henry Holland, who was responsible for the 1793 fire tests, was retained as the architect of the theatre [4]. The Drury Lane Theatre was considered the most advanced fire-proofed building of the time. Four water reservoirs were installed on the roof in order to quell any fire that could occur. However, during theatrical performances, these reservoirs served another purpose: the tanks were used to produce real waterfalls and lakes on stage – at the expense of fire fighting. An iron curtain was also installed to separate the stage from the audience, but after 15 years it was said to be rusted and non-functional. In 1809, the theatre caught fire while its water tanks were empty [5] and the fireproofing was insufficient to protect the building. The building collapsed within 30 min – there was no reported life loss (Figure 1).



The Drury Lane Theatre during and after fire, from *Londina Illustrata* circa 1825.

Henry Holland passed away in 1806; therefore little historical commentary on the effect of the fireproofing measures at the Drury Lane Theatre survives today. Aside from providing an interesting ice cream anecdote, the above story reminds us of some dangers in misinterpreting or over interpreting structural fire test results. The collapse of the Drury Lane Theatre illustrates the need to ensure that fire protection technologies are appropriately designed for the conditions to which they will be exposed (fuel load, ventilation conditions, scale, etc). Although fire science and engineering have evolved significantly since the work of Mahon and Holland, we are still today wrestling with the concept of how real fires influence real structural behaviour. This story therefore deserves preservation as a cautionary tale in fire engineering.

Digitised copies of the public domain reports which have been used to construct this article will be featured on the Open Access Historical Documents of Fire Safety Engineering Collection when the project officially launches.

Acknowledgements: This digitisation project has been sponsored by a University of Edinburgh Alumni Innovation Initiative Grant 2012-13. Thanks to Audrey Roy-Poirier and Luke Bisby for providing comments on this article.

REFERENCES

1. Mahon. Philosophical transactions 68:2. July 1778
2. Public Characters. Vol 3. 603 pp. 1801.
3. Holland. Resolutions of Associated Architects. 1793.
4. Carter. Journal of Society of Architectural Historians. 26(3). 1967.
5. Sheppard. Survey of London. 1970

FEATURED ARTICLE

Why Flame Retardants Are Used: Insights from a Flame Retardant Chemist

by Alexander B. Morgan
University of Dayton Research Institute, USA

Over the past 12 months, flame retardants have appeared in the mainstream media many times, including a high-profile appearance in a May 2012 *Chicago Tribune* article [1]. In the August 2012 issue of this newsletter, the topic was discussed again. With all of this attention, much of it implying flame retardants as a class of chemicals cause more problems than they solve, one would think that flame retardants are something to be avoided when pursuing fire safety goals. However, flame retardants do have an important role to play in fire safety. There are very good reasons why we as a society have chosen to put high heat release synthetic materials in our clothing, automobiles, furniture, electronic goods, houses, and many other articles throughout our civilization. As we're unlikely to return to the days when hay, horsehair, adobe, and wood were in extensive use, flammable synthetic materials - which can and do present a major fire risk - will continue to be with us.

The decision to use flame retardants relies upon decision trees, and chooses mitigation of fire risk through the use of fire prevention strategies, fire control, and suppression methodology. Flame retardant materials and low heat release polymers fall into the fire control category that help to prevent the fire from starting, and this can be the first line of fire safety in many scenarios. Suppression methods (such as sprinklers) may not always be an option as a replacement for flame retardants as suppression systems cannot always be installed in older buildings or places where suppression could create other problems. Further, use of low heat release polymers as may not be a viable option for all fire risk scenarios either. No one is going to make/buy a Kevlar and Nomex couch anytime soon because of high cost issues, and so flame retardants may have to be selected to provide fire control protection. The following article briefly covers which flame retardants get used and why.

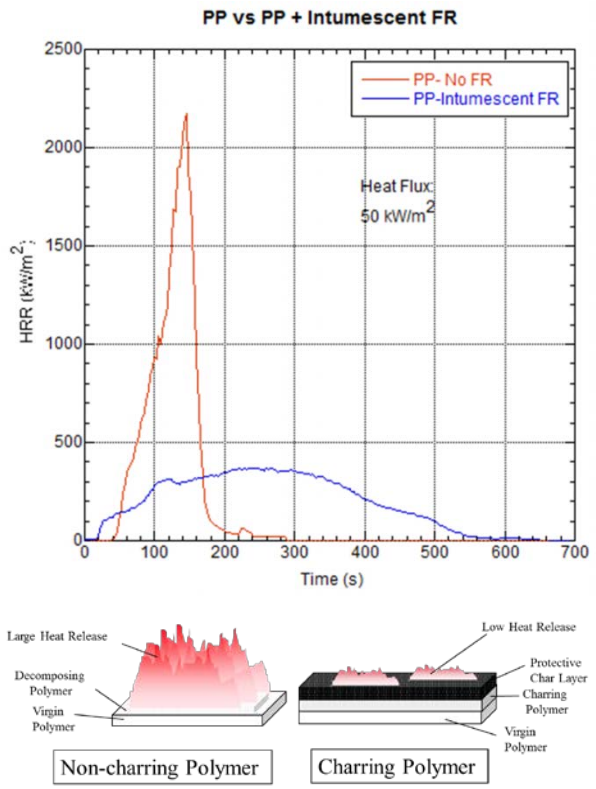
As Hull and Stec [2] correctly pointed out, it is difficult to quantify the benefit of a flame retardant. If the flame retardant prevented accidental ignition from a short circuit in an electronic item, or led to a scorch mark on a couch rather than a full fire, these incidents are not recorded by the fire loss statistics. That said, no commercial manufacturer will bother adding something extra to their product if it does not provide some performance required by a regulatory test. Assuming the regulatory fire test truly addresses a significant fire risk, if a flame retardant enables a manufactured item to pass that test, then it is beneficial because it has lowered fire risk according to the test. This issue is the core assumption behind the use of flame retardants, and is an issue receiving much attention as it drives whether or not flame retardants are chosen for use. We may not be able to quantify the number of times the flame retardant was "activated" world-wide if no one reported it (i.e., the flame retardant did its job and no fire occurred after accidental ignition), but this type of passive fire protection does make sense. We use passive fire protection for steel in buildings, for electrical cables throughout the modern home, for circuit boards in our electronic goods, for interiors of rail and aircraft, and many other important applications which have significant fire risks associated with them [3].

Flame retardants do more than prevent fires from starting; some of them will continue to act and lower heat-release rates in large fires. Some flame retardants can lead to higher concentrations of toxic emissions from fires, as pointed out by Hull and Stec [2] in the last newsletter; but if the fire risk scenario requires low smoke and low heat release, there are flame retardant additives in use today that help meet those standards for aircraft, ships, mass transport, and essential structures where rigorous fire protection is needed. The chemistry can be designed to provide fire protection and address emissions if so required.

Flame retardants are selected because of particular regulatory test requirements, so the flame retardant chemist must design to the tests [4]. It is impossible to design to every fire risk scenario for every polymer, because chemical structure dictates flammability, and that same chemical structure dictates flame retardant choice. The chemist must pick a chemistry/flame retardant class which addresses the fire property in which the polymer is deficient while meeting all other product requirements (appearance, function, cost, etc.). In general there are three broad classes of flame retardants: Vapor phase flame retardants, Endothermic cooling flame retardants, and Condensed phase flame retardants.

Vapor Phase Flame Retardants

These flame retardants work by inhibiting free-radical reactions between fuel and oxygen in the flame front/vapor phase of a fire. Broadly speaking, this includes halogen (group VII of the periodic table) and phosphorus-containing flame retardants [3].



Heat release rate measured in the cone calorimeter (50 kW/m² external heat flux) comparing a sample of Polypropylene to a sample of Polypropylene + Intumescent Flame Retardant (top); and visually how the samples appear under burning conditions (bottom).

Of the halogenated flame retardants, organobromine compounds are most commonly used for two very important reasons. The first is that they have the ideal bond strength between carbon and halogen, so the C-Br bond will break under fire conditions, and release in a timely manner to keep a fire from growing. The second is that bromine chemistry is very cost effective; it is chemically "easy" to perbrominate an organic molecule as opposed to chlorination or fluorination of that same molecule. The original halogenated flame retardants were discovered via trial and error, but the C-Br bond proved to be the most cost-effective while remaining stable at room temperature but flame-retardant-effective in a wide range of synthetic polymers.

Phosphorus compounds used today are typically phosphates, phosphonates, or elemental (red) phosphorus. The vapor phase effect of these phosphorus compounds is very polymer dependent. A phosphate could be vapor phase active in one polymer but condensed phase active in another. When vapor phase active, they work in the same way as a halogenated species: phosphorus compounds are volatilized into the flame front, inhibit combustion of fuel molecules, and act as oxygen scavengers.

Both halogen and phosphorus compounds provide benefits for ignition resistance, lowering of heat release, reduction in flame spread, and many other fire-test specific needs. They almost always yield higher levels of smoke and CO production since they are combustion inhibitors.

Endothermic Cooling Flame Retardants

These flame retardants work by decomposing endothermically when exposed to heat. They effectively cool the polymer (fuel) and prevent it from thermally decomposing further and pyrolyzing into small combustible molecules. Further, they typically release non-flammable gases such as water vapor and CO_2 which dilute the fuel in the flames as well as reduce smoke release. Finally, since they must be used in high loading levels to be effective (loadings of >50w% are very common for these additives) they also dilute the total amount of fuel available for combustion, thus lowering the total heat release (fuel load) of an item treated with these additives.

This class of flame retardants is commonly called mineral fillers because they are composed of mined minerals which can release water and CO_2 under fire conditions [5]. The most common are aluminum and magnesium hydroxide, with boehmite, hydromagnesite, magnesite, and huntite also being used. In general, these additives have a very favorable environmental profile in the event they escape from the polymer over time. However, these additives cannot be used in a wide range of polymers. The high loading required to achieve a passing result in most fire tests means that the mineral fillers can only be used in polymers which have the ability to hold that much filler and still have reasonable mechanical properties. As a result mineral fillers are used as the primary flame retardant only in carpet back coatings, wire and cables, and some building material applications.

Condensed Phase Flame Retardants

Condensed phase flame retardants prevent fires by causing the polymer to carbonize and char rather than decompose and pyrolyze into flammable fuel [6]. When this class of flame retardants works, one can achieve very impressive reductions in flammability and impart remarkable levels of fire safety. An example of the effect can be seen in the figure where an intumescent flame retardant package has lowered heat-release rates in polypropylene. The peak heat release rate (HRR) is dramatically lowered by the flame retardant, and this is important as lowering the peak HRR is considered to be one of the most important factors governing time to escape from fire events [7].

While this type of flame retardancy has potent effects on heat release, it may not be useful in all fire scenarios. A condensed phase flame retardant which forms a char that does not dissipate heat fast enough may present a smolder risk for a secondary fire, even if it did prevent the first fire from catching and spreading. Condensed phase flame retardants only work when able to chemically react with the polymer under fire conditions such that the polymer will chemically convert to a more stable form. If the polymer has no chemical functional groups for the condensed phase flame retardant to react with, there could be little to no flame retardant effect. Some examples of condensed phase flame retardancy include phosphorus-based chemistries (phosphates, phosphonates, ammonium polyphosphates), polymer nanocomposites, and intumescent systems. Intumescents are notable in that they form protective thermally-insulating carbon foams on the surface of the polymer to protect the underlying material from further thermal damage [4, 6, 8]. Intumescent flame retardants are used for fire protection on steel, for example, due to their thermal insulation performance; they keep the steel from reaching a temperature where it would structurally fail. While condensed phase flame retardants provide robust fire protection, they are not appropriate for use in some items. Intumescents tend to absorb water, making them a poor choice for electronic/electrical fire protection. Additionally, condensed phase compounds can produce high levels of soot, as they form high amounts of sp^2 hybridized carbon during burning, which can lead to polyaromatic hydrocarbon formation and soot. This is admittedly polymer- and chemistry-specific, however, and smoke/soot production can sometimes be more a function of burning scenario than of flame retardant chemistry [9].

To conclude my discussion of why flame retardants have a role to play in fire protection, let me make it clear that I am not advocating sticking our collective heads in the sand about the environmental issues posed by some flame retardant additives, or ignoring issues presented by many persistent man-made chemicals that have entered into our world. When science has shown these chemicals to be a problem, it is time to get rid of them and put replacements into use. We're not using flame retardants of the 19th century anymore because we found better solutions. We can find flame retardants which provide fire safety and meet environmental needs, and the partnerships between environmentalists, toxicologists, and flame retardant chemists (as proposed by Babrauskas and colleagues in their article of the last newsletter [10]) are ones I hope we will form soon. As a flame retardant chemist, I do not like discovering and developing a new flame retardant that does a fantastic job preventing fire growth only to discover that it's environmentally toxic, as it means I've effectively wasted my time. So I am confident that we'll see better flame retardants that meet fire protection needs and have favorable environmental problems. It will take time to discover and commercialize them, and hopefully we will not accept a higher level of fire risk in non-flame retarded goods as an interim solution while waiting for those new solutions.

REFERENCES

1. Playing with Fire, Tribune Watchdog, Chicago Tribune, 2012 http://media.apps.chicagotribune.com/flames/index.html.
2. Hull, R. A Stec, Fire Safety Science News, No 33, Aug 2012. http://www.iafss.org/newsletter-issue-33.
3. Simonson, M.; Andersson, P.; Bliss, D. Fire Tech.2004, 40, 27-37.
4. Fire Retardancy of Polymeric Materials, Eds. Wilkie, C. A.; Morgan A. B.2010, Taylor and Francis.
5. Hull, T. R.; Witkowski, A.; Hollingbery, L. Polym. Degrad. Stab.2011, 96, 1462-1469.
6. Bourbigot, S.; Duquesne, S. J. Mater. Chem.2007, 17, 2283-2300.
7. Babrauskas, V.; Peacock, R. D. Fire Safety Journal1992, 18, 255-272.
8. Bourbigot, S.; Le Bras, M.; Duquesne, S.; Rochery, M. Macromol.Mater. Eng.2004, 289, 499-511.
9. Fire Toxicity, Eds. Stec, A. A.; Hull, T. R. 2010, Woodhead Publishing Ltd.
10. Babrauskas, V., D Rich, V Singla, A. Blum, Fire Safety Science News, No 33, Aug 2012. http://www.iafss.org/newsletter-issue-33.

ARTICLE

Flame Retardants – Fire Safety Voices Need to Be Heard

by Robert Campbell
Bromine Science and Environmental Forum

In *Fire Retardants and Fire Safety* [1], Hull and Stec talk of "a fire retardant debate (that) is polarised between the Green and 'Industry' lobbies, with little input from fire safety professionals...". Unfortunately, the article does little to bring stakeholders closer and in some ways only further polarises the debate.

Flame retardants contribute to fire safety by increasing the resistance to fire of flammable materials such as polyurethane foam used in furniture, synthetic textiles used in cinemas and theatres, insulation foams used in housing and public buildings, and plastic cables used in cars and public transport. If a fire is going to spread it needs flammable materials as a fuel. The increasing use of synthetic materials in public spaces and homes, notwithstanding all the tremendous benefits these provide, has resulted in an increased fire load for public buildings and the home [2].

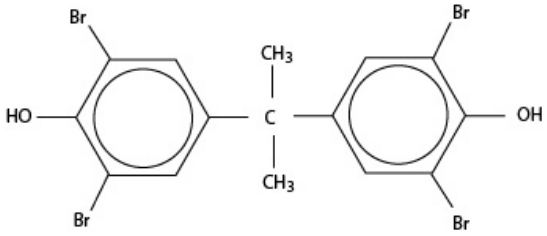
As Chairman of an industry association producing a wide range of flame retardants, I feel strongly that the voice of fire safety scientists and professionals is not sufficiently heard. There is indeed a need for the fire safety community, including fire safety engineers, to stand up for fire safety. Too often broad statements denouncing fire safety standards for inherently flammable materials come from stakeholders with no expertise in fire safety. Indeed, underplaying or even dismissing the need for fire resistant materials is all too convenient for those opposing the use of flame retardants. The Green Science Policy Institute recently lobbied against Europe's existing standard for external ignition of TV sets alleging that "the proposed requirements do nothing to improve fire safety"[3]. By the same logic, it could be stated that because the frequency and severity of cinema or nightclub fires are less than decades ago, it justifies relaxing the relevant fire safety standards! At times, it seems that the “green lobby” justifies the lowering of fire safety levels by pointing to a lack of adequate statistics on fire safety.

As Hull and Stec [1] state in reference to a recent report from the European Commission, it is inherently difficult to compare fire safety statistics when these are collected and compiled differently between countries. However, where the most detailed statistical analysis has taken place, the benefits of introducing high fire safety standards are evident. Independent research has shown that flame retardants reduce the impact of fires and the number of fire deaths [4]. A 2009 study carried out for the UK government, showed that in the period between 2002 and 2007 the UK Furniture and Furnishings Fire Safety Regulations accounted for 54 fewer deaths per year, 780 fewer non-fatal casualties per year and 1065 fewer fires each year following the introduction of the UK furniture safety regulations in 1988 which mandate the use of fire resistant materials [4]. Other reports by reputable experts demonstrate the fire safety benefits of flame retardants [5]. Such data were unfortunately ignored by the very same media reports referred to by Hull and Stec as being “well-researched”.

When it comes to considering the environmental or health impact of flame retardant chemicals, statements are often made that have little meaning in terms of environmental or health risk. For example, while certain flame retardants have been found in dust, they are typically at levels which are below those which regulators view as a health risk and are clearly at levels well below other chemicals found in house dust. This is where Hull and Stec’s commentary unfortunately crosses the line into becoming an advocacy piece against whole families of flame retardants. It is regrettable that no credit seems to be given to regulatory assessments in Europe of leading flame retardants which demonstrate that they are safe in terms for the environment and human health [6, 7]. The overly simplistic view that the presence of a certain atom, whether bromine, chlorine or any other is an indication of risk is scientifically unjustified and amounts to scaremongering.

Just as the world of fire science continues to evolve, so does the world of toxicology and environmental science. Tremendous strides have been made in the area of integrating this knowledge into developing flame retardants for the future. Furthermore, under today’s chemical regulatory processes, every new chemical substance (which obviously includes new flame retardants) introduced into commerce must go through a rigorous battery of environmental and health testing. Those results are evaluated by governmental agencies (such as the European Chemicals Agency in the EU) and decisions are made concerning the best practices for managing these substances.

I appreciate that industry is viewed as having a vested interest in the flame retardant debate. This will always be the case. However, we see it as part of our corporate responsibility to further advance scientific understanding so as to ensure a high level of fire safety and environmental protection for all. This is why we have worked with and supported authoritative institutes and individuals such as Environment Agency of England and Wales, the VU University Institute for Environmental Studies, Amsterdam and SP Fire Technology in Sweden.



To some extent, the fire safety community is a victim of its own success. Tremendous strides have been made over the last century in fire prevention, fire suppression and care and treatment of burn victims. But it seems some want to use this success as justification for now reversing some of these standards.

We, like others in the fire safety community, aspire for a day when deaths, injuries and major property losses are a thing of the past. Future generations can benefit from higher fire safety standards just as those of us today have benefitted from the advancements of the last 100 years. But virtual elimination of deaths, injuries and environmental impact of fires will not be achieved by carelessly reversing today's fire safety codes and standards. I encourage the entire fire safety community to speak up for higher standards and additional research, which will lead to new materials and enhanced approaches to preventing the human and environmental effects of fire.

REFERENCES

1. Hull, R. A Stec, Fire Safety Science News, No 33, Aug 2012. http://www.iafss.org/newsletter-issue-33
2. Keeping Fire in Check, European Flame Retardants Association, March 2012.
3. Green Science Policy Institute, Yet Another "Candle" Standard for TV Enclosures Rejected in Europe,
4. Greenstreet Berman Ltd., A statistical report to investigate the effectiveness of the Furniture and Furnishings (Fire) (Safety) Regulations 1988.
5. Steinhage,C.C.M., van Mierlo R.J.M., (2010), Efectis Nederland Report:Reaction to Fire Testing Sofas. Efectis Nederland.
6. EU Risk Assessment Report, (2006)
7. Summary EU Risk Assessment Report (2008)

LETTER TO THE EDITOR IN RESPONSE TO THE ARTICLE FLAME RETARDANTS - FIRE SAFETY VOICES NEED TO BE HEARD BY ROBERT CAMPBELL

Dear Editor,

Thank you for inviting us to respond to the article from Robert Campbell, BSEF. We sincerely believe that getting the right balance between the risks and benefits of flame retardants will only be achieved by scientists, through proper peer review.

The argument that fire retardants increase fire safety is spurious. Manufacturers do not add fire retardants voluntarily – they increase costs and are detrimental to the physical properties – they are added to meet regulatory requirements; this allows more flammable materials to be used in high risk applications such as electrical equipment and public transport.

We described the articles on the Flame Retardant Industry in the Chicago Tribune as "well-researched" because they shed light on the activities of lobbyists, and their connections with the tobacco industry lobby. We emphatically refute the suggestion that we are against flame retardants. Those scientists working in fire retardant development will be aware of our 100+ peer-reviewed publications on the development of new fire safe materials. Outside the narrow range of halogenated flame retardants, there have been notable advances in the broader field of fire retardants (especially those which do not rely on gas phase flame inhibition), which not only reduce ignitability and heat release rate, but also reduce toxic gas production by the formation of char or a protective barrier layer.

There are also a very large number of reputable scientific studies showing both the environmental persistence and toxicity of a number of halogenated flame retardants in current use. The San Antonio statement, signed by over 200 scientists, provides a good starting point for those unaware of the environmental and toxic hazards of certain flame retardants.

Yours faithfully,

Dr Anna Stec and Prof Richard Hull, Centre for Fire and Hazard Science, University of Central Lancashire.

ARTICLE

Industrial contributions to flame retardants debate

by Roland Dewitt
Chairman of Fire Safety Committee
PlasticsEurope

The Plastics Industry was interested to see the introduction of the discussion from the *Chicago Tribune* in the last issue of *Fire Safety Science News* [1]. It was stated in the editorial that the Editor was seeking to move the debate into the IAFSS to a more scientific basis. However it seems that the result was the articles only covered certain positions and not a wider picture since some other experts were approached but apparently declined to speak. This serves to potentially fall into the same trap as the *Chicago Tribune* with an assumption that everything one reads is giving a full picture. As Margaret Simonson [2] pointed out in her IAFSS article '*investigative reporting may not be balanced despite good intentions*.'

From the perspective of Plastics Europe whose members are users of flame retardants, plastics producers recognise the importance of fire safety in formulating their products where necessary. In addressing the fire safety characteristic which is one of many which need to be met, the plastics industry is presented with various options for ensuring products comply with any fire performance requirements which may form a legal basis for allowing a product to be sold into a particular application. Considerable efforts in research, development and certification are done to develop an appropriate acceptable formulation. Choice of solutions to enable required fire performance is influenced by the efficacy of substance , ability to maintain processing conditions and retain product performance in all aspects and not forgetting the important parameter of the acceptability of the substance from an environmental and health profile standpoint. This last point is very much addressed in Europe now with the introduction of the REACH Directive (n°1907/2006/EC) in 2007 and which deals with the Registration, Evaluation, Authorisation and Restriction of Chemical substances.

The aim of REACH, as stated by the European Commission, is to improve the protection of human health and the environment through the better and earlier identification of the intrinsic properties of chemical substances and of their impact on health and environment throughout their whole life cycle. While the Chemical Industry has already long before shown its great awareness by committing itself to the Responsible Care Program, the REACH Regulation now places greater responsibility on industry to manage the risks from chemicals and to provide safety information on the substances. The Regulation also calls for the progressive substitution of the most hazardous chemicals when suitable alternatives have been identified. All chemicals including flame retardants, manufactured or imported into Europe are subject to this Directive so this forms a sound scientific basis for defining the acceptability for this characteristic as the Directive reaches full implementation.

As mentioned the selection of the flame retardant should be governed by sound science in terms of both fire safety and environment & health. The Plastics Industry recognises that not all Flame retardants fit all polymers and all applications. In addition, the health and environmental aspects need an approach which is specific to a flame retardant and not general for all flame retardants or on the basis of particular element content. So this situation somewhat defines the direction and use of specific types of flame retardants in certain applications. This point needs to be understood by the wider fire safety community to reach the common goal of fire safety in our daily lives.

REFERENCES

1. Fire Safety Science News, No 33, Aug 2012. http://www.iafss.org/newsletter-issue-33
2. Margaret Simonson McNamee, Fires and the Environment – a Burning Issue!, Fire Safety Science News, No 33, Aug 2012. http://www.iafss.org/newsletter-issue-33

ARTICLE

Humanoid Firefighting Robots

by Brian Lattimer
Department of Mechanical Engineering, Virginia Tech, USA

Firefighting is a dangerous job. In 2011, 70,090 firefighters in the U.S. alone were injured in the line of duty with 61 deaths [1]. Though the number of firefighter deaths decreased from 1977-2000, the percent decline tracks well with the decrease in the number of fires [2]. During this period, the number of firefighter deaths while operating inside structures per 100,000 fires increased from 1.8 to 3.0 [2]. Though structure fires only account for one-third of fires [3], 65% of the fires resulting in more than five firefighter deaths from 1977-2010 were with firefighters inside of large structures such as warehouses, stores, or industrial plants [4]. Over 60% of the firefighter deaths and over 20% of the firefighting injuries are caused by exposure to fire conditions such as smoke inhalation, burns, overexertion/stress, or being trapped [5, 6].

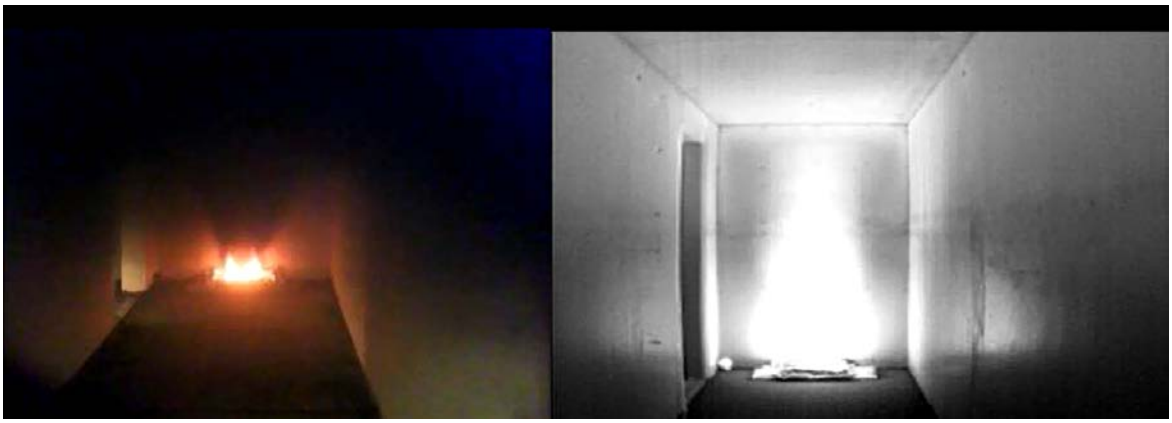
Technological advances are providing firefighters with new devices to support them in the line of duty. An interdisciplinary project being led by Prof. Brian Lattimer at Virginia Tech is developing a shipboard autonomous humanoid firefighting robot (SAFFiR) to send into structures containing a fire. A rendering of the robot is shown in the figure. The team consists of Prof. Brian Lattimer at Virginia Tech who is developing multi-spectral sensor systems and algorithms for firefighter tasks, Prof. Dennis Hong who operates the Robotics and Mechanisms Lab (RoMeLa) at Virginia Tech, and Prof. Dan Lee at University of Pennsylvania who is an expert in autonomous system navigation and intelligence integration. The three-year research program is being performed for the U.S. Navy to fight fires onboard ships. The autonomous humanoid platform was selected by the research team so that the robot could navigate through the tight confines of a ship designed for humans including movement over obstacles such as doors sills ("knee-knockers") and ladders.

The humanoid robot platform is part of several generations of humanoid robots being developed at Virginia Tech in RoMeLa by Prof. Hong's research group. These robots range from 150 mm to 1.5 m in height. Though many of these robots started off in development for robotic challenges such as RoboCup, an international robotic soccer competition, the advancements in technology are currently sufficient that these robots can now be used for more sophisticated objectives. The lower body of SAFFiR shown in Figure 2 is capable of autonomous walking in any direction. It includes active balance control to resist falling if pushed in any direction. The arms of the robot include hands that are capable of grasping objects as well as performing tasks such as operating a handline.

A multi-spectral vision system will be used for navigation of SAFFiR for indoor, smoke filled environments. With the stereo IR vision system developed in the program, the robot is capable of identifying surfaces in zero visibility conditions. The vision system is equipped with other rangefinding sensors to assist in tasks requiring more accurate location of objects. With the multi-spectral system, the robot is capable of path planning through complex indoor layouts to navigate through structures.

The robot needs to be capable of not only navigating around a structure, but once the robot has been alerted that there may be a fire, it needs to find the fire and suppress it. Algorithms are being developed to provide the robot with a means to identify which direction it needs to walk to reach the fire. Much like humans, the robot will rely on input from multiple sensors to "see", "smell", "hear", and "feel" its way to the fire. This multi-spectral sensor approach provides a redundancy in the algorithm to ensure that the robot is moving in the correct direction. In addition, the direction of movement must be considered along with the path planning to ensure the robot avoids obstacles while navigating to the fire.

Once the robot reaches the fire, it must suppress the fire. Algorithms have been developed to autonomously identify fires in the field of view, target the fires, and apply suppressant. The algorithms can target multiple fires at different elevations and distances and successively suppress them.



Robot vision system.

The team is currently entering the final year of the research program. At the end of the program, the robot will be brought to the ex-USS Shadwell to perform a series of demonstrations using the robot. This will include the robot working in a team of firefighters to help put out a fire with a standard hoseline as well as autonomously finding a fire and suppressing it.

REFERENCES

1. Karter, M. and Molis, J., "U.S. Firefighter Injuries in 2011," NFPA Journal, November/December, 2012.
2. NFPA, "Deadliest Fires in the U.S. with 5 or more Firefighter Deaths at the Fire Grounds, 1977-2010", Fire Incident Data Organization, 2012.
3. Karter, M., "Fire Loss in the United States," NFPA Journal, Sept., 2011.
4. Fahy, R., "Selected Special Analyses of Firefighter Fatalities," NFPA Report, 2005.
5. Fahy, R., et al., "Firefighter Fatalities in the United States 2010", NFPA Journal, June 2011.
6. Karter, M. and Molis, J., "U.S. Firefighter Injuries – 2010", NFPA Journal, Oct., 2010.

CONFERENCE REPORTS

9th Asia-Oceania Symposium on Fire Science and Technology, Hefei

Group photo of delegates with USTC Student Orchestra of Nationalities Music

The 9th Asia-Oceania Symposium on Fire Science and Technology (AOSFST) was held in Hefei, China from October 17 to 20. Organized by the Asia-Oceania Association for Fire Science and Technology (AOAFST) and hosted by the State Key Laboratory of Fire Science (SKLFS) at the University of Science and Technology of China (USTC), this symposium gathered over 200 scholars and postgraduates from about 20 countries and regions. The authors of the nearly 130 papers accepted for publication in the symposium proceedings covered nearly 28 countries and regions. Topics of the Symposium included fire physics and chemistry; fire and smoke modeling; human-fire interactions; fire statistics and risk assessment; fire safety design and code; structure response to fire; fire properties and testing methods of materials; suppression, detection, and smoke management; urban, WUI, and forest fires. Some special topics including fire investigation, fire reconstruction, fire service needs, transportation fires, and industrial fires are also covered.

The Symposium, held every 2-3 years, is one of the highest level international conferences in the fire research field. The 9th AOSFST aimed to present and discuss the latest research results and related technology development trend in Fire Science and Technology. The attendees of the symposium showed their newest researches by given presentations of papers in their field. The symposium also comprises 14 invited lectures from the world's top fire science researchers. The plenary speech was given by Prof. John L. de Ris from the Factory Mutual Global, USA. In addition to the technical sessions, several social activities provided opportunities for participants to meet with other colleagues and friends from around the world. The four-day symposium was a good platform to share new ideas and recent research findings in fire science and technology.

Prof WK Chow hands the Lifetime Contribution Award of AOAFST to Prof. Weicheng Fan

On this symposium a Lifetime Contribution Award was instituted by Asia-Oceania Association for Fire Science and Technology (AOAFST), to recognize the persons who have made outstanding contributions to the development of Fire Science and Technology. Prof. Toshisuke Hirano, first chairman of AOAFST during 1992-1995, and Prof. Weicheng Fan, chairman of AOAFST during 1995-2000, were rewarded the first Lifetime Contribution Award of AOAFST in this symposium.

The 9th AOSFST has made some innovations in its organization. The symposium collaborates with Elsevier to publish the proceedings in the journal of Engineering Procedia, while the copyright of the proceedings will be kept by IAFSS. By this step, the proceedings is expected to be indexed by Engineering Index. Very strict review steps helped select qualified papers from the submissions, for which the program committee consisted of nearly 120 reviewers from all over the world, and each paper was subjected to at least two peer reviews. The final acceptance ratio was nearly 64%. Additionaly, the video recordings of the invited speeches of the symposium have been produced which is available online.

The techical committee of the symposium was led by Prof. Tanaka Takeyoshi (Kyoto University), the program committee was led by Prof. Naian Liu (USTC), and the award committee was led by Prof. Charles Fleischmann (The University of Canterbury). The three committees consisted of nearly 40 committee members, who contributed a lot for the success of this symposium.

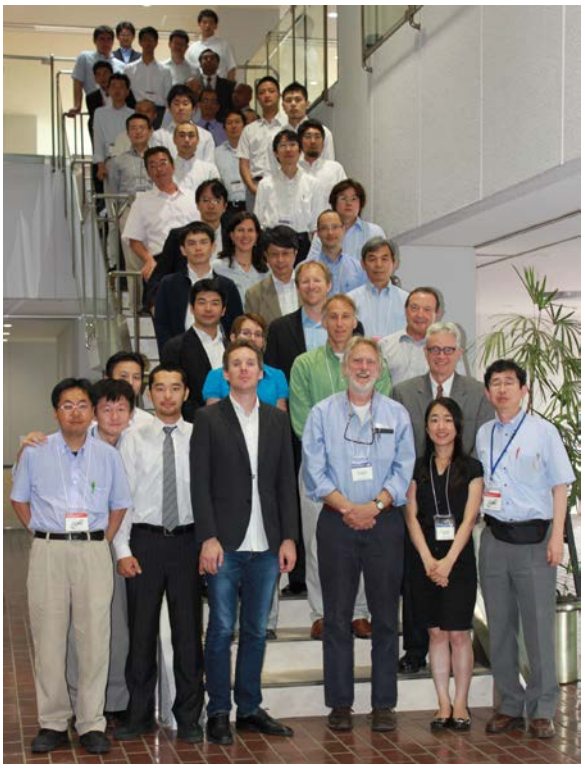
Many social activities were organized during the symposium. On evening of October 18, a special performance of Traditional Chinese Music was contributed by USTC Student Orchestra of Nationalities Music. All the students had made great efforts for several months for this performance. All the attendees were highly impressed by their skilled performance. Besides, tours of the facilities of SKLFS were arranged two times every day. Also a local tour in Hefei was organized, and the attendees were invited to visit the Anhui Museum, Huiyuan Park and/or Expo Anhui Pavilion, by which the attendees had opportunities of learning of the history and culture of Anhui Province and China.

Participants from both China and abroad were impressed by the fabulous organization of the conference. "This is probably one the best conferences that I have attended," said by Bogdan Dlugogorski, Chairman of the International Association for Fire Safety Science (IAFSS).

This symposium is organized by the AOAFST which is under the International Association for Fire Safety Science (IAFSS). It is the premier fire safety science meeting in the Asia-Oceania region and has been organized since 1992. The two most recent symposiums were held successfully in Hong Kong and Australia in 2007 and 2010 respectively.

Signed: NaiAn Liu, State Key Laboratory of Fire Science, and Wanki Chow, Hong Kong Polytechnic University and Chairman of AOAFST.

Operation Tomodachi: Workshop on Fire, Structures and WUI, Tokyo



The 2nd Japan-USA workshop held in Tokyo, Japan from July 1 to July 4, 2012. This workshop was known as "Operation Tomodachi - Fire Research". Tomodachi means friendship in Japanese. This workshop, led by Dr. Samuel L. Manzello of EL-NIST and Dr. Tokiyoshi Yamada of the University of Tokyo, was conducted in partnership with the Japan Association of Fire Science and Engineering (JAFSE). The local organizing committee consisted of: Dr. Ichiro Hagiwara, Prof Yoshifumi Ohmiya, and Dr. Kaoru Wakatsuki. The objective is to open a dialogue for new research collaborations between Japan/USA in an effort to develop scientifically based building codes and standards that will be of use to both countries to reduce the devastation caused by unwanted fires. This is a formal continuation of the kickoff meeting held at NIST's Engineering Laboratory (EL-NIST) in June 2011. EL-NIST signed a Statement of Intent with JAFSE to hold this workshop, and a follow on workshop at EL-NIST in 2014.

On July 1, participants from the USA learned about research at the Tokyo University of Science (TUS) during an optional laboratory tour event. On July 2, the state of the art in Fire Structure-Interaction Research was presented from leading researchers from both countries. EL-NIST's new National Fire Research Laboratory (NFRL) was presented. From July 3 to July 4, the state of art in Wildland-Urban Interface (WUI)/Urban Fire Research was presented from leading researchers from both countries. An overview of focused research in WUI fires by EL-NIST was provided in two presentations. USA participants learned about post-tsunami fires that occurred in Japan after the March 11, 2011 Great East Japan earthquake. USA delegates enjoyed laboratory tours of the Building Research Institute's facilities as well as those of the National Research Institute of Fire and Disaster (NRIFD). USA presentations were delivered from: NIST, Purdue University, University of Texas-Austin, Michigan State University, University of Michigan, Insurance Institute for Business and Home Safety (IBHS), Worcester Polytechnic Institute (WPI), University of California-Berkeley, California Polytechnic University (CALPOLY), Underwriters Laboratories (UL), and the University of Delaware (organizations are listed based on the order of oral presentation). Japanese presentations were delivered from: The University of Tokyo, Building Research Institute (BRI), Takenaka Corporation, Center for Better Living, Shimizu Corporation, TUS, National Institute for Land and Infrastructure Management (NILIM), Kyoto University, NRIFD, Yamagata University, and Kobe University (organizations are listed based on the order of oral presentation). The workshop closed with an open discussion of the future workshop to be held at EL-NIST.

All of the presentations are documented in a recent NIST Special Publication (NIST SP 1137, online). The purpose of this NIST special publication is to document presentations and discussions. Six of the participants from the workshop, are working with Manzello (Dr. Yamada, Dr. Jeffers, Dr. Ohmiya, Dr. Fernandez-Pello, and Dr. Himoto), to prepare a joint review paper regarding the workshop for publication in an upcoming issue of Fire Safety Journal.

Signed: Samuel L. Manzello, NIST

Advanced Fire Research in Asia, Tokyo

The kickoff seminar hosted by the Center for Fire Science and Technology, Tokyo University of Science was held in order to establish "FORUM for Advanced Fire Education/Research in Asia" on December 27-28, 2012 in Tokyo. Professors and researchers on fire safety in universities/institutes and administrative officers of fire brigades along with fire protection engineers gathered from home and abroad such as Japan, China, Hong Kong, Taiwan, South Korea, Vietnam, Indonesia, and Bangladesh from Asia and the U.K., New Zealand, Brazil in the areas from other than Asia.

On the first day, eleven lectures were delivered in two sessions as to the common recognition about Asian fire statistics, the common recognition on fire safety regulations and standards in Asia and also introduction of important fire accidents in this region. On the 2nd day, three lectures were given in the session on the topics such as what will be expected of the education regarding building fire safety in Asia, what will be expected of the FORUM we plan to build this time. After the session, a panel discussion about establishment of the FORUM was held. The total number of participants was 88 on the first day and 46 on the second day.

In the mega cities in Asia, construction of skyscrapers and urban development of underground space etc. are rapidly progressing in connection with economic growth. The space and material used for development are also changing rapidly and hence the potential risk of fire is increasing. And, in fact, a number of serious fire accidents that resulted in many fatalities really have occurred in this region. Although it is earnestly desired that the appropriate measures are developed based on fire risk analysis of these incidents to solve such issues, fire protection engineers, which can cope with these problems, run short crucially in the region because we do not have enough education system to nature professional fire protection engineers in this region. Therefore, this calls for urgent attention among us.

Due to all those things, as the continuing activity of 5-year project of Global COE Program called as "Center for Education and Research on Advanced Fire Safety Science and Technology in East Asia" of Tokyo University of Science, which will complete in March, 2013, the required action must be the establishing the FORUM, where people on research and education concerning fire safety in Asian countries cooperate constantly. For this purpose, a panel discussion on the second day was organized and we adopted the resolutions described below in the end of the discussion.

1) Construct a common platform to exchange the information about education and methodology for fire safety engineering and science among related academic organizations in countries in the Asia-Oceania region.
2) For this purpose, one is through the Internet website and the mailing list, and the other is a periodical meeting like this FORUM.
3) For the time being, Tokyo University of Science will play as a secretariat of this FORUM until the activities have become steady.
4) Seek a common funding from countries involved in the FORUM.
5) The next FORUM will be held in South Korea around October, 2013. The detailed plan will be discussed further after creating the mailing list of the persons concerned.

Signed: Ai Sekizawa, Tokyo University of Science

2012 International Congress Fire Computer Modeling, Santander

The International Congress “Fire Computer Modeling” FCM2012 was successfully held on October 18-19th, 2012 at the University of Cantabria, Spain. This Congress was organized by GIDAI Group with the collaboration of Carleton University (Canada), Ulster University (UK), Polytechnic Institute of Bragança (Portugal), Berkeley University (USA), among others, and with the support of the National Fire Protection Association (NFPA), Society of Fire Protection Engineers (SFPE), International Association for Fire Safety Science (IAFSS) and Spanish Section of Combustion Institute.

The International Congress allowed bringing together international experts in computational modeling in all areas related to fire safety, to promote the exchange of knowledge acquired through research results, applications and studies. In this sense, experts in modeling the fire dynamics, the thermal decomposition of the solid phase, the combustion, the turbulence models, among other fields were gathered.

The FCM2012 met in Santander about 120 participants from over 15 different countries, where the centers and most prestigious universities worldwide submitted their researches.

During the first day, it was performed a Workshop about Fire Computer Modeling, which had an excellent participation. The workshop was the aim to transfer knowledge to the Spanish business sector and was

developed in Spanish language. The second day, the opening session was given by Prof Michael Delichatsios of the Ulster University, and was titled "Numerical Soot Modelling in Turbulent Jet Flames and Pool Fires". In the talk, a laminar soot model was extended to turbulent cases using a conditional moment closure (CMC) equation only for soot formation.

During the Congress, the speakers presented a wide range of topics such as “CFD Modeling of Flame Spread over Corrugated Cardboard Panels”, “Modeling Wildland Fire Spread using an Eulerian Level Set Method and High Resolution Numerical Weather Prediction” or “Temperature Analysis and Validation of Partially Encased Beams Submitted to Elevated Temperature” amongst others. For more information and the videos of the presentations, visit our website.

In the framework of the FCM2012, we held a tribute to the Founder and Director of the GIDAI Research Group at Universidad de Cantabria, Prof. Dr. Jorge A. Capote Abreu, due to his retirement, and for his scientific work related to the Science of Fire Safety.

Signed: Mariano Lázaro, Universidad de Cantabria.

European Fire Safe Use of Wood

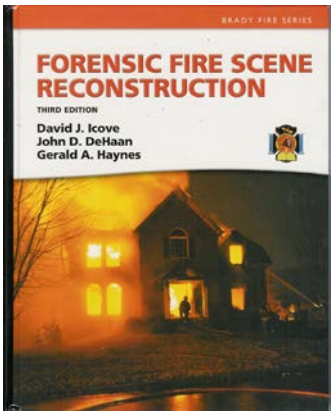
The European Fire Safe Use of Wood (FSUW) network started in 2002 as a result of an initiative from Finland and Sweden and is now being extended by new partners from Australia, New Zealand and North America. The network has representatives from both industry and research in most countries. Previous work by the group resulted in the very first European guideline on Fire Safety in Timber Buildings published by SP in 2010.

The latest European meeting was held in September 2012 with about 20 representatives from 12 countries. A number of issues were highlighted. The main topic being discussed was how to overcome the wide disparity in national regulations and insurance requirements throughout Europe that hinders the use of wood on a scale equivalent to concrete and steel. There is a drive for increased use of timber in high and medium rise buildings, only in few countries it has reached above 15 % of new constructions. Ultimately it is hoped that the FSUW group will contribute to harmonization of the fire safe use of timber and wood products in buildings throughout Europe and also globally. The next meeting is being planned to 3-5 April 2013 in Stockholm.

Signed: Birgit Östman, SP

RECENT BOOKS

Forensic Fire Scene Reconstruction and *Kirk’s Fire Investigation*



The 3rd edition of *Forensic Fire Scene Reconstruction*, now authored by David J. Icove, John D. DeHaan and Gerald A. Haynes was released in September 2012. This new edition covers engineering calculations and fire modeling and also features several exhaustive case studies which leverage the current technology that is explained in depth throughout the text. Specialized topic areas including fire tenability and deaths, the use of drone aircraft, laser scanning, forensic photography and computer modeling are discussed. Using historical fire cases and realistic case examples, the authors examine the newest lessons learned and insight into the ignition, growth, development, and outcome of those fires. All documentation in the case examples follows or exceeds the methodology set forth by NFPA 921 – Guide for Fire and Explosion Investigations (2011) and its companion standard NFPA 1033 – Standard for Professional Qualifications for Fire Investigators (2009), and Kirk’s Fire Investigation. Copyright 2013. It is available from Brady Publishing/Pearson. ISBN: 0-13-295620-9.

This text is the companion text to *Kirk’s Fire Investigation*, now in its 7th edition (authored by John D. DeHaan and David J. Icove). It was released in June 2011 (copyright 2012). Also available from Brady/Pearson. ISBN: 0-13-283001-9. Both texts are widely used in fire investigation, fire science, and forensic science courses at colleges and universities, as well as professional training courses.

CALL FOR PAPERS

Fire Technology: special issue on flame retardants and environmental impact

Awareness of the fact that large fires may present dramatic and persistent adverse effects on the environment has increased since the occurrence of numerous high impact incidents over the past 25 years. Traditionally, discussion of the environmental impact of fires has focused on the emissions that fires can cause both to the air, water and soil; but in recent years a new debate has arisen where the impact of chemicals on the environment and the precautionary principle have taken precedence. In the wake of the political debate concerning potential exposure to chemicals in our environment, flame retardants, used to restrict the size and number of fires in products to which they are added, have also been questioned.

New developments in materials and their performance in fires have been instrumental in the development of many products which are ubiquitous today. In recognition of the importance of research into new flame retardants and their impact on the environment *Fire Technology* is inviting submissions to a Special Issue focusing on flame retardants. Potential papers could address e.g. new fire retardant chemicals, the environmental impact of fire retardants, their cost benefit and comparisons between fire performance of fire retarded and non-fire retarded material. For more information please contact Dr Margaret S. McNamee (Margaret.McNamee@sp.se) who is the Guest Editor.

Fire Technology: special issue on mine fires

Fires that occur in underground mines represent unique problems due to the confined spaces involved, the presence of forced ventilating airflows, the wealth of potential ignition sources and the diversity of equipment and combustibles that are commonly used as part of the mining process.

Papers are invited as part of a special issue of *Fire Technology* devoted to the state of the art in mine fires. Of interest are research studies (field, experimental, numerical) that may provide the scientific basis for improved codes/standards as well as strategies to reduce the number of fire incidents and loss of life potentially resulting from these fires. These could include: Flammability of combustible mine materials, Fire detection and warning systems, Computer modeling of fire/ventilation, interactions, and Fire suppression/extinguishment.

For more information please contact Charles D. Litton at the National Institute for Occupational Safety and Health (NIOSH) (chl3@cdc.gov) who is the Guest Editor.

UPCOMING EVENTS

14th International Conference on Numerical Combustion - SIAM, 8-10 Apr 2013, San Antonio, Texas, http://www.siam.org/meetings/nc13

European Fire Safe Use of Wood, 3-5 April 2013, Stockholm.

3rd Fire Safety Day (Scandinavian), April 17, 2013 at the Technical University of Denmark, www.brand.dtu.dk

Application of Structural Fire Engineering Conference, 19-20 Apr 2013, Prague. http://fire.fsv.cvut.cz/ifer

5th International Conference on Design, Fabrication and Economy of Metal Structures, 24-26 April 2013, University of Miskolc, Hungary. http://www.dfe2013.uni-miskolc.hu

7th Internationals Seminar on Fire and Explosion Hazards, May 5-10, 2023, Providence (USA). https://www.seeuthere.com

13th International Congress on Combustion By-Products and their Health Effects May 15-18, 2013, New Orleans. http://www.lsu.edu/piccongress

8th US National Combustion Meeting, May 19-22, 2013, Park City, Utah. http://combustion2013.utah.edu

Fire Retardants in Plastics 2013, June 13-14, 2013, Denver, CO, USA. http://www.amiplastics-na.com/events/Event.aspx?code=C516&sec=3039

13th Interflam - International Conference and Exhibition on Fire Science and Engineering Jun 24 -26, 2013, London, UK. http://www.intersciencecomms.co.uk

6th European Combustion Meeting (ECM2013), Lund, Sweden, Jun 25-28, 2013. http://www.ecm2013.lth.se

14th European Meeting on Fire Retardancy & Protection of Materials (FRPM). June 30-July 4, 2013, Lille, France. http://frpm2013.eu

4th Fire Behavior and Fuels Conference, IAWF and IAFSS, Jul 1 -4, 2013, St. Petersburg, Russia. http://www.iawfonline.org/2013FuelsConference

NFPA Conference and Expo, July 10-13, 2013.

24th International Colloquium on the Dynamics of Explosions and Reactive Systems (ICDERS), Jul 28 to Aug 2, 2013, Taipei, Taiwan. www.ncu.edu.tw/~icders2013

8th Mediterranean Combustion Symposium, Sep 8-13, 2013, Izmir, Turkey. http://www.ichmt.org/mcs-13

Fire Spalling 2013 - 3rd International Workshop on Concrete Spalling due to Fire Exposure. Sept. 25-27, 2013. http://www.firespalling2013.fr

2nd International Symposium on Ultra-High Performance Fibre-reinforced Concrete, Marseille, October 1-3, 2013. http://www.afgc.asso.fr/index.php/uhpfrc2013

Eurofire conference, Basel, Switzerland, Oct, 2013. http://www.eurofireconference.com

1st International Seminar on Fire Safety of Façade, Paris, 14th-15th November 2013, http://facade2013.sciencesconf.org

7th Triennial International Aircraft Fire & Cabin Safety Research Conference, November 28, 2013 - December 8, 2013, Philadelphia, USA. http://www.fire.tc.faa.gov/2013Conference/conference.asp

Royal Society of Chemistry's Fire Retardant Technologies (FRT 14), 14 to 16 April 2014, Preston, UK.

11th International Symposium on Fire Safety Science, Feb 10 – 14, 2014, New Zealand. http://www.iafss.org/symposium/11th-symposium

Structures in Fire (SiF) 2014, Shanghai, China, Jun 11 to 13 2014. http://www.structuresinfire.com

35th International Symposium on Combustion, Aug 2014, San Francisco, California. (submission deadline Dec 5, 2013) https://www.combustioninstitute.org

7th International Conference on Forest Fire Research, November 17-20, 2014, Coimbra, Portugal. http://icffr2014.wordpress.com

JOB OFFERS

Faculty position at Case Western Reserve University, USA

Case Western Reserve University's Engineering Strategic Hiring Initiative continues in 2012 and beyond with a focus on recruiting extraordinary faculty in the broad areas of advanced materials, energy and human health. Research clusters identified as strategic priorities and opportunities for the Case School of Engineering include Biomedical Imaging, Biomolecular Engineering, Brain Interfacing & Signal Analysis, Layered Polymeric Materials, Electrochemistry, Multi Scale Biomedical Systems & Computational Biology, Musculoskeletal Innovation, Photovoltaics & Lifetime Degradation, Smart Grid, Sustainable Manufacturing, and Translational Biomaterials.

We are currently seeking candidates with relevant experience in a new cluster area of fire and materials flammability. Candidates with experience in one or more of the following areas: fire dynamics, fire suppression, flammability of polymeric materials, polymer flammability mechanisms and the development of non-halogenated flame retarding agents are of particular interest.

Launched in 2010, the strategic hiring initiative has attracted outstanding junior and senior candidates interested in being part of a community determined to drive discoveries that improve people's lives. The Case School of Engineering values interdisciplinary thinking, creative collaboration and entrepreneurial ideas. It also believes strongly in the vital importance of diversity within the professorial ranks, both in terms of women and underrepresented minorities.

Successful candidates will hold primary appointments in the Case School of Engineering, although in many instances they will be eligible for additional appointments within the School of Medicine or College of Arts and Sciences, among others.

Candidates seeking positions at the Assistant Professor level should hold an earned doctorate in a field of engineering or related science and demonstrate promise for research and teaching excellence. Those seeking these positions should provide the names and contact information of three references in addition to a cover letter, research and teaching statements and CV. Candidates seeking positions at the Associate Professor level should have established a significant research reputation nationally and possess a record of extramural funding. Candidates seeking positions at the level of full Professor should be recognized internationally for research excellence, leadership and scholarship in their discipline.

We welcome all nominations and applications. For additional information, please contact Search Chair P. Hunter Peckham, Donnell Professor of Biomedical Engineering and Orthopaedics, at cseinterest@case.edu.

In employment, as in education, Case Western Reserve University is committed to Equal Opportunity and Diversity. Women, veterans, members of underrepresented minority groups, and individuals with disabilities are encouraged to apply. Case Western Reserve University provides reasonable accommodations to applicants with disabilities. Applicants desiring a reasonable accommodation for any part of the application and hiring process should contact the Office of Inclusion, Diversity and Equal Opportunity at 216-368-8877. Determinations regarding granting accommodations will be made on a case-by-case basis.

Lecturer in Hydrogen Safety, University of Ulster, UK

The main purpose of the post is to provide support to the HyFacts project funded by the Fuel Cell and Hydrogen Joint Undertaking, and to contribute to teaching and research in the field of hydrogen safety.

Key duties include: deliver research and related duties of the University of Ulster as a partner in the EC-funded FP7 project HyFacts "Identification, Preparation and Dissemination of Hydrogen Safety Facts to Regulators and Public Safety Officials", including communication with coordinator of the project and partners on all aspects of the project, development and maintenance of the project website, organising short courses, travelling to meetings, etc.; provide relevant experience in area of hydrogen safety engineering; set targets for outputs and achievements for hydrogen safety engineering research in terms of high quality publications, grant applications, research income, research students, and measures of esteem; develop research activities in the area of hydrogen safety engineering, apply for external funding, and contribute to externally funded projects within the area of expertise, etc.; submit and publish research results in leading journals in the field; foster knowledge and technology transfer at HySAFER; work in a strong collaboration with national and international partners of HySAFER; undertake any other duties and responsibilities consistent with the nature and grade of the post. More information and application documents can be found online.

PhD Studentships at University of Ulster, UK

There are the following PhD possible openings in FireSERT in the Fire Dynamics and Materials laboratory:

1. Soot, Carbon Monoxide and Radiation in Pool Fires: experiments and modelling
2. Fire dynamics of large scale enclosure and corridor or tunnel fires
3. Chemistry and physics of material flammability properties including extinction and ignition
4. Fire suppression using liquid nitrogen
5. Fire Risk assessment using Agent Based Modelling.

For more information and application, visit the website:
http://research.ulster.ac.uk/info/prospective/funding.html

PhD Studentship at University of Cantabria, Spain

The GIDAI Group- Fire Safety Research and Technology from the University of Cantabria will commence a research project concerned with pyrolysis modelling of some building materials. GIDAI Group wishes to recruit a student who starts his/her PhD and will undertake this project over the next three years. The salary will be linked to Spanish official grants for PhD students (FPI Ministerio de Economía y Competitividad).

The successful candidate will have experience in computational fluid dynamics modeling and mathematical optimization techniques (skills in programming would be appreciated), background with a good student record and knowledge of fire safety engineering. Experience using comprehensive pyrolysis models would be considered an advantage. The successful candidate must have excellent written and oral skills in English. We will also be pleased to accept people coming with their own grant. Contact: Prof. Daniel Alvear at daniel.alvear@unican.es.

OBITUARY

Soonil Nam (1952 - 2013)

Dr. Soonil Nam passed away on February 18, 2013 after more than a three year struggle with cancer. Soonil was a Senior Research Specialist at FM Global where he conducted research in fire protection for over twenty years. Soonil received a bachelor's and a master's degree in mechanical engineering from Seoul National University. In 1987, he received a doctorate at Stanford working under the supervision of the renowned theoretical fluid dynamicist Prof Milton Van Dyke. His thesis topic was "Higher-Order Boundary-Layer Solution for Unsteady Motion of a Circular Cylinder." Previous to joining FM Global, Soonil was a Research Associate at Stanford University conducting research on stability and convergence of numerical solutions. With his strong theoretical and computational background in fluid mechanics, Soonil was well suited to contribute to FM Global's early efforts at using computational fluid dynamics (CFD) to predict automatic sprinkler performance. His CFD simulations of the performance of ESFR sprinklers along with experimental validation of results were pioneering efforts in applying CFD tools to practical sprinkler problems. His efforts led the way to FM Global's continuing research on computational approaches to predicting sprinkler performance.

In addition to his research focus on sprinklers, Soonil was always enthusiastic and ready to meet the challenges of the wide range of problems associated with fire safety, whether theoretical or practical. He made significant contributions to fire safety in many areas. These include: modeling of thermal plumes, smoke movement, and smoke deposition; performance of water mist systems, responses of heat and smoke detectors, and flammability of materials. Of particular note was his development of an intermediate-scale parallel panel test to replace the large-scale test used at FM Global for building construction materials.

Soonil was an active member of the International Association for Fire Safety Science, the American Society of Mechanical Engineers, and the American Physical Society. He is survived by his wife, Elizabeth and two children, Esther and Walter. He is much missed by all his colleagues.

Signed: Robert G. Bill, Jr., FM Global

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, letter to the editor, images, news, announcements or job offers related to fire safety science or IAFSS members. These could be collected from your department, institution, country or region. Please send your contributions to the Editor-in-Chief (Guillermo Rein, g.rein@imperial.ac.uk).

For the next issue (No. 35), the deadline for submissions is July 10, 2013. Main topic of discussion would be education in fire safety engineering.

http://www.iafss.org

2011-2014
OFFICERS AND COMMITTEE MEMBERS OF THE IAFSS

EXECUTIVE COMMITTEE
Chairman:
Prof Bogdan Dlugogorski, Australia
Bogdan.Dlugogorski@newcastle.edu.au

Vice-Chairmen:
Dr Anthony Hamins, USA
Prof Ai Sekizawa, Japan
Prof Patrick van Hees, Sweden

Secretary:
Dr Margaret Simonson McNamee, Sweden
margaret.mcnamee@sp.se

Treasurer:
Dr Christopher Wieczorek, USA

Immediate Past Chairman:
Dr Craig Beyler, USA

Executive Members:
Dr Charles Fleischmann, New Zealand
Dr Arnaud Trouveé, USA

IAFSS COMMITTEE:
Dr Vytenis Babrauskas, USA
Mr Dieter Brein, Germany
Prof W-K Chow, Hong Kong, China
Prof Nicholas Dembsey, USA
Dr Rita Fahy, USA
Ms Carole Franks, UK
Prof Ed Galea, UK
Prof George Hadjisophocleous, Canada
Dr Tuula Hakkarainen, Finland
Prof Yuji Hasemi, Japan
Dr Yaping He, Australia
Dr Björn Karlsson, Iceland
Dr Bart Merci, Belgium
Dr Guillermo Rein, UK
Prof Jinhua Sun, China
Prof Takeyoshi Tanaka, Japan
Prof Jose Torero, UK