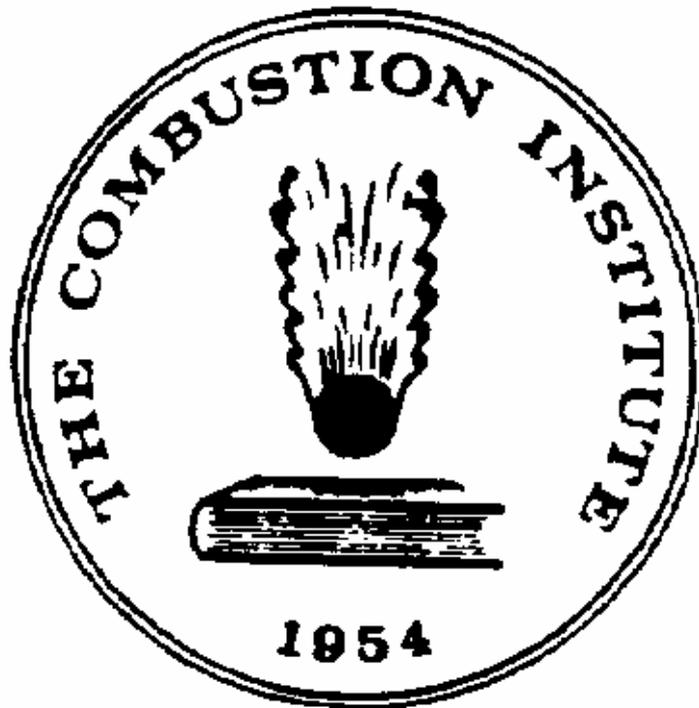


THE COMBUSTION INSTITUTE

(British Section)



NEWSLETTER

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HAPPY NEW YEAR/MILLENNIUM

I wished readers this in 2000, but there are a number of significant combustion scientists and engineers who believe the new millennium is only just upon us, so these two consecutive messages should suffice!

The British Section has a new chairman and two new secretaries to match the change in date. Ken Bray has been our chairman for many years and I hope he will sometime write about his experiences in this office which he has served extremely well. We are all grateful to him for the gentle, but firm way he has guided the Section.

John Griffiths has relinquished his post as Hon Sec and has taken the opportunity of writing about some of his combustion life in this *Newsletter*. John has worked extremely hard and efficiently for the British Section; the Secretary has a large task, much of it unseen by the members, and it says something about John and the job he did that it has taken two women to replace him (only joking, Alison and Valerie and all my pc friends)!

I know that all members of the British Section would want to thank both Ken and John for all they have done, and to wish them happy "retirement" from these posts.

We are also happy to welcome back Chris Lawn to the committee and wish him success as our new chairman. Alison Tomlin will take over much of John's work, but Valerie Dupont will deal with all membership matters. John has asked me to pass on apologies for a few problems with address labels on the renewal notices that were sent out before Christmas. This was "the culmination of a "bad week" for him, and he wishes to assure members that this was not the fault of either Alison or Valerie, as the new secretarial team. Errors / omissions were entirely of his making!"

Members are urged to renew their membership for 2001 using the form sent out before Christmas. It is now possible to pay by standing order and a form for this was also sent to members. Copies of both forms will be on the web page alongside this *Newsletter*. Membership was slightly down last year; a sign of the decline in combustion activity in Britain? Please do what you can to enrol more members for 2001. This *Newsletter* is being sent to a number of previous members in the hope that it will persuade them to renew their membership.

We understand that there has been some difficulty effecting payment by standing order. This appears to be connected with the account number. The advice from the Bank at which the British Section account is held is that, if in doubt about the number of digits in the account number, insert an additional zero at the front, so that the account number then reads 00082488. Let Valerie Dupont know of any difficulties.

This "Millenium II" edition of the *Newsletter* is a bumper one. There was a time when I thought I would not have enough material, but, by waiting till 2001 (mainly by default - mine!) we have ended up with the largest ever. Don't let that stop you from writing something for the next edition. I cannot rely on Ken Palmer to come up with an original article every time!

Tony Burgess

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COMBUSTION PEOPLE

Bill Gardiner

Bill Gardiner of the Department of Chemistry, University of Texas at Austin passed away on 17 November 2000 as a result of increasing complications from a broken neck injury that he suffered in a biking accident on Tuesday 14 November.

Bill was well-known throughout the combustion community and was a regular attendee at International Combustion Symposia. A kinetics session would not have been the same without his participation.

Typically he had said previously that in the event of his death, his wish was to have a "celebration" on his behalf. His family arranged to hold this immediately following a funeral service. In place of flowers, friends were asked to contribute to a Memorial Fund which will be "used to assist chemistry students in their quest for an education". They were also asked to bring reminiscences and photos to the "celebration".

Professor James Holcombe, Chairman of his Department in Austin, asked that Bill's friends and collaborators "across the globe" be notified of his death. He continued "Bill will be missed as a colleague, teacher and friend". I am sure that many British Section members will have similar feelings.

This is the only information to have reached the Newsletter, but I am sure that Professor Holcombe would be pleased to provide more and to receive appreciation's of Bill.

Peter Moore

Derek Bradley told me the sad news that Peter Moore died just before the Edinburgh Symposium. He reminded me that Peter was an old stalwart of the Institute and his main research interest was on reciprocating engines which he carried out in the Mechanical Engineering Department at Imperial College, London for many years. He then took a Chair in India and was one of those instrumental in helping to found the Indian section. After his return to Britain he retired, and the last time Derek saw him was at an I.Mech. E. meeting acting as a science correspondent for the Financial Times.

Professor Dinos Arcoumanis

Derek Bradley also told me that Dinos is moving from the Mechanical Engineering Department at Imperial College, London to City University.

Hans Michels

Belated congratulations to Hans Michels who was appointed Professor of Safety Engineering in the University of London at Imperial College, London in 1999. I am sorry that I missed this news earlier.

Graham Dixon-Lewis

At the Edinburgh Symposium there was a special meeting to honour Graham and his work. This was organised by David Smith and Charlie Westbrook who had previously written to the many friends and colleagues of Graham Dixon-Lewis. Graham has been a pioneer in the field of combustion modeling, especially including chemical kinetics, and

they wanted to find a way to express our appreciation and affection for him and his work. They asked to be sent a personal or technical letter or something similar that could be collected into a "book" to present to Graham at the Symposium.

This was done on the first, very rainy, Monday lunchtime. I missed it along with a number of other friends of Graham, but I am grateful to David Smith for the loan of the originals of the 65 contributions to the book. I can only extract a few snippets from them (I am sure that Graham would show you the book if you ask); I have chosen a few more personal reminiscences; Graham's papers prove his contribution to combustion science.

Charlie Westbrook:

"When we sent out our invitations to colleagues, Bob Bilger was worried. His question was "Has anything happened to Graham?", I suppose because this type of recognition is sometimes done "in memoriam". We all hope and expect to have the pleasure of your company, and that of your charming Pat, for a very long time: we just couldn't pass up the opportunity to make these comments on the occasion of a Symposium "in your own backyard" at this time".

Ninni D'Alessio:

"G D-L surfaced in my life as a benign elf in the most unusual way. Once, in the seventies, coming back from Bari He gave a seminar in Naples about the kinetics of hydrogen-air combustion. For me, quite a nightmare, lost in the aggressive sequence of so many elemental reactions. He developed so much from those early efforts! Then queuing together in the lobby of a Manhattan hotel, which offered special rates for young British scientists, we both being well over forty..... To a southern European, Graham is the prototype of the Englishman with a bit of eccentricity, which is gradually disappearing from Europe....."

Bob Bilger:

"I first met G D-L in a tempura bar in Tokyo ... in 1974. The notable Australian kineticist, Maurice Mulcahy, introduced us..... I particularly enjoyed Graham's views on the essentials of radical pools and recombination of moles, subjects well explored by him before "reduced mechanisms" were invented. His plenary lecture at the 23rd Symposium on laminar flame structure has insights that I still value"

Derek Bradley:

"It does not seem so long ago that, as a young lecturer at Leeds University, keen to resume combustion research, I became aware of an interesting character with a double-barrelled name working for the Gas Council on flame equations with, what seemed to be at the time, overwhelmingly complex chemical kinetics. His very good idea became an even better one when the Eldon Chapel ...acquired a new altar-piece in the form of the University's first digital computer. We didn't know a lot about numerical methods, convergence or accuracy, but we experienced the exhilaration of doing a year's work in a day, being able to go home at half past three, buy a pint of beer and still have change from half a crown. But I exaggerate. Contrary to what the political pundits say, the computer has never given Graham increased leisure (just ask Pat). If you didn't bump into him on the campus at the weekend, you wondered if he was ill..... I thank him for his rigour in our many discussions on combustion throughout our lives at Leeds, and all the fun, enjoyment and friendship this has generated along the way".

Melvyn Branch:

".....Graham has been the paradigm of the gentleman in a discipline in which self-importance can be common. His regard for others in the field and concern for his students stands out. He clearly takes great pleasure in interacting with others and helping others advance their research"

Ela Bulewicz:

"In these memory "snapshots" collected over about 40 years, Graham always looks much the same. I cannot remember him young; he has always been ageless. In a grey-brown suit, greying, with half a smile on his face, shy but mischievous and a bit absent-minded. The scenes that came first to my mind were: *USA, Salt Lake City*. Graham, with glasses secured by a piece of white elastic, losing his wallet (or having it stolen). *Leeds, Graham's office*.Papers everywhere, but particularly on the floor. Long rolls of computer printouts in the corner, in apparent disorder and Graham diving into the pile to retrieve just the fragment he was after.....*Several visits to Poland*, attending a number of our meetings and giving an excellent paper each time.... and enjoying himself.... up a mountain in a cable railway on a very misty day in drizzling rain, or going down a salt mine in Krakow".

Tony Dean:

"When thinking of your many contributions to kinetics and combustion, I recall the phrase "standing on the shoulders of giants",you have made it much easier for the next generation(s) to advance these areas....."

Bob Dibble:

"Ah! A fellow Yorkshireman singing the National Anthem of Wales. It must be Graham."

Richard Gann:

"...in Bob Fristrom's excellent upgrade to the classic text *Flame Structure*, there are more references to your work than anyone else's (well, except for his own)."

Barry Greenberg:

"There was a period in the early seventies when he was seriously ill and was hospitalised. The doctors had given instructions that he should not be involved in any work..... However, one of his research assistants managed to visit him and was immediately give detailed instructions as to what parametric studies to carry out with the latest version of his code. And an update was expected ("but don't tell my wife")..... Graham does not seem to change and, to my mind, still remains the jovial, unpretentious, scholarly gentleman I first met 30 years ago..."

Tony Oppenheim:

"It is you, in my opinion, who brought to fruition the century of research studies on laminar flames, initiated by Mallard and Le Chatelier in 1883, by elegant mathematical exposition of their intrinsic mechanism, displaying so beautifully the structural relationship between their viscous flow field and the chemical kinetic nature. you are truly among the most respected authorities in our field of endeavor - a position you hold with remarkable modesty, as is typical of great men".

Elaine Oran:

"Our conversations range from the delights of wild raspberries to the complexities of a set of truly intractable reactions.....Your calm, insightful, and intelligent approach to these wonders has been an inspiration to all of us".

I want to add two small episodes. After the Munich Symposium we found ourselves camped about a hundred metres from Pat and Graham near Venice. We had several bad storms and our tent was flooded one night. So my younger son dug a very deep trench around the tent. Every evening we alternated at each other's tent for night-caps. I still can see the vision of Graham in our trench in the dark holding a bottle of gin in one hand, the other trapped in a pair of folding aluminium chairs crying "release me" as he looked

heavenward! He showed me the scar on his hand a few months later and, for many years we were made to apologise for our son's over-enthusiastic canal building. More recently, Graham confessed that the scar was much older and had nothing to do with the camping episode!

The other story is of when we went to the Soviet Union in 1989 with Graham and Derek Bradley. We all flew from Manchester and Pat, who was not flying with us, asked us to keep an eye on Graham. We lost him in W H Smiths, and were desperately trying to find him. Eventually, after the last call to board the plane we gave up the hunt, without having had chance to buy our duty-free. Graham was sitting on the plane, had been there some time and had bought books, newspapers and his duty-free!

Thank you, Graham, for being a good friend as well as an extra-ordinary combustion scientist.

Tony Burgess

Please let me have news of combustion people to put in this section.

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B*** SPELLING!**

As I have often remarked in my editorials, it is very difficult to arouse readers enough to get them to reply to a contentious statement in the *Newsletter* or to contribute something themselves. It seems that the only topics likely to give rise to protests concern cruelty to animals! What about cruelty to the English language?

I have recently returned from the land of split infinitives and funny spelling! As a co-editor of the last three Symposium proceedings I have had to use American English (is that a contradiction?), and, however I set up my home computer, it still tells me that I am spelling sulphur wrongly and tries to correct my perfectly correct grammar.

Imagine my concern on reading in a recent copy of "The Times" that we may have to "standardise" (or is it standardize?) our spelling and grammar, so that we shall have to *seriously* worry about the *color* of *sulfur* dioxide emissions and the *modeling* of their formation. Shall we have to spell P_2O_5 as fosferos pentoxide? And what about Filadelfia? There must be a Story there!

All in favor write to me. We could organize a Spelling Bee!

Tony Burgess

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MINUTES OF THE ANNUAL GENERAL MEETING HELD AT LEEDS UNIVERSITY, ON 21 SEPTEMBER 2000 AT 1.30 p.m.

Present:

R Backready	V Karlin
F Biagioli	B Moss
D Bradley	A Perera
M Brown	B Pierce
A Burluka	M Pourkashanian
P Cadman	R Raine
R S Cant	C Santos
R M Davies	D B Smith
V Dupont	P J Stephenson
M Fairweather	K Syed
J F Griffiths (Chairman / Secretary)	A S Tomlin
K M Hughes	A Williams
S Ireland	R M Woolley
W P Jones	R Woolley
G T Kalghatgi (Treasurer)	

Apologies for absence were received from K N C Bray, A R Burgess, D D Drysdale, P Gray, A N Hayhurst, C J Lawn and C Morley. In the absence of the Chairman of the Section, the Secretary took the Chair.

1. Minutes of the AGM held on 14 September 1999

The Minutes were signed as a correct record.

2. Matters arising

There were no matters arising other than items on the Agenda.

3. Chairman's report

The Secretary, acting for the Chairman, thanked the group led by Dr David Smith for their sterling efforts in bringing the 28th Symposium so successfully to fruition. It is well recognised that proficient and sustained activity over a very long period was required in order to accomplish a task of such enormity and responsibility. In a similar way, the Section owes a considerable debt of gratitude to Professor Bradley for his work as UK Editor of Combustion and Flame. The stature of Combustion and Flame is very high indeed amongst scientific journals, and this reputation has been achieved only through the standards set by its Editors. Professor Bradley relinquished his role as UK Editor in August. He is succeeded by Professor Hayhurst.

At the Section level, thanks are due also to Professor Burgess for his willingness and ability to continue to produce a fine Newsletter. The most recent edition was issued while Professor Burgess was heavily involved with editorial duties of Symposium papers. It should be noted that the Newsletter is circulated not only to members but also to Chairmen of other Sections, officers of the Institute and a number of other organisations. The British Section maintains a high profile worldwide in this way.

Professor Bray is to resign as Chairman from October 2000. His successor is to be appointed at the next committee meeting. The Secretary expressed gratitude to Professor Bray on behalf of the Section for his loyal service as Chairman since 1992. The Secretary is also to relinquish the post as soon as a successor (or successors) can be appointed. An issue that has exercised the minds of committee members is that, while the nature of the secretarial duties have not changed, the demands on and commitments of individuals have increased considerably. Consequently, it seems prudent to divide the duties between general secretarial and membership matters, and for there to be two appointments made.

An intervention was made by Dr Smith at this point to express thanks to the current Secretary for his contributions to the operation of the Section.

4. Honorary Secretary's Report

Membership of the Section is a lower than that expected by this stage of the year, by approximately 30 people. There is some concern that it may be a reflection of the diminishing combustion community within the UK, and will be a matter of discussion by the Committee.

There was no Spring meeting during 2000 on account of the activity connected with organisation of the International Symposium. Also, there were already a number of other combustion or combustion-related meetings in the UK early in the year (UKELG, two-day, Fire and Explosion Seminar, IOP congress, IChemE Hazards).

Ten grants of £500 per person were awarded to presenters of papers at the 28th Symposium and six grants of £300 were awarded to student members so that they could attend the Symposium.

The Sugden Prize for 1999 was awarded to K H Luo for a paper entitled, "Combustion Effects on Turbulence in a Partially Premixed Supersonic Diffusion Flame", which was published in Combustion and Flame, vol. 119, pp.417 - 435

5. Honorary Treasurer's report

The Treasurer presented a statement of accounts audited at the end of 1999. The reduced balances reflected sums that had been paid in advance of the 28th Symposium but which had not yet been refunded. Ordinarily the accumulated funds would stand at approximately £70,000. In response to a question about the policy for retaining a balance of this magnitude, the Treasurer noted that the principle was that the operation of the Section should be financed out of income rather than capital. Registration fees alone did not cover the annual expenditure. Professor Moss made the point that, nevertheless, perhaps some of the reserves might be used to support secretarial needs, given the difficulties associated with the post.

A question about the viability of electronic methods of money transfer for payment of membership fees was raised. There are cost implications in most of the electronic methods which are beyond the scope of Section funds, but the Treasurer agreed that the Committee should keep this matter under review and devise a system if possible. The Section accounts were audited by Drs Davies and Sykes, who were thanked for their services.

6. Election of Committee members, 1999 - 2002

Professor Jones and Dr Fairweather had been nominated by the Chairman, and seconded by the Secretary, for election to a second, three-year term of office. No other nominations had been received from members, and so they were duly re-elected without a ballot being necessary. The Secretary expressed the hope that members would not feel inhibited from making nominations even if committee members were eligible for re-election.

7. Any other business

Dr Cadman asked if there had been progress towards a federation of European Sections of the Combustion Institute, as had been proposed at the Joint meeting in Nancy. There had been some discussion of this at the Institute Members meeting in Edinburgh. An update will be given in the next Newsletter

Professor Moss sought clarification on the mechanism of appointment of the Chairman of the Section. On learning that the rules stated that Officers of the Section are appointed by the Committee, he wondered if a more democratic process might be considered. It was pointed out that, normally, the professional bodies in the UK operate in this way rather than having a "presidential style" of election*. It was agreed that members' views might be aired through the Newsletter*.

The meeting closed at 2.05 pm.

John F Griffiths (23/9/00)

* **Footnote:** At a recent committee meeting this matter was discussed. It was felt that the the present method of electing officers was not out of line with most other British Institutions, but that members should be asked to express their views to the *Newsletter* editor or members of the committee.

.....

THE CLEANER COAL TECHNOLOGY R&D PROGRAMME

John Griffiths has received a letter from Mott MacDonald, who have been appointed by the Department of Trade and Industry to manage the Cleaner Coal Technology R&D Programme in the UK.

The first two calls for proposals for R&D projects have already been issued and this process is now well under way with a number of companies.

The third call was initiated in November 2000. More details are given on the DTI website:-

www.dti.gov.uk/ent/coal

Further information may be obtained from:-

Alan V Wooll, Project Manager
Mott MacDonald Ltd
Victory House , Trafalgar Place
Brighton BN1 4FY

BRITISH SECTION NEWS

Committee

At its September meeting, the Committee was very pleased to confirm Professor Chris Lawn as the Section Chairman to succeed Professor Ken Bray. Dr Alison Tomlin's offer to stand as Secretary from January 2001 was gratefully accepted. It had been agreed that the Secretary's duties would be divided, and that assistance to deal with membership matters would be provided. Dr Valerie Dupont has offered to take on this responsibility, and so her co-option to the Committee for that purpose was confirmed. Professor Griffiths' co-option was extended to 31 December 2000, so that he could continue as Secretary to that date. Professor Dougal Drysdale had been co-opted specifically in relation to the organisation of the 28th Symposium at Edinburgh. Thus Dougal's term of office in that capacity has now terminated, and he was thanked for his substantial contributions. Dr Mike Fairweather and Professor Bill Jones were returned as elected members, each for a further three-year term, their nominations at the AGM having been unopposed.

Finance

The Committee recognises that more convenient procedures for membership fee payment are desirable, and so a standing order procedure is to be set up at renewal for 2001. Members will still be able to pay registration fees by cheque if they so choose. The membership fees for 2001 will be maintained at their current amounts, which are £16 for full members or £8 for student and retired members.

AGM

In response to discussion that arose at the AGM, members may wish to note that the co-ordination of European Sections to create a closer federation is in the hands of Dr Iskander Gokalp, Chairman of the French Section. The Committee is to review procedures that are adopted for appointment of the Section Chairman.

Sugden Prize 1999

As reported in the minutes of the September AGM the Sugden prize for 1999 was awarded to K H Luo for his paper entitled "Combustion Effects on Turbulence in a Partially Premixed Supersonic Diffusion Flame", *Combustion and Flame*, 119:417-435 (1999).

Sugden Prize 2000

Papers eligible for the award of the Sugden Prize for 2000 are to be reviewed by a sub-committee under the direction of Professor Lawn. The sub-committee will consider, automatically, papers that were published in *Combustion and Flame*, *Proceedings of the Combustion Institute*, *Combustion Science and Technology* or *The Royal Society journals*. Members may submit to the Secretary for consideration in the first instance, papers that have a substantial combustion research content and were published in any other journal, if at least one author was a section member in the year 2000 and remains as a section member for 2001.

John Griffiths

TURBULENT FLAMES: MODELLING AND MEASUREMENTS

The Spring Meeting of the Combustion Institute (British Section) to be held at Imperial College, London on 26 April 2001

Speakers who have so far accepted invitations to present papers include:-

Dr Rob Barlow, Sandia Labs, USA
Professor Thierry Poinsot, Cerfacs, Toulouse
Professor Johannes Janicka, Darmstadt, Germany
Professor Peter Lindstedt, Imperial College
Dr Nondas Mastorakos, Cambridge University
Professor P Gaskell, University of Leeds
Dr James Kelman, Cranfield University

Further information on the meeting can be obtained from:-

Professor W P Jones	Tel: +44 (0)20 7594 7037/7033
Department of Mechanical Engineering	Fax: +44 (0)20 7581 5495
Imperial College of Science Technology & Medicine	e-mail: w.jones@ic.ac.uk
London SW7 2BX	web site: http://www.ic.ac.uk

THE INCINERATION OF WASTE MATERIALS

The Autumn Meeting of the Combustion Institute (British Section) to be held at the University of Cambridge on 13 September 2001

The autumn meeting of The Combustion Institute (British Section) will be held, together with the Annual General Meeting, on Thursday 13 September 2001 at the Department of Chemical Engineering, University of Cambridge, Pembroke Street, Cambridge CB2 3RA.

The programme of talks is currently being organised, but will include the incineration of a wide variety of waste materials, including biomass, sewage sludge, domestic garbage, polymers, etc, including co-firing with coal. Different types of combustor and gasifier will be discussed, as also will the pollution from them and the associated combustion problems.....

The talks will normally last for 30 minutes (approx. 20 + 10 min for discussion). In addition, there will be the opportunity to give a brief talk lasting 5 minutes. If you would like to speak or learn of further details, contact the organiser:-

Professor Allan Hayhurst,	Tel: (01223) 334790
Department of Chemical Engineering,	Fax: (01223) 334796
Cambridge University,	E-mail: allan_hayhurst@cheng.cam.ac.uk
Pembroke Street,	
Cambridge CB2 3RA.	

COMBUSTION CHEMISTRY: ELEMENTARY REACTIONS TO MACROSCOPIC PROCESSES

Faraday Discussion number 119 to be held at the University of Leeds
on 9 - 11 July 2001

Programme

Chemical Kinetics has played a central role in experiment and theory in the development of our understanding of combustion, at the same time deriving focus and impetus from such a key area of application. The last few years have seen major advances in our understanding of both elementary and complex reactions and in applying realistic techniques to probe chemistry in combustion systems. The Discussion will draw on the interplay between these developments, and new and unpublished work will be presented in the following areas:

- Kinetics and dynamics of elementary reactions of importance in combustion and especially the combination of experiment and theory in the characterisation of key elementary reactions
- Modelling of combustion processes. The dynamics of complex chemical reactions and approaches to incorporating realistic chemistry in combustion models.
- Diagnostic (especially laser) techniques applied to real combustion systems especially in the evaluation of models

An introductory lecture will be given by Jürgen Wolfram (Heidleberg) and concluding remarks will be by Jim Miller (Sandia). Papers from distinguished workers from many countries, including Australia, France, Germany, Israel, Taiwan and the USA, are on the programme.

Date and Location

The Discussion will be held from 9 - 11 July 2001 at the University of Leeds, UK. The sessions will begin after lunch on Monday 9 July and will end at lunchtime on Wednesday 11 July. The scientific sessions will be held in the School of Chemistry and accommodation will be available in Devonshire Hall.

Preprints

Preprints will be issued four weeks in advance of the meeting. The Discussion will be conducted on the assumption that the papers have been read in advance and only five minutes will be allowed for presentation. Most of the time will be devoted to discussion, which will be recorded and then submitted for publication. The proceedings will be published by the Society about six months after the conference.

Further Information

All enquiries concerning attendance at the Discussion should be addressed to:

Miss Christine Hall, Ref: FD 119, Conferences and Awards, Royal Society of Chemistry, Burlington House, Piccadilly, London W1J 0BA UK

Tel: +44 (0)20 7437 8656
e-mail: conferences@rsc.org

Fax: +44 (0)20 7734 1227
Web: www.rsc.org/lap/confs/faradischeme.htm

EDINBURGH 2000

In the next issue of the *Newsletter* I am hoping to have some contributions from readers who attended the 28th International Symposium on Combustion on the meeting. This was the first Symposium to be held in Britain since Leeds in 1978. I am inviting any reader to write, at any length, on their experiences, whether trivial and humourous or serious and scientific. I am hoping particularly that the British Section recipients of travel grants, listed below, will offer short articles.

John Griffiths has written of some of his experiences at past meetings in the next article in this *Newsletter*; one day I may try to recall my own. My first meeting was as a student at the Oxford/London Symposium in 1958. I was given £10 to cover all my expenses in Oxford during the meeting! The other British meeting was in 1964 in Cambridge. But I digress!

David Smith, in the last *Newsletter*, wrote about the trials and tribulations of a Symposium organiser: He has provided me with some statistics and thoughts about Edinburgh 2000 which may interest readers. The total number of registrations was 1160, very slightly less than at Naples and Boulder, including 305 (26%) students, again much in line with previous Symposia, and 329 Accompanying guests. This last figure is about same as Naples but significantly higher than at Boulder. Does a non-US venue present vacation opportunities, especially for accompanying guest numbers from US?

Thirty-seven countries were represented (details in table below), making it a truly international meeting. The use of web sites continues to increase with each recent Symposium. We had a dedicated web site giving details of the technical program, travel news, etc. with a link to another site with registration details and forms. The large majority of delegates registered electronically.

The tradition of the Combustion Symposium is to separate the organization of the technical program from the local arrangements, though with close liaison between the two. The former was done by Sebastien Candel and Jim Driscoll; local arrangements were planned by a small committee:

Area of responsibility

David Smith	Chair and link with Pittsburgh office
Chris Lawn	Facilities for technical program
Chris Morley	Finances
Stewart Cant	Accommodation and ancillary services
Phil Gaskell	Social programme
Dougal Drysdale	Edinburgh contact

The fact that Dougal was the "local" contact arose because, unlike previous Combustion Symposia, Edinburgh did not have a body of combustion people based at the host institution. It was therefore imperative that we employed firm of professional conference organizers. We chose Clansman Monarch, who were deeply involved in all aspects of the local arrangements.

Highlights of the social programme were an excellent concert of choral and organ music in St. Giles Cathedral and the banquet at the newly-opened "Dynamic Earth" exhibition. The accompanying guests, and not a few who should have been at the sessions, visited many parts of the region including Culross, the Palace of Scone, Sterling Castle and a whisky distillery.

Countries represented

Argentina	1	Germany	148	Norway	2
Australia	21	Greece	5	Poland	15
Austria	2	Hungary	5	Portugal	9
Belarus	1	India	2	Romania	1
Belgium	10	Ireland	5	Russia	5
Brazil	1	Iran	1	Spain	9
Canada	22	Israel	19	Sweden	36
Chile	1	Italy	31	Switzerland	7
China	6	Japan	123	Taiwan	6
Denmark	10	Korea	24	Turkey	1
Egypt	1	Mexico	2	UK	122
Finland	18	Netherlands	26	USA	388
France	74				

Financial support to members to attend the 28th Symposium

John Griffiths, in his “retrospective” article refers to the support given to members of the Section to enable them to attend the International Symposia and other selected meetings. A number of members benefited from these grants to help them travel to Edinburgh. The list, printed below, was not available in time to be published in the last *Newsletter* but may still serve as encouragement to members to submit papers to the next Symposium. It may also encourage non-members to join the Section!

£500 each as authors of accepted refereed papers

Dr M Kraft (Cambridge)
Professor C J Lawn (London, QMWC)
Professor P Lindstedt (London, IC)
Professor F Lockwood (London, IC)
Dr K Luo (London, QMWC)
Professor A C McIntosh (Leeds)
Professor M J Pilling (Leeds)
Dr G Skevis (London, IC / Athens)
Professor A Williams (Leeds)
Dr R Woolley (Leeds)

£300 each to student members

Mr R Backready (Leeds)
Mr C Burgess (London, QMWC)
Mr D R Chadeesingh (Cambridge)
Mr P Fennell (Cambridge)
Mr S Santos (Portsmouth)
Ms L Rubino (London, IC)

Tony Burgess

THIRTY YEARS OF SYMPOSIA

or

recollections of an ageing academic

Preface

Here we are approaching the end of 2000 and I am just recuperating from a severe neck problem, undoubtedly as a result of too many hours in the wrong sitting position at a computer. Save only for the publication of Proc. Comb. Inst. 28: 2000 (I know Tony Burgess and Jay Gore will have completed their onerous editorial task by now), "Edinburgh 2000" is gracefully fading into the records as the latest of the distinguished history of Combustion Symposia. So what better time and opportunity might there be for some personal reminiscences of the Combustion Symposium series? Perhaps rather appropriately I have started this article using a Macintosh SE (circa 1989) which has served me faithfully through six of the Symposia, and what a little gem it is! Of course my WORD 2000-fuelled monster in the department is much cleverer. But for screen clarity and user friendliness there is no contest - and dare I hope that I will avoid another case of GBH on my neck!

My association with the Combustion Institute and the Symposia began in 1968 (the Twelfth Symposium) when I was one of a group of about 15 from Leeds who made the pilgrimage to Poitiers. These were before the days of readily accessible cheap travel, but we were able to negotiate a group package with BEA (British European Airways) from Heathrow to Orly Airport, Paris. Charles de Gaulle Airport did not exist, but the President did. This really is history! I still have in everyday use the commemoration letter opener from the Poitiers meeting, albeit without its point - which lost a fight with a filing cabinet drawer some years ago. A truly interactive involvement in the Symposia began at the Thirteenth Symposium in Salt Lake City (1970) and I have had more than my share of good fortune in the paper submission lottery, having had presentations and publications in every one of the Symposia since that date. The registration fee for the Twelfth Symposium was \$25, and it is a credit to the Institute and successive organising groups that registration has remained well within inflation (approximating to \$360, at Edinburgh) if I take academic starting salaries as a guide. This is the background, but as my thoughts have unfolded I have taken a liberty of tracing further back through the annals of the Symposia.

Places

All regular Symposium registrants have had the pleasure of travelling the world in the cause of combustion. Though, with the exception of the Seventh and Tenth Symposia, prior to the Twelfth Symposium all journeys would have been to the United States. The Seventh Symposium was held in London *and* Oxford (Think of the logistics of that, David Smith, even if it was a much smaller meeting than the Twenty-Eighth Symposium!). I quote here the preface to the Proceedings; "On the 29th of August the Symposium adjourned to Oxford. A special train, drawn by one of the new gas-turbine locomotives, was provided by British Railways to transport the participants". In these troubled times for public transport in the UK, perhaps British Section members readers may not know whether to laugh or cry. (Overseas readers may not appreciate that for a period of over three months recently public transport by rail was virtually brought to its knees in the UK subsequent to a tragic accident arising from a rail breakage. Following extensive surveys, a programme of rail replacement was commissioned throughout the network - disrupting services to an almost unimaginable extent). With the exception of Orleans and Sydney (Twenty-Third and Twenty-Fourth), which were sequential, from the Fourteenth

Symposium the meetings have alternated between North America and “the rest of the world”.

Programmes

As is commonly the case, the earliest experiences tend to be the most memorable, but my initial involvement really did coincide with some milestones. Air pollution hit the streets - as it were - and we were exposed to the seminal work of Starkman and Newhall on emissions from spark ignition engines, from which emerged the classic diagram relating emissions to the fuel / air mixture. “Prompt NO” was identified by Fenimore at the Thirteenth Symposium. Later highlights also come instantly to mind though. I recall being mesmerised by Bronfin’s invited talk on continuous chemical lasers at the 15th Symposium in Tokyo. Save for anemometry and ignition, prior to that any discussion involving lasers had been concerned with their mode of operation. By the Eighteenth Symposium (1980), the session introduced at preceding meetings as “Measurement Techniques” had become more fashionable as “Combustion Diagnostics”, and lasers were “de rigueur” (see Eckbreth, “Recent advances in ...” Proc. Comb. Inst. 18: 1471 - 1477 (1981)). Detailed kinetic modelling by numerical methods made appearances quite early on (<1970) essentially in connection with flames and shock tubes, but this approach took off in a big way at the Eighteenth Symposium when Jürgen Warnatz and, independently, Charlie Westbrook and co-workers reported their first (of many) significant contributions.

The earliest Symposia (1 - 5) were opened with a series of reviews summarising progress in selected topics, up to ten in number. Thereafter and until the Sixteenth Symposium there was only a smattering of review papers in the programme. Even these disappeared briefly thereafter, but were then re-introduced at the Nineteenth Symposium formally as “invited reviews” - well just one, to be precise, on coal char combustion, which was presented in Haifa by Ian Smith. Since then the invited reviews have proliferated, to become important and valuable components of the present day Symposia.

I usually suggest to students who attend my final year combustion chemistry course that they should browse the indexes of the Symposia Proceedings to get a perspective of changing interests and activities in combustion research over the last half century or so. I doubt if any take the trouble to do so, but I believe that they are missing a most interesting record of the developments. Flame stability and structure and also gas kinetics have always been a mainstay. Similarly, explosives, propellants and detonation have maintained a presence to this day. But one can see how the programme has become much more directed, and also how it has diversified. There has been an increasing preoccupation with emissions and pollution, and these aspects appear to have influenced the design of the programme. For example, soot formation, which is among the longest standing, fundamental topics, has tended to be integrated into “pollution” alongside PAH formation and toxic emissions. A spark of interest amongst students is initiated by fullerenes and diamond formation in flames. (Antonio D’Alessio, why did you not publish your delightful review “Smoke, diamonds and stardust”, presented at the Twenty-Fifth Symposium?). The synthesis of new materials is also one of the most exciting modern topics, as is the attention to new technologies such as catalytic combustion and porous media. Combustion in microgravity has had a place from early days. Though formerly confined to drop-towers, the development of KC-135 and other parabolic flight programmes, the SOFBALL mission and the promise of ISS combustion projects has caused this area to blossom. These are just a few observations. Perhaps the evolution is not fully illustrated, but I summarise below the session titles from the Sixth, Sixteenth and Twenty-Sixth Symposia to give a wider perspective. Approximate numbers of papers are given in brackets.

Sixth Symposium (1956)

laminar flames (37)
turbulent flames (6)
high speed reactions (8)
flames stabilised in fast streams (8)
instability in combustion chambers (4)
ignition (5)
droplets and sprays (9)
solid fuels (8)
explosives and solid propellants (11)
experimental and analytical techniques (10)
applications of combustion (20)

Twenty-Sixth Symposium (1996)

non-premixed turbulent combustion (24)
premixed turbulent combustion (28)
laminar premixed flames (25)
laminar diffusion flames (16)
microgravity combustion (21)
spray combustion (16)
catalytic combustion (7)
materials synthesis (11)
metals combustion (8)
propellants (9)
fire safety (20)
chemical flame inhibition (6)
elementary reaction kinetics (14)
kinetic mechanisms: modelling and expt. (29)

Sixteenth Symposium (1976)

flame structure and chemistry (11)
turbulent flames and combustion (13)
high output combustion systems (6)
technology in power systems (37)
energy production from coal (14)
ignition, optical and electrical properties (7)
droplets and sprays (9)
soot formation and growth (8)
propellant ignition and combustion (9)
fire and explosion (17)
elementary reaction kinetics (20)
mathematical modelling (5)

NO_x formation and control (24)
soot formation and destruction (17)
other pollutants (8)
incineration (6)
diesel engines (8)
spark ignition engines (18)
gas turbines (10)
active combustion control (9)
high speed combustion (11)
detonation (9)
coal and char combustion (20)
fluidised beds (12)
porous media, fixed beds and furnaces (7)

Presentations

In my early days there were three parallel sessions, which has burgeoned to six. The Twenty-Fifth also saw the inclusion of poster presentations for refereed papers. There is no doubt in my mind of the benefits of these presentations for their self-selective nature as a medium for intimate discussion between interested participants. They also give the poster presenter a quite different perspective of the overall meeting insofar that one suffers none of the stress that precedes an oral presentation. One downside is the restricted opportunity to view simultaneously displayed posters. There are also other disadvantages. The practicality of the display area has to be acknowledged as one potential problem and the failure to attract published discussion comments is another. However, my major concern is that, other than authors intentionally selecting "poster presentation" (which has proved to be remarkably few), there seems to be little rationale for which papers are selected to be "refereed posters". As a reviewer I have remarked on papers that are worthy of presentation but, in my view, were far more appropriate for poster rather than oral presentations. Colloquium organisers have yet to heed these observations! I also have a personal gripe - which is that I have been consigned to the poster sessions in each meeting since their inception, which is only partly by choice. It would be nice to have a change!

Concerning oral presentations, I wonder if there is an optimum presentation slot? I have experienced various times throughout the week. Nobody seems to like Friday pm very much, perhaps because we are all “shell-shocked” by then. Five days of conference certainly drains the energy. I can vouch from experience that the other extreme, ie immediately following the plenary session on Monday, is also far from ideal. Perhaps the problem is that the atmosphere of the meeting takes a little while to develop, so this slot has a vacuous feel. Tuesday seems to me to be a nice day for oral presentation, because there is still plenty to enjoy with a more relaxed frame of mind – both academically and socially.

Anyone who has made submissions will, almost certainly, have suffered disappointments as far as paper acceptance is concerned and occasionally, as I am fortunate to be able to acknowledge, a “pleasant surprise”. Clearly, whatever the procedure adopted for successive conferences, the selection is done in good faith. However, one point that I would raise concerning paper acceptance, and even in relation to the subdivision between poster and oral presentation, is to what extent there is any effort to distinguish “exciting”, “novel”, “cutting edge” (or any other similar description of one’s choosing) from “good science on a well trodden path” or even “worthy but dull” when it comes to taking valuable time-slots in the programme. Not a lot, I would say, yet in my view these aspects should be considered as a major element in planning the programme. The relevance of a few kinetics papers also appears to be marginal.

The astonishing level of participation and success of the work-in-progress posters (WIPP) is a reflection of how the community relishes an up-to-the minute exposure of combustion research. The first appearance of WIPP was at the Twenty-Fourth Symposium, I think, and I suspect that initially they served as a vehicle to enable delegates with rejected papers to establish a case for financial support as a “contributor”. Whatever the original intent, many would agree that the WIPP are now established as a most important and enjoyable component of the Symposia. At Boulder and at Edinburgh there were far more WIPP presentations than formal papers and posters.

Publications

With the growth in the number of contributed papers, the Twenty-Fifth Symposium became a watershed, at which two volumes of Combustion and Flame were taken up with Symposium papers and also, temporarily it transpired, the discussion comments were not published in the Proceedings. The Combustion and Flame experiment was probably not entirely successful, certainly insofar that the short Symposium manuscripts did not fit well with the more expansive development of papers normally published in the Institute journal. I presume also that the Editors of Combustion and Flame must have had a most difficult task with regard to incompatibilities of or lack of control over refereeing - a feature that is one of the great strengths of that prestigious journal. Whatever the outcome, the Twenty-Sixth to Twenty-Eighth Symposia have been (or will be) presented as a two volume set, and the CD is now an accompaniment.

The Institute President’s success in attaining “citation status” for the Symposia Proceedings is a tremendous achievement, and will be of professional benefit to a number of combustion scientists. I have been fortunate that, when it has been necessary, good friends have rallied to my support by vouching for the status of Symposium papers in my publications list as refereed contributions - but others may not have been so well placed. Incidentally, how many people noticed the shift of formal publication date, between the Twentieth and Twenty-First Symposia, from the year of actual publication to the year of presentation? Has anyone else tried (and succeeded) to get a cartoon through the Editors of the Proceedings (see Proc. Comb. Inst. 24:1777 (1992))? Forman Williams

included the “punishment of Prometheus” in the text of his plenary lecture, also at the Twenty-Fourth Symposium. Curiously, the Twelfth Symposium Proceedings do not include a plenary lecture.

People

So many friendships have been established through the Symposia, even though many of these associations are confined to the meetings themselves, there being hardly any or no contact in the intervening periods. It is not an exaggeration to note this to be the case even with colleagues in Leeds! After so many years of the pleasure of “seeing familiar faces again”, one of the striking features at Edinburgh was just how many “unfamiliar faces” were there also. This bodes well for the combustion community, showing that it has not stagnated and that many new people are coming into the field.

As if confirmation were necessary, Chris Priddin and I, as organisers of WIPP for Edinburgh, learned just how nice a bunch combustion people are. Members who submitted posters will know that we were in some difficulty by having received an excess of submissions. It seemed inappropriate for us to decide what to accept or reject, so we sent out appeals to authors of multiple submissions to ask if they might be willing to either amalgamate or withdraw posters. We had a spontaneous and truly magnanimous response from the community and we were able to achieve the target with no need for supplementary pressure. I wonder how many other groups would act so unselfishly?

The opportunity to attend the Symposia cannot be fulfilled if funding is not forthcoming. Support through research grants had become more liberal and I suppose that my ability to generate such funds has improved over the years. In the early days the situation was very different, and I appreciate very much that Leeds University provided support when it was sought. The British Section Committee has always been very generous, never failing to offer a travel grant, and even though I have not always needed to take it up I am most grateful for that. However, my continued involvement with the Combustion Symposia would not have come about but for the collaboration with a considerable number of co-workers. Most of the links have been established through work at Leeds but I have also had the privilege and pleasure of a number of very rewarding associations with colleagues world-wide that have culminated in Symposium contributions.

John Griffiths

SECOND INTERNATIONAL DISPOSAL CONFERENCE

held on 9 – 10 November 2000
in Linköping, Sweden

(and including a visit to the CHP plant at Gärstad)

The Swedish Section for Detonics and Combustion held the second conference of this series in the charming setting of the old chapel at Gamla Linköping. Linköping was a comparatively small town until about 60 years ago, at which time SAAB decided to establish its main facilities there. This necessitated rapid expansion with an attendant change in character. As a means of preservation of the earliest heritage, the community decided that the very oldest part of the town should be relocated. So now Gamla Linköping stands as a living, open air museum, in a wooded area at what has become the edge of the modern city of Linköping. However, this does not signify that the new city is a sprawling, characterless complex. On the contrary, there is still substantial history in the centre, and the development resulting from the influence of SAAB has been sensitively integrated into earlier developments.

There were more than 40 registrants for the meeting, mainly from Scandinavia, but also with US and UK representation. Twenty presentations were incorporated in the programme and, in addition, there was a “study visit” to the combined heat and power plant at Gärstad, just outside Linköping. Concerning the conference itself, there was a wide spectrum of interest, ranging from technological developments for grate furnace monitoring and emission control strategies, through combustion hazards connected with waste and landfill, to environmental and other risks associated with the destruction of munitions or similar hazardous materials. As is all too familiar, part of the issue for munitions is that they have to be located before they can be destroyed. A conference session was concerned with detection of buried explosives. Pollution in disused industrial or other sites and the means of ensuring environmental safety for redevelopment proved to be a topic of interest, and industrial risk assessment itself was also discussed - one important message being that to assess risk, first one has to understand the hazard. An initiative that addresses just this aspect on an industry-wide basis is an integrated programme to educate “explosives technologists”, that has been established by Nammo Sweden AB. This is an imaginative approach to further education, and creation of a culture of awareness amongst staff at all levels of the organisation, without any constraints set by age or educational background. There is a largely self-teaching element on an individual and group basis, with exploitation of the latest IT facilities for access to more structured teaching or specific expertise.

One of the consequences of the changed political climate amongst the super-powers is that there is an enormous surplus of munitions world-wide. (I am at risk of getting it wrong, but I think that 500k tonnes in the US is not too far out.) Controlled disposal is difficult and dangerous in any event, but these issues have been exacerbated by unconfined destruction no longer being acceptable for environmental reasons. The US services are tackling the problems with serious intent, one strategy of which is re-cycle of explosives. Much of the content of shells can be re-used as lower grade commercial explosives, but the technology of decommissioning in a safe manner is not trivial. On a related aspect of emissions, we in the UK will be easily reminded of how “thick” the air becomes during the evenings around 5 November as a result of numerous firework displays. In 1998, Hansson Pyrotechnic AB were commissioned to measure the emissions of toxic materials from typical displays of fireworks (such as arsenic, cadmium and mercury), with a view to assessing the contributions to the overall environmental pollution. The figures make

interesting reading, and will be available in the proceedings of the meeting in due course. However, the main conclusion was that the contribution is insignificant.

Turning to Gärstad CHP plant, district heating was first distributed to consumers in Linköping in 1954. But with the growth of the city demand outstripped the supply, so the Gärstad plant was commissioned, in 1964, with heat and power being generated by oil-fired boilers. However, increasing oil costs of the 1970s focused minds on a change of fuel to waste materials. Today the Gärstad plant uses about 95% household waste, with supplement of wood waste to “homogenise” the fuel supply to the furnaces to maintain combustion temperatures at their optimum.

Conventional grate furnaces are used, but there is rigorous attention to emission control. This is all conventional technology, with filters, scrubbers and flue gas condensation equipment. The latter adds 15 MW to the district heating facility, raising its total output to 100 MW. The water temperature at supply source is 115°C and it returns at 50°C. Electricity generation by steam turbine amounts to 25 MW, and this is supplemented by a gas turbine to raise the total generation capacity to 50 MW at peak periods. There is another power generation plant locally, and there are exchanges with the national grid. Hydro-power features also in the overall scheme.

The total efficiency of the Gärstad plant is as high as 95%, and the cost savings by burning waste are equivalent to about 70,000 tonnes of oil. The plant consumes nearly 250k tonnes of domestic waste per annum, which is collected from a large number of communities in Southern Sweden (approximately 600k inhabitants), which requires a strong community spirit to undertake self-sorting of waste at collection points. There are incentives / financial penalties for not operating within the scheme, but I fear that the culture within the UK is just not up to this sort of discipline whatever the penalty. The evidence is that most of the waste that goes to the incinerator is biological in origin, which means that “greenhouse gas” emissions are part of the natural cycle. The difficulties of landfill are not eliminated entirely, because about 1/5 of this waste remains as ash, but it is a considerable reduction nevertheless. The additional problem of toxic waste, retrieved from the filter systems, requires special disposal measures to be adopted. Increasingly stringent controls of flue gas emissions have led to reductions of dioxins and of heavy metals to below 10% of their pre-1990 concentrations. Acid emissions have been reduced to a similar extent over a twenty-year period. Selective catalytic reduction (SCR) by NH₃ injection within a V₂O₅-containing matrix is used to reduce NO_x emissions, with a consequent decrease from about 400 mg MJ⁻¹ to 10 mg MJ⁻¹.

The enjoyment of this meeting was epitomised in the delightful evening at Mjellerumsgården, at Gamla Linköping, for the conference dinner at which traditional local dishes were served, and it was crowned by the natural hospitality and charm of the Swedish hosts. I heartily recommend that an eye is kept on the “combustion calendar” so that contributions can be prepared in good time for the next meeting of the series. It is not to be missed by anyone interested in matters concerned with personal safety and environmental issues of destruction, especially where deflagration and detonation are involved.

John Griffiths

COMBUSTION MODELLING AND VERIFICATION

A report on the two-day autumn meeting of the Combustion Institute (British Section) and the Combustion Physics Group of the Institute of Physics held at the University of Leeds on 20-21 September 2000

The format of this two-day meeting was a departure from the normal arrangements and it appears to have been successful. Fifty-five registrants attended, with approximately 45 being present on each day. The British Section and the Combustion Physics Group both took the opportunity to hold their AGMs at the meeting.

I first heard about this meeting from Barrie Moss, when he asked if another meeting would clash with it. When I showed ignorance of this meeting, he was surprised as my name was given as one of the presenters on the published details! It turned out that I'd been volunteered by someone who shall remain nameless whilst I was on holiday, and this information had not been passed on. I feel the need to recount this tale, since the same person has also volunteered me to write this, and I want to ensure that any blame associated with either this or my presentation is appropriately allocated.

The meeting itself was interesting, with presentations and discussions covering a wide range of topics. Indeed there was some debate about the title of the meeting itself; why was 'Verification' chosen rather than 'Validation'? Is the CFD community 'verifying' or 'validating' their codes? For those who were not present, my dictionary defines verify as 'establish truth or correctness of by examination or demonstration' and validate as 'make valid (sound defensible, well-grounded) ratify, confirm; make your own mind up.

Aside from discussion about such contentious issues the technical content was broad and stimulating, ranging from fires in rooms to furnaces, and from IC engines to GT combustors. It was good to see how other areas dealt with common problems, and such cross-fertilisation is the main reason why such meetings are a useful investment of time. It's a pity how such considerations are often overridden by financial considerations by those within industry. It was also salutary to learn that the problems faced by those in other industries are much greater than those involved in modelling GT combustors. Modelling a GT fuel injector is trivial in comparison to the problems in defining boundary conditions for a coal-fired furnace, and kerosene is a well defined fuel in comparison to the different substances that burn in room fires and fire spread calculations.

A number common themes were apparent from all the presentations, which I believe are worth highlighting. Firstly, the quality of predictions is highly dependent on the quality of the boundary conditions and this is something the community as a whole should be striving to improve. Next, the validation of models within industrial relevant geometries is dependent on the availability of suitable measurements and this is an area that needs significantly more funding. Finally, and perhaps most importantly, CFD as applied to combustion problems is far from a black box process and requires knowledge and understanding of the underlying models and the physical processes involved. Without critical analysis of the results, it is possible to believe physically impossible results and make incorrect engineering decisions. This is something that the community as a whole should be publicising, especially given the ready availability of commercial CFD codes.

Personally, aside from the usefulness of exposure to broader combustion modelling issues, one of the key benefits of the meeting were the discussions during lunch and coffee breaks. Indeed, discussions with Phil Cadman have lead to the application of his soot oxidation constants to GT combustors, which has given some interesting results.

These could lead in the long run to improved quantitative predictions, but in the short term is certainly improving the understanding of the phenomena involved.

All in all a useful way to spend 2 days.

**Helen Brocklehurst
Combustion Systems, Rolls-Royce**

BOOK REVIEW

The Principles of Thermal Sciences and their Application to Engineering

J C Jones

Published (2000) by Whittles Publishing, Caithness, Scotland

ISBN 0-8493-0921-2

Paperback, 152 pp, £16.95

Thermodynamics was a subject which I never really grasped as an undergraduate. The lecturer was probably brilliant, but did not convey that to his audience; and the textbook was not much use either. I have struggled with the subject ever since and have even had to teach it (in a better way than how I was taught it I hope). In both rôles as teacher and student I could have done with a book like this. There is no mysticism about Clifford Jones' approach to the subject, perhaps because he avoids the philosophic treatment often adopted in earlier texts. This is a straightforward way of tackling the subject.

The claim of the author is that the book is an interdisciplinary approach to thermodynamics for chemists, chemical and mechanical engineers, fuel technologists and fire scientists. This is achieved, but at the expense of detail and background. To compensate, and this is a very short book to attempt to cover such a large subject, extensive references to the literature and the world-wide-web are made. It is certainly a good starting point for a study of the subject. A much more detailed approach might have been desirable, but this would have meant at least doubling the size of the book and its price, thus defeating the declared aims of the author.

The book starts with chapters on the first and second laws of thermodynamics from both a chemical and engineering point of view. Then comes a chapter on processes involving steam and thermodynamic cycles (Carnot, Rankine, refrigeration, Otto and Diesel). Heat transfer by convection, conduction and radiation are the subjects of the following three chapters. A final chapter on an introduction to statistical thermodynamics concludes this integrated approach to thermal science.

The author has used his experience and background in combustion-related topics to provide realistic and interesting illustrations of the use of the science. There are numerical problems at the end of each chapter and worked examples throughout.

This could not be the only text on the subject which an undergraduate scientist or engineer would need, not even in their first year. However, as an introduction, and perhaps as a background to help master a more detailed text, this book can be recommended. It is one I should have liked to have had on my shelf earlier in my career. It could also be useful on the desks of engineers who have not attended university courses on the subject, but who are now involved with some aspects of thermal sciences in their everyday working life.

ALL CHANGE

Are not we all becoming a little weary of burning the same old fuels: carbon, hydrogen and their various chemical compounds? That is not to say that everything that is worth knowing about them we now know, even after 28 International Symposia. Far from it, otherwise combustion research laboratories all around the world would be going out of business as a result. Some are, of course, but for other reasons such as unfortunate financial ones.

For those who are much more than a little weary, help is at hand: a new fuel. Phosphorus. John Emsley has recently written a book in popular science style with the arresting title of "The Shocking History of Phosphorus, a Biography of the Devil's Element" [1]. The style and content are perhaps not as lurid as the sub-title would infer, but they are accessible to scientists and engineers, other than chemists, and indeed to a much wider readership. The book is obviously aimed at the Public Understanding of Science (PUS). There ought to be more books like this, extending to the Public Understanding of Scientists (PUSS). There is much purring with pleasure when scientists are fed with a creamy research contract. After all, they do spend a lot of time pawing a mouse.

But back to phosphorus. It was the 13th chemical element to be isolated, alas no prize is offered in these *Newsletters* for naming the first 12, and was discovered accidentally in 1669 by the alchemist Brandt in Hamburg, Germany. He was attempting to manufacture gold, oblivious to the fact that if he were successful the price of gold would plummet. His starting material was urine (thought to be a magic fluid), which he evaporated in a retort to a solid lump, which he then put into a furnace. On attaining red heat the retort filled with vapours and a shining liquid dripped out which ignited. It was white phosphorus.

To his amazement the liquid when caught in a bottle, solidified and emitted a pale green light even after the bottle was stoppered. Glowing continued for many hours, in fact until all the oxygen in the bottle had reacted, but he did not know this. News of the discovery of phosphorus spread; it became a curiosity amongst high society who had the wealth to promote its supply. Further research showed that it could be manufactured from more concentrated materials than urine: for instance bones and some rocks. In fact phosphates are commonplace. What happens is that at a sufficiently high temperature phosphate will react with carbon to yield phosphorus, carbon monoxide, and ash. The book does not dwell in detail with the chemistry of phosphorus, its various forms, and the various modes of combustion which could be a challenge to readers of this *Newsletter*.

Firstly the glow. This is a cool flame, involving combustion in the vapour phase. It is a chain reaction, ultimately leading to the formation of the oxide (P_4O_{10}), which can be suppressed by too much or too little oxygen, or by traces of poisons. The glow is caused by chemiluminescence, not by incandescence, but it is exothermic. Detailed study led to the theory of branching chain reactions by Semenov - one of the great combustion men of the 20th century. If left to itself white phosphorus will spontaneously ignite at about room temperature, and melting at 44°C . The product of combustion is the oxide, which is a solid, and reacts thirstily with water.

Phosphorus can burn in the conventional way, with incandescence. Obviously, white phosphorus will melt, vaporise, and burn as a flammable liquid. The heat release can be compared with that of burning hydrogen and carbon by calculating that per mole of oxygen consumed. The numbers are:

Oxide	Heat release per mole of oxygen (kJ)
H ₂ O	484
CO ₂	394
P ₄ O ₁₀	597

So the heat release should be treated with respect, as should white phosphorus generally. It is very toxic, by inhalation or swallowing, and the vapour attacks the eyes. For safety it is usually stored under water.

To add to the complications, there is another common form of phosphorus: the red variety, an allotrope. This is less reactive, does not melt, but vaporises at 416°C. There is no glow, but red phosphorus will also burn with an incandescent flame. Like that from the white variety the vapour consists of P₄ molecules. The difference between white and red is that the former, in the solid state, also consists of P₄ molecules whereas the latter is a polymer of them. The two varieties can be interchanged by thermal processing.

Can these subtleties of combustion be computer modelled? Only if there is enough experimental data to input. Even then the chemiluminescent flame would be a major challenge. An immediate start is needed if a paper is to be submitted to the 29th International Symposium. Remember that Hofstadter's Law governs the writing of a paper, report, or thesis. The Law states: "It takes longer than you expect, even when you take Hofstadter's Law into account".

Failure to observe the Law arises from having so little time with so much to do. The consequences became clear to those who innocently allowed themselves to be inveigled into becoming Members of the Editorial Committee for the 28th Symposium. After the vetting was all over, and deadlines met, "The Times" [2] published guidelines for aspiring writers which would have been a great help to some authors if publication in the newspaper had been six months earlier. Guidelines of particular interest were:

- Verbs has to agree with their subjects.
- Prepositions are not words to end sentences with.
- It is wrong to ever split an infinitive.
- Always avoid annoying alliteration.
- Parenthetical remarks (however relevant) are (usually) unnecessary.
- Eliminate commas, that are not necessary.
- Use the apostrophe in it's proper place and omit it when its not needed.
- Proofread carefully to see if you any words out.

Now go back to the beginning of this article, and pick holes in it.

Then get ready to write that abstract and paper for the 29th Symposium. If there is still so little time, with so much to do, regard it as a challenge rather than an excuse. Mark Twain was once asked how he managed to meet deadlines for newspaper articles. He replied: "It's simple. I apply seat of pants to seat of chair."

Having drafted the paper there could be time left to have another look at Emsley's book. There can be few combustion researchers who have not had the occasional need for a

box of matches. He devotes three chapters to the match industry, which really escalated from when white phosphorus was introduced to match heads. It was not used as the fuel for the head, because it would oxidise away, but as the initiator of the flame. The glue which held the components of the head together protected the phosphorus. As white phosphorus is toxic, it was eventually replaced by a sulphide of phosphorus for the 'strike anywhere' matches. The motivation for the change was the appalling injuries suffered by the match girls in the factories and as home workers, because of totally inadequate industrial hygiene. The next step was the putting of red phosphorus, mixed with powdered glass, on the side of the matchbox instead of in the match head. This product is the safety match, and is far less likely to ignite accidentally. Very sensible because billions of matches are manufactured annually. Another safety measure is the treatment of each matchstick with ammonium phosphate to prevent afterglow when the flame has been extinguished. Matchsticks are not made from any old wood; aspen and poplar are preferred. There is a lot of technology in just one match.

Finally, literally, Emsley deals with spontaneous human combustion. But that is another story.

Ken Palmer

References

1. Emsley, J. *The Shocking History of Phosphorus*. Macmillan. London, 2000.
2. *The Times*. London. 17 June 2000.

COMBUSTION CALENDAR

2001

JANUARY 2001

22-26 JANUARY

Leeds, England. COMBUSTION INSTRUMENTATION, CONTROL & LOW NO_x BURNER EMISSIONS. A short course. Details: Alison Whiteley, CPD Unit, School of Process, Environmental and Materials Engineering, University of Leeds, Leeds LS2 9JT. Tel: (0113) 233 2494, Fax: (0113) 233 2511 e-mail: cpd.speme@leeds.ac.uk, web: <http://www.leeds.ac.uk/fuel/shortc/sc.htm>

22-26 JANUARY

Leeds, England. FIRE DYNAMICS AND MODELLING. A short course. Details: Alison Whiteley, CPD Unit, School of Process, Environmental and Materials Engineering, University of Leeds, Leeds LS2 9JT. Tel: (0113) 233 2494, Fax: (0113) 233 2511, e-mail: cpd.speme@leeds.ac.uk, web: <http://www.leeds.ac.uk/fuel/shortc/sc.htm>

FEBRUARY 2001

18-23 FEBRUARY

Ventura CA, USA. GORDON RESEARCH CONFERENCE ON CHEMICAL REACTIONS AT SURFACES. Details: J C Hemminger, Department of Chemistry, University of California, Irvine, CA 92697, USA. e-mail: jchemmin@uci.edu, web: <http://www.grc.uri.edu>

22-24 FEBRUARY

Veracruz, México. II INTERNATIONAL WORKSHOP ON COMBUSTION MODELLING. Joint Meeting of the Mexican & Spanish Sections of The Combustion Institute. Details: Prof J C Prince, Instituto Tecnológico de Veracruz. E-mail: jcpa@itver.edu.mx or Prof César Treviño, UNAM. E-mail: ctrev@servidor.unam.mx, web: <http://academ01.itver.edu.mx/workshop>

MARCH 2001

4-8 MARCH

New Orleans, LA, USA. THE PITTSBURGH CONFERENCE, PITTCON 2001. Details: The Pittsburgh Conference, 300 Penn Center Boulevard, Suite 332, Pittsburgh, PA 15235, Tel: +1 412 825 3220, Fax: +1 412 825 3224, e-mail: pittconinfo@pittcon.org, web: <http://www.pittcon.org/>

5-6 MARCH (??)

Leeds, England. CFD IN COMBUSTION ENGINEERING. A short course. Details: Alison Whiteley, CPD Unit, School of Process, Environmental and Materials Engineering, University of Leeds, Leeds LS2 9JT. Tel: (0113) 233 2494, Fax: (0113) 233 2511 e-mail: cpd.speme@leeds.ac.uk, web: <http://www.leeds.ac.uk/fuel/shortc/sc.htm>

5-8 MARCH

Clearwater, Florida, USA. 26th INTERNATIONAL TECHNICAL CONFERENCE ON COAL UTILIZATION AND FUEL SYSTEMS – “THE CLEARWATER CONFERENCE”. Details: Barbara Sakkestad, Coal Utilization and Fuel Systems Conference Committee, 601

Suffield Drive, Gaithersburg, Maryland 20878, USA. Tel: +1 301 294 6080, Fax: +1 301 294 7480, e-mail: barbarasak@aol.com, web: coaltechnologies.com

5-8 MARCH

Detroit, MI, USA. SOCIETY OF AUTOMOTIVE ENGINEERS WORLD CONGRESS. Details: Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA

15096, USA. Tel: +1 724 776 1830, Fax: +1 724 776 5760, e-mail: meetings@sae.org, web:<http://www.sae.org>

11-16 MARCH

Ventura, CA, USA. GORDON RESEARCH CONFERENCE ON MODERN DEVELOPMENTS IN THERMODYNAMICS. Details: R S Berry, Department of Chemistry, University of Chicago, 5735 South Ellis Avenue, Chicago, IL 60637, USA. e-mail: berry@rainbow.uchicago.edu, web: <http://www.grc.uri.edu>

19-23 MARCH

Leeds, England. FIRE SAFETY DESIGN. A short course. Details: Alison Whiteley, CPD Unit, School of Process, Environmental and Materials Engineering, University of Leeds, Leeds LS2 9JT. Tel: (0113) 233 2494, Fax: (0113) 233 2511 e-mail: cpd.speme@leeds.ac.uk, web: <http://www.leeds.ac.uk/fuel/shortc/sc.htm>

25-28 MARCH

Oakland, CA, USA. SECOND JOINT MEETING OF THE US SECTIONS OF THE COMBUSTION INSTITUTE. Topics will Include Engine and Industrial Combustion, Combustion Emissions, Droplet and Spray Combustion, Combustion Diagnostics, Modeling and Numerical Simulation and Chemical Kinetics. Details: W J Pitz, WSS/CI Secretary, L-370, Lawrence Livermore National Laboratory, P.O. Box 808, Livermore, CA 94551, USA. Tel: +1 925 422 7730, Fax: +1 925 423 0909, e-mail: pitz@lbl.gov, web: <http://www.lbl.gov/conferences/combustion2001>, or <http://www.wssci.org>

25-30 MARCH

Destin, FL, USA. CONFERENCE ON STATIONARY SOURCE SAMPLING AND ANALYSIS FOR AIR POLLUTANTS XXV. Details: B K Hickernell, United Engineering Foundation, Three Park Ave., 27th Floor, New York, NY 10016, USA. Tel: +1 212 591 7836, Fax: +1 212 591 7441, e-mail: engfnd@aol.com, web: <http://www.engfnd/engfnd/1aw.html>

26-28 MARCH

Leeds, England. INDUSTRIAL AIR POLLUTION MONITORING. A short course. Details: Alison Whiteley, CPD Unit, School of Process, Environmental and Materials Engineering, University of Leeds, Leeds LS2 9JT. Tel: (0113) 233 2494, Fax: (0113) 233 2511 e-mail: cpd.speme@leeds.ac.uk, web: <http://www.leeds.ac.uk/fuel/shortc/sc.htm>

APRIL 2001

1-5 APRIL

San Diego, CA, USA. 221st NATIONAL MEETING OF THE AMERICAN CHEMICAL SOCIETY to include sessions on Reaction Mechanisms in Fuel Processing, Coal Bed Methane, Nitrogen Chemistry in Coal Utilization, Carbon Products for Environmental Applications, Fuels of the Future: Heavy Oil & Hydrogen for Fuel Cells, Environmental Challenges for Fossil Fuel Combustion and Solid Fuel Chemistry. Details: Meetings Department, American Chemical Society, 1155 - 16th Street, NW, Washington, DC 20036, USA. Tel: +1 202 872 4396, Fax: +1 202 872 6128, e-mail: natlmtgs@acs.org

2-5 APRIL

Brighton, England. 6th INTERNATIONAL CONGRESS ON OPTICAL PARTICLE CHARACTERISATION. Details: Belinda Hopley, Conferences Department, The Institute of Physics, 76 Portland Place, London W1N 3DH. Tel: (020) 7470 4800, Fax: (020) 7470 4900, e-mail: belinda.hopley@iop.org

2-6 APRIL

Leeds, England. DIESEL PARTICULATES AND NO_x EMISSIONS. A short course. Details: Alison Whiteley, CPD Unit, School of Process, Environmental and Materials Engineering, University of Leeds, Leeds LS2 9JT. Tel: (0113) 233 2494, Fax: (0113) 233 2511 e-mail: cpd.speme@leeds.ac.uk, web: <http://www.leeds.ac.uk/fuel/shortc/sc.htm>

3 APRIL

Birmingham, England. FUELS, FUELLING AND LUBRICATION. A UnICEG meeting. Details: Colin Garner, Department of Mechanical Engineering, Loughborough University, Loughborough LE11 3TU. Tel: (0150) 922 3249, Fax: (0150) 922 3934, e-mail: C.P.Garner@Lboro.ac.uk

3-4 APRIL

Leeds, England. COMBINED HEAT AND POWER - TECHNOLOGY, SAFETY AND ENVIRONMENT. A short course. Details: Alison Whiteley, CPD Unit, School of Process, Environmental and Materials Engineering, University of Leeds, Leeds LS2 9JT. Tel: (0113) 233 2494, Fax: (0113) 233 2511 e-mail: cpd.speme@leeds.ac.uk, web: <http://www.leeds.ac.uk/fuel/shortc/sc.htm>

8-11 APRIL

Cambridge, England. KYOTO COMPLIANCE REVIEW – GWXII. XIIth GLOBAL WARMING INTERNATIONAL CONFERENCE AND EXPO. Details: GWXII International Conference Committee, c/o The Global Warming Center, 22W381 – 75th Street, Naperville, IL 60565, USA. Tel: +1 630 910 1551, Fax: +1 630 910 1561, e-mail: gw12@GlobalWarming.Net, web: www.GlobalWarming.Net

26 APRIL

London, England. TURBULENT FLAMES: MODELLING AND MEASUREMENTS. The Spring Meeting of the Combustion Institute (British Section). Details:- W (Bill) P Jones, Department of Mechanical Engineering, Imperial College of Science Technology & Medicine, London SW7 2BX, England. Tel: (020) 7594 7037/7033, Fax: (020) 7581 5495, e-mail: w.jones@ic.ac.uk, web site: <http://www.ic.ac.uk> (see this *Newsletter* for more details)

29 APRIL-2 MAY

Philadelphia, PA, USA. INTERNAL COMBUSTION ENGINE DIVISION SPRING TECHNICAL CONFERENCE OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Details: Meetings Department, American Society for Mechanical Engineers, 345 E. 47th Street, New York, NY 10017, USA. Tel: +1 212 591 7054, Fax: +1 212 705 7143, web: <http://www.asme.org>

30 APRIL-2 MAY

Edinburgh, Scotland. 15th FIRE SCIENCE AND FIRE INVESTIGATION COURSE. A short course. Details: Office of Lifelong Learning, 11 Buccleuch Place, Edinburgh EH8 9LW, Scotland. Tel: (0131) 651 1180, Fax: (0131) 651 1746, e-mail: lisa.ellis@ed.ac.uk

MAY 2001

7-9 MAY

Orlando, FL, USA. CEC/SAE SPRING FUELS AND LUBRICANTS MEETING AND EXPOSITION. Details: Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096, USA. Tel: +1 724 776 4841, Fax: +1 724 776 5760, e-mail: meetings@sae.org, <http://www.sae.org>

13-16 MAY

Reno, Nevada, USA. 16TH INTERNATIONAL CONFERENCE ON FLUIDISED COMBUSTION. Details: National Energy Technology Laboratory, Conference Services, 626 Cochran Mill Road, PO Box 10940, Pittsburgh, PA 15236-0940, USA. Tel: +1 412 386 4763/6044, Fax: +1 412 386 6486, e-mail: kimberly.yavorsky@netl.doe.gov, or Meetings Department, American Society for Mechanical Engineers, 345 E. 47th Street, New York, NY 10017, USA. Tel: +1 212 705 7037, Fax: +1 212 705 7143, web: <http://www.asme.org>

14-18 MAY

Tuscaloosa, Alabama, USA. THE 2001 INTERNATIONAL COALBED METHANE SYMPOSIUM. Details: Karl Schultz, US EPA Coalbed Methane Outreach Program, 6202J Ariel Rios Building, 1200 Pennsylvania Avenue, NW, Washington, DC 20460, USA. Tel: +1 202 564 9468, Fax: +1 202 565 2077, e-mail: schultz.karl@epa.gov

14-18 MAY

Karlsborg, Sweden. TWELFTH SYMPOSIUM ON CHEMICAL PROBLEMS CONNECTED WITH THE STABILITY OF EXPLOSIVES. Organised by the Swedish Section for Detonics and Combustion (affiliated to the Combustion Institute). Details: Stig Johansson, Johan Skyttes väg 18, SE-554 48 Jönköping. Fax +46 36 16 37 34, e-mail srj@telia.com, or Ola Listh, FOA, SE-172 90 Stockholm, Sweden. Fax +46 87 06 30 75, e-mail listh@sto.foa.se

14-18 MAY

Philadelphia, Pennsylvania, USA. TWENTIETH INTERNATIONAL CONFERENCE ON INCINERATION AND THERMAL TREATMENT TECHNOLOGIES. Details Lori B Cohen, University of California, EH&S, 300 University Tower, Irvine, CA 92697-2725, USA. Tel: +1 949 824 5859, Fax: +1 949 824 1900, e-mail: lbarnow@uci.edu

14-15/16-18 MAY

Leeds, England. FIRE FLAMMABILITY AND EXPLOSIONS with GAS AND DUST EXPLOSIONS AND VENT DESIGN. Two short courses. Details: Alison Whiteley, CPD Unit, School of Process, Environmental and Materials Engineering, University of Leeds, Leeds LS2 9JT. Tel: (0113) 233 2494, Fax: (0113) 233 2511, e-mail: cpd.speme@leeds.ac.uk, web: <http://www.leeds.ac.uk/fuel/shortc/sc.htm>

20-25 MAY

Palm Cove, Queensland, Australia. INTERNATIONAL CENTRE FOR HEAT AND MASS TRANSFER, SECOND SYMPOSIUM ON ADVANCES IN COMPUTATIONAL HEAT TRANSFER (CHT'01). Details: Professors Graham de Vahl Davis and Eddie Leonardi, CFD Research Laboratory, The University of NSW, Sydney, NSW, AUSTRALIA 2052. Tel: +61 2 9385 4099 or +61 2 9385 4252, Fax: +61 2 9663 1222, e-mail: cht01@cfm.mech.unsw.edu.au, web: <http://cht01.mech.unsw.edu.au>

20-25 MAY

Beijing, China. FLUIDIZATION X. 10th INTERNATIONAL CONFERENCE ON FLUIDIZATION: FLUIDIZATION FOR SUSTAINABLE DEVELOPMENT. Details: United Engineering Foundation, Meetings Department, Three Park Avenue, 27th Floor, New York, NY 10016, USA. Tel: +1 212 591 7836, Fax: +1 212 591 7441, web: <http://www.engfnd.org/engfnd/conf.html>

22-24 MAY

Cleveland, Ohio, USA. SIXTH INTERNATIONAL MICROGRAVITY COMBUSTION WORKSHOP. Details: Dr Kurt Sacksteder, NASA Glenn Research Center, Microgravity Science Division. Tel: +1 216 433 2857, e-mail: kurt.sacksteder@grc.nasa.gov, or Christine R Gorecki, Conference Coordinator, National Center, 21000 Brookpark Road, MS 110-3, Cleveland, Ohio 44135, USA. Tel: +1 216 433 2851, Fax: +1 216 433 3793, e-mail: Christine.Gorecki@grc.nasa.gov, web: <http://www.ncmr.org/events/combustion2001/index.html>

27 MAY-1 JUNE

New Orleans LA, USA. 4th INTERNATIONAL CONFERENCE ON MULTIPHASE FLOW. Details: E E Michaelides, School of Engineering, Tulane University, New Orleans, LA 70118, e-mail: icmf@mailhost.tcs.tulane.edu, web: <http://mail.eng.lsu.edu/icmf.2001/>

29 MAY-1 JUNE

New Orleans LA, USA. ASME FLUIDS ENGINEERING SUMMER MEETING: SYMPOSIUM ON SEPARATED AND COMPLEX FLOWS III. Details: B E Thompson, Department of Mechanics and Aerodynamics, Jonssen Engineering Center 2049, Rensselaer Polytechnic Institute, Troy, NY 12180, USA. Tel: +1 518 276 6989, Fax: +1 518 276 6025, e-mail: thompson@rpi.edu

JUNE 2001

3-6 JUNE

Kingston, Ontario, Canada. IUTAM SYMPOSIUM ON TURBULENT MIXING AND COMBUSTION. Topics will include: Turbulent Mixing, Mixing Dominated by Combustion, Simulation and Modeling of Turbulent Mixing and Combustion, Control of Mixing and Combustion and Applications. Details: A Pollard, Department of Mechanical Engineering, Queen's University at Kingston, ON, Canada K7L 3N6. Tel: +1 613 533 2569, Fax: +1 613 533 6489, e-mail: pollard@me.queensu.ca, web: <http://me.queensu.ca/~IUTAM>

4-7 JUNE

New Orleans LA, USA. 46th ASME INTERNATIONAL GAS TURBINE AND AEROENGINE TECHNICAL CONGRESS, EXPOSITION AND USERS SYMPOSIUM. Details: A Layne, National Energy Technology Center, DOE, 3610 Collins Ferry Road, MS CO2, Morgantown, WV 26505, USA. Tel: +1 304 285 4603, Fax: +1 304 285 4469, e-mail: abbie.layne@netl.doe.gov, web: <http://www.asme.org>

10-12 JUNE

Anaheim, CA, USA. 35th ASME NATIONAL HEAT TRANSFER CONFERENCE. Details: C B Panchal, Energy Concept Co., Annapolis, MD 21401, USA. Tel: +1 410 266 6521, Fax: +1 410 266 6539, e-mail: cpanchal@aol.com, <http://www.asme.org>

17-22 JUNE

Antalya, Turkey. INTERNATIONAL CENTRE FOR HEAT AND MASS TRANSFER: RADIATION 2001. THE THIRD INTERNATIONAL SYMPOSIUM ON RADIATIVE TRANSFER. Details: F Arinc, Secretary-General, ICHMT, Mechanical Engineering

Department, Middle East Technical University, 06531 Ankara, Turkey. Tel: +90 312 210 5214, Fax: Tel: +90 312 210 1331, web: <http://ichmt.me.metu.edu.tr>

17-22 JUNE

Newport, RI, USA. GORDON RESEARCH CONFERENCE ON ATMOSPHERIC CHEMISTRY. Details: S P Sander, Jet Propulsion Laboratory, Mail Stop 183-901, 4800 Oak Grove Drive, Pasadena, CA 91109, USA. e-mail: stanley.sander@jpl.nasa.gov, web: <http://www.grc.uri.edu>

24-27 JUNE

Seoul, Korea. THE THIRD ASIA-PACIFIC CONFERENCE ON COMBUSTION, ASPACC 2001. Details: Prof In-Seuck Jeung, School of Mechanical & Aerospace Engineering, Seoul National University, San 56-1, Shinrim-Dong, Kwanak-Ku, Seoul 151-742, Korea. Tel: +82 2 880 7387, Fax: +82 2 887 2662, e-mail: enjjs@plaza.snu.ac.kr, web: <http://aspacc.snu.ac.kr>

24-28 JUNE

Orlando, FL, USA. ANNUAL MEETING OF THE AIR AND WASTE MANAGEMENT ASSOCIATION. Details: Air and Waste Management Association, Member Services, One Gateway Center, Third Floor, Pittsburgh, PA 15222, USA. Tel: +1 412 232 3444, Fax: +1 412 232 3450, web: <http://www.awma.org>

JULY 2001

1-6 JULY

South Hadley, MA, USA. GORDON RESEARCH CONFERENCE ON LASER DIAGNOSTICS IN COMBUSTION. Details: J B Jeffries, Molecular Physics Laboratory, SRI International, 333 Ravenswood Ave., Menlo Park, CA 94025, USA. Tel: +1 650 859 6341, Fax: +1 650 859 6196, e-mail: jay.jeffries@sri.com

2-6 JULY

Leeds, England. ENGINE EMISSIONS MEASUREMENT. A short course. Details: Alison Whiteley, CPD Unit, School of Process, Environmental and Materials Engineering, University of Leeds, Leeds LS2 9JT. Tel: (0113) 233 2494, Fax: (0113) 233 2511 e-mail: cpd.speme@leeds.ac.uk, web: <http://www.leeds.ac.uk/fuel/shortc/sc.htm>

8-11 JULY

Salt Lake City, UT, USA. 37th AIAA/ASME/SAE/ASEE JOINT PROPULSION CONFERENCE. Details: Meetings Department, American Institute of Aeronautics and Astronautics, 1801 Alexander Bell Drive, Suite 500, Reston, VA 20191, USA. Tel: +1 703 264 7500, e-mail: custserv@aiaa.org, <http://www.aiaa.org>

8-13 JULY

New London, NH, USA. GORDON RESEARCH CONFERENCE ON GRAVITATIONAL EFFECTS IN PHYSICO-CHEMICAL SYSTEMS. Details: P H Steen, Department of Chemical Engineering, Cornell University, 346 Olin Hall, Ithaca, NY 14853, USA. e-mail: phs7@cornell.edu, <http://www.grc.uri.edu>

9-11 JULY

Leeds, England. COMBUSTION CHEMISTRY: ELEMENTARY REACTIONS TO MACROSCOPIC PROCESSES. Faraday Discussion 119. Details: Miss Christine Hall, Ref: FD 119, Conferences and Awards, Royal Society of Chemistry, Burlington House, Piccadilly, London W1J 0BA England. Tel: (020) 7437 8656, Fax: (020) 7734 1227,

email: conferences@rsc.org, Web: www.rsc.org/lap/confs/faradischeme.htm (see this *Newsletter* for more details)

9-12 JULY

Oporto, Portugal. SIXTH INTERNATIONAL CONFERENCE ON TECHNOLOGIES & COMBUSTION FOR A CLEAN ENVIRONMENT. Details: Prof Maria da Graça Carvalho, Instituto Superior Técnico, Mechanical Engineering Department, Av. Rovisco Pais, 1049-001 Lisbon, Portugal. Tel: +351 21 841 7378 / 7186, Fax: +351 21 847 5545 / 726 263. e-mail: cleanair@esoterica.pt, web: <http://navior.ist.utl/cleanair/>

10-13 JULY

Leeds, England. FIRE SAFETY MANAGEMENT AND RISK ASSESSMENT. A short course. Details: Alison Whiteley, CPD Unit, School of Process, Environmental and Materials Engineering, University of Leeds, Leeds LS2 9JT. Tel: (0113) 233 2494, Fax: (0113) 233 2511 e-mail: cpd.speme@leeds.ac.uk, web: <http://www.leeds.ac.uk/fuel/shortc/sc.htm>

29JULY-2 AUGUST

Savannah, GA, USA. 36th INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE. Details: Meetings Department, American Society for Mechanical Engineers, 345 E. 47th Street, New York, NY 10017, USA. Tel: +1 212 591 7057, Fax: 212 705 7143, web: <http://www.asme.org>

29 JULY-3 AUGUST

Seattle, Washington, USA. 18th INTERNATIONAL COLLOQUIUM ON THE DYNAMICS OF EXPLOSIONS AND REACTIVE SYSTEMS. Details: ICDERS Secretariat, Engineering Professional Programs, University of Washington, 10303 Meridian Ave North, 301, Seattle, WA 98133-9483, USA. Tel: +1 206 543 5539, Fax: +1 206 543 2352, e-mail: icders@enr.washington.edu, web: <http://www.enr.washington.edu/epp/icders/>

AUGUST 2001

26-30 AUGUST

Chicago, IL, USA. 222nd NATIONAL MEETING OF THE AMERICAN CHEMICAL SOCIETY. Topics include Cofiring or Coprocessing Coal & Biomass, Computer Modeling in Fuel Chemistry, Fine Particulate (PM2.5) Formation & Emissions from Fuel Combustion, Catalysis in Fuel Processing for Fuel Cell Application, Value-Added Carbon Products from Fossil Fuels, Mercury Emissions from Coal and General Fuel Chemistry. Details: Meetings Department, American Chemical Society, 1155 - 16th Street, NW, Washington, DC 20036, USA. Tel: +1 202 872 4396, Fax: +1 202 872 6128, e-mail: natlmtgs@acs.org

SEPTEMBER 2001

2-6 SEPTEMBER

Zurich, Switzerland. 17TH ANNUAL CONFERENCE ON LIQUID ATOMIZATION AND SPRAY SYSTEMS (ILASS 2001). Details: Secretariate ILASS2001, Ms V Mueller, Museumstrasse 20, CH-7260 Davos-Dorf, Switzerland. e-mail: ilass@ethz.ch, web: <http://www.ilass.ethz.ch>

9-14 SEPTEMBER

Breckenridge, Colorado, USA. 6TH INTERNATIONAL CONFERENCE ON CARBON DIOXIDE UTILISATION. Details: ICCDU VI Secretariat, National Renewable Energy Laboratory, 1617 Cole Boulevard, Golden, CO 80401-3393. Tel: +1 303 384 6199, Fax: +1 303 384 6150

12 SEPTEMBER

Norwich, England. HIGH PERFORMANCE ENGINES. A UnICEG meeting. Details: Colin Garner, Department of Mechanical Engineering, Loughborough University, Loughborough LE11 3TU. Tel: (0150) 922 3249, Fax: (0150) 922 3934, e-mail: C.P.Garner@Lboro.ac.uk

13 SEPTEMBER

Cambridge, England. THE INCINERATION OF WASTE MATERIALS. The Autumn Meeting of the Combustion Institute (British Section), to include the AGM of the Section. Details: Allan Hayhurst, Department of Chemical Engineering, Cambridge University, Pembroke Street, Cambridge CB2 3RA, England. Tel: (01223) 334790, Fax: (01223) 334796, e-mail: allan_hayhurst@cheng.cam.ac.uk (see this *Newsletter* for more details)

17-21 SEPTEMBER

Leeds, England. FIRE AND EXPLOSION PROTECTION AND INVESTIGATION. A short course. Details: Alison Whiteley, CPD Unit, School of Process, Environmental and Materials Engineering, University of Leeds, Leeds LS2 9JT. Tel: (0113) 233 2494, Fax: (0113) 233 2511 e-mail: cpd.speme@leeds.ac.uk, web: <http://www.leeds.ac.uk/fuel/shortc/sc.htm>

22-25 SEPTEMBER

Leeds, England. INCINERATION OF MUNICIPAL WASTE WITH ENERGY RECOVERY. A short course. Details: Alison Whiteley, CPD Unit, School of Process, Environmental and Materials Engineering, University of Leeds, Leeds LS2 9JT. Tel: (0113) 233 2494, Fax: (0113) 233 2511 e-mail: cpd.speme@leeds.ac.uk, web: <http://www.leeds.ac.uk/fuel/shortc/sc.htm>

23-27 SEPTEMBER

Melbourne, Australia. 6th WORLD CONGRESS OF CHEMICAL ENGINEERING: A NEW CENTURY OF CHEMICAL ENGINEERING. Details: The 6th World Congress of Chemical Engineers, The Meeting Planners, 91-97 Islington Street, Collingwood, Victoria, Australia 3066. Tel: +61 3 9417 0888, Fax: +61 3 9417 0899, e-mail: chemeng@meetingplanners.com.au, web: <http://www.chemengcongress.com>

24-26 SEPTEMBER

Argonne IL, USA. INTERNAL COMBUSTION ENGINE DIVISION FALL TECHNICAL MEETING OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Details: Meetings Department, American Society for Mechanical Engineers, 345 E. 47th Street, New York, NY 10017, USA. Tel: +1 212 591 7054, Fax: +1 212 705 7143, web: <http://www.asme.org>

24-27 SEPTEMBER

San Antonio, TX, USA. INTERNATIONAL SAE FALL FUELS AND LUBRICANTS MEETING AND EXPOSITION. Details: Society of Automotive Engineers Inc., 400 Commonwealth Drive, Warrendale, PA 15096, USA. Tel: +1 724 776 4841, Fax: +1 724 776 5760, e-mail: meetings@sae.org, <http://www.sae.org>

24-28 SEPTEMBER

Thessaloniki, Greece. FIFTH WORLD CONFERENCE ON EXPERIMENTAL HEAT TRANSFER, FLUID MECHANICS AND THERMODYNAMICS. Details: Dr Gian Piero Celata, Conference Chair, ENEA Casaccia, via Anguillarese 301, I-00060 S.M. Galeria Rome, Italy. Tel: +39 06 3048 3905; Fax: +39 06 6048 3026; E-mail: celata@casaccia.enea.it, web: <http://www.ing.unipi.it/exhft5> or Prof A Goulas, Department

of Mechanical Engineering, University of Thessaloniki, Greece 54006. Tel: +30 31 996001, Fax: +30 31996002, e-mail: goulas@eng.auth.gr

25-27 SEPTEMBER (??)

Leeds, England. POLYMERS AND TEXTILES IN FIRES. A short course. Details: Alison Whiteley, CPD Unit, School of Process, Environmental and Materials Engineering, University of Leeds, Leeds LS2 9JT. Tel: (0113) 233 2494, Fax: (0113) 233 2511 e-mail: cpd.speme@leeds.ac.uk, web: <http://www.leeds.ac.uk/fuel/shortc/sc.htm>

30 SEPTEMBER-5 OCTOBER

San Francisco, CA, USA. 11th INTERNATIONAL CONFERENCE ON COAL SCIENCE: EXPLORING THE HORIZONS OF COAL. Details: David A Clarke, Power Technology, Radcliffe-on-Soar, Nottingham NG11 0EE, England. Tel: (0115) 936 2452, Fax: (0115) 936 2363, e-mail: dave.clarke@powertech.co.uk, web: <http://www.netl.doe.gov>

OCTOBER 2001

14-18 OCTOBER

Haifa, Israel. 6th INTERNATIONAL SYMPOSIUM ON SELF-PROPAGATING HIGH-TEMPERATURE SYNTHESIS. Details: I Gotman, Technion-Israel Institute of Technology, Department of Materials Engineering, Technion, Haifa, Israel 32000, Tel: +972 4 829 2112, Fax: +972 4 832 1978, e-mail: gotman@techunix.technion.ac.il, web: <http://www.technion.ac.il/technion/materials/conferences.html>

14-19 OCTOBER

Antalya, Turkey. INTERNATIONAL SYMPOSIUM ON VISUALIZATION AND IMAGING IN TRANSPORT. (VIM'01). Details: F Arinc, Secretary-General, ICHMT, Mechanical Engineering Department, Middle East Technical University, 06531 Ankara, Turkey, Tel: +90 312 210 1429, Fax: +90 312 210 1331, E-mail: arinc@metu.edu.tr, web: <http://ichmt.me.metu.edu.tr> e-mail: arinc@metu.edu.tr

21-25 OCTOBER

Buenos Aires, Argentina. 18TH WORLD ENERGY CONGRESS. Details: World Energy Council, Del Carmen 766-4^o Piso, 1019 Buenos Aires, Argentina. Tel: +54 11 4 813 2219, Fax: +54 11 4 814 3664

NOVEMBER 2001

6-9 NOVEMBER

Leeds, England. EXPLOSION PREDICTION AND MITIGATION. A short course. Details: Alison Whiteley, CPD Unit, School of Process, Environmental and Materials Engineering, University of Leeds, Leeds LS2 9JT. Tel: (0113) 233 2494, Fax: (0113) 233 2511 e-mail: cpd.speme@leeds.ac.uk, web: <http://www.leeds.ac.uk/fuel/shortc/sc.htm>

11-16 NOVEMBER

New York, NY, USA. COMPUTATIONAL MODELING OF INDUSTRIAL COMBUSTION SYSTEMS. 2001 ASME INTERNATIONAL MECHANICAL ENGINEERING CONGRESS AND EXPOSITION. Details: Dr Cary Presser, National Institute of Standards & Technology, 100 Bureau Drive, Stop 8360, Gaithersburg, MD 20899-8360. Tel: +1 301 975 2612, Fax: +1 301 869 5924, e-mail: cpresser@nist.gov or Prof A K Gupta, Dept of Mechanical Engineering, University of Maryland, College Park, MD 20742. Tel: +1 301 405 5276, Fax: +1 301 314 9477, e-mail: ak Gupta@eng.umd.edu, web: http://www.asme.org/division/htd/alpha2001_IMECE.html

26-30 NOVEMBER

Leeds, England. SPARK-IGNITION ENGINE EMISSIONS. A short course. Details: Alison Whiteley, CPD Unit, School of Process, Environmental and Materials Engineering, University of Leeds, Leeds LS2 9JT. Tel: (0113) 233 2494, Fax: (0113) 233 2511 e-mail: cpd.speme@leeds.ac.uk, web: <http://www.leeds.ac.uk/fuel/shortc/sc.htm>

28-30 NOVEMBER

Pisa, Italy. 2001 SAE SMALL ENGINE TECHNOLOGY CONFERENCE AND EXPOSITION. Details: Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096, USA. Tel: +1 724 776 4841, Fax: +1 724 776 5760, e-mail: meetings@sae.org, <http://www.sae.org>

DECEMBER 2001

3-7 DECEMBER

Newcastle, New South Wales, Australia. 18TH INTERNATIONAL PITTSBURGH COAL CONFERENCE, COAL'S INTERNATIONAL FUTURE: THE TECHNICAL CHALLENGE. Details: Conference Secretary, Pittsburgh Coal Conference, University of Pittsburgh, 1130 Benedum Hall, Pittsburgh PA 15261, USA. Tel: +1 412 624 7440, Fax: +1 412 624 1480, e-mail: pcc@engrng.pitt.edu, web: <http://www.engrng.pitt.edu/~pccwww/>

3-6 DECEMBER

Callaghan, NSW, Australia. FIFTH ASIA-OCEANIA SYMPOSIUM ON FIRE SCIENCE AND TECHNOLOGY. Details: B Z Dlugogorski, Department of Chemical Engineering, The University of Newcastle, Callaghan, NSW 2308 Australia. Tel: +61 2 4921 6176, Fax: +61 2 4921 6920, e-mail: cgbzd@alinga.newcastle.edu.au

9-14 DECEMBER

Adelaide, Australia. 14th AUSTRALASIAN FLUID MECHANICS CONFERENCE. Details: 14th Australasian Fluid Mechanics Conference, Department of Mechanical Engineering, The University of Adelaide, SA 5005, Australia. Tel: +61 8 8303 5397, Fax: +61 8 8303 4367, e-mail: afmc@mecheng.adelaide.edu.au, web:<http://www.mecheng.adelaide.edu.au/14afmc/14afmc.htm>

18 DECEMBER

Uxbridge, England. ENGINE DIAGNOSTICS AND INSTRUMENTATION. A UnICEG meeting. Details: Colin Garner, Department of Mechanical Engineering, Loughborough University, Loughborough LE11 3TU. Tel: (0150) 922 3249, Fax: (0150) 922 3934, e-mail: C.P.Garner@Lboro.ac.uk

2002

JANUARY 2002

6-11 JANUARY

Sharm El-Sheikh, Egypt. SECOND MEDITERRANEAN COMBUSTION SYMPOSIUM. Topics will include Flame Dynamics and Turbulence, Sprays and Gas Combustion Systems, Internal Combustion Engines, Solid Fuels Combustion, Diagnostics and Measurements, Fire and Explosions, Pollutants and Kinetics. Details: M S Mansour, Mechanical Engineering Dept, The American University in Cairo, Cairo, Egypt. Fax: +202

795 7565; e-mail: mansourm@aucegypt.edu, web: <http://ichmt.me.metu.edu.tr/upcoming-meetings/Mcs-02/announce.html>

MARCH 2002

18-22 MARCH

New Orleans, LA, USA. PITTCON 2002: THE PITTSBURGH CONFERENCE. Details: The Pittsburgh Conference, 300 Penn Center Blvd., Suite 332, Pittsburgh, PA 15235, USA. Tel: +1 412 825 3220, Fax: +1 412 825 3224, e-mail: pittconinfo@pittcon.org, web: <http://www.pitcon.org/>

APRIL 2002

29 APRIL-1 MAY

Seoul, Korea. 5th INTERNATIONAL WORKSHOP ON CATALYTIC COMBUSTION. Topics will Include: Kinetics and Transport Processes in Catalytic Combustion, Development of High Temperature Materials for Catalytic Combustion, Application of Catalytic Combustion in Industrial Commercial and Residential Burners and Commercialization of Low Emission Gas Turbine Catalytic Combustors. Details: Sung June Cho, Secretary, 5 IWCC, Korea Institute of Energy Research, 71-2, Jang-dong, Yusung-gu, Taejon 305-343, Korea. Tel: +82 42 860 3613, Fax: +82 42 860 3133, e-mail: sjcho@kier.re.kr

MAY 2002

5-8 MAY

Niagara Falls, Canada. 7th CIRCULATING FLUIDIZED BED CONFERENCE. Details: AICUL Consulting. e-mail: aicul-con@home.com

JULY 2002

21-26 JULY

Sapporo, Japan. TWENTY-NINTH INTERNATIONAL SYMPOSIUM ON COMBUSTION. Details: Sue Terpack. e-mail: office@combustioninstitute.org