


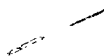

APPLIED OPTICS DIGEST

Editor: J C Dainty



Papers presented at

Applied Optics and Opto-Electronics
17-20 September 1990
Nottingham, UK



Institute of Physics

SCIENTIFIC PROGRAMME

SUNDAY 16th SEPTEMBER

- 17:00 - 21:00 Registration (Cripps Hall)
 19:30 - 21:30 "Ice-breaker" reception (Cripps Hall)

MONDAY 17th SEPTEMBER

- 08:00 - 18:00 Registration (T1 reception area)
 20:00 Civic Reception (buses leave Cripps Hall from 19:30 onwards)

PLENARY SESSION Chair: J C Dainty

- 09:00 *Trends in opto-electronic devices for sensors and instrumentation* **19**
 A. E. Smart (Spectron Development Labs) [Invited]
 09:40 *The study of surface-induced molecular alignment by a nonlinear optical technique* **21**
 M Feller and Y R Shen (UC Berkeley) [Invited]
 10:20 COFFEE

ACTUATORS, SENSORS and INSTRUMENTATION

Session 1: Velocimetry and On-line Measurement

- 10:50 *Flow measurement by vortex shedding from multimode and monomode optical fibres* **25**
 S. Webster, R. McBride, A. Boechat, J. S. Barton and J. D. C. Jones (Heriot-Watt University)
 11:10 *Optical techniques for measuring velocities in three dimensional flows* **27**
 A. M. Shand and P. R. Ereaud (AEA Environment & Energy)
 11:30 *A low coherence frequency and temporally shifted fibre optic Doppler anemometry (FOD1) system* **29**
 W. J. Boyle, B. T. Meggitt, K. T. V. Grattan and A. W. Palmer (City University)
 11:50 *In-line measurement of dimensions and reflectance of moving objects of irregular shape* **31**
 I. McFarlane (Beaconsfield Instrument Co.)
 12:10 *On-line optical surface roughness monitor* **33**
 E. Theocharous (BP Research)
 12:30 LUNCH

Session 2: Sensors I

14:00	<i>The application of short coherence sources in interferometric testing</i> R. Jones (Cambridge Consultants) [Invited]	37
14:40	<i>Polarised light in chromatic modulation systems</i> M. Moghisi, R. Holmes, G. R. Jones (University of Liverpool)	39
15:00	<i>Miniature fast response fibre optic Fabry-Perot temperature sensors</i> S. R. Kidd, P. G. Sinha, J. S. Barton and J. D. C. Jones (Heriot-Watt University)	41
15:20	TEA	

Session 3: Sensors II

15:50	<i>A novel Hi-Bi current sensor</i> W. Chu, D. McStay and A. J. Rogers (King's College London)	45
16:10	<i>Detection of microwaves in free space using an optical fibre grid</i> A. J. Harris, P. Dagoulis and L. J. Auchterlonie (University of Newcastle-upon-Tyne)	47
16:30	<i>Force measuring sensor applying transmission ellipsometric principles</i> W. Baetz, J. Braasch, W. Holzapfel, U. Neuschaefer-Rube (University of Kassel)	49
16:50	<i>Evanescent wave sensing using fluoride optical fibres</i> B. D. MacCraith, V. Ruddy and S. McCabe (Dublin City University)	51
17:10	<i>Implementation of a two parameter hybrid optical fibre sensor</i> M. Glover (Land Infrared)	53

(This Meeting continues on Tuesday morning.)

NONLINEAR OPTICS

Session 1: Nonlinear Waveguides and Spatial Light Modulators

10:50	<i>Photorefractive and photobleaching effects on propagation in polarisation-maintaining optical fibres</i> V. A. Handerek, S. E. Kanellopoulos, H. Jamshidi and A. J. Rogers (King's College, London)	57
11:10	<i>A model for the photosensitive formation of Bragg gratings in Ge-doped fibres</i> D. McStay (King's College, London)	59
11:30	<i>Finite element analysis of nonlinear optical devices</i> B. M. A. Rahman (City University)	61
11:50	<i>Tunable phase devices using liquid crystals</i> S. A. Reid, W. Pollock and C. Powles (GEC-Marconi Research Centre)	63
12:10	<i>The design of smart SLMs and applications in optical systems</i> D. G. Vass, G. Bradford, I. Underwood, W. A. Crossland, S. A. Reid (University of Edinburgh)	65
12:30	LUNCH	

Session 2: Phase Conjugation and Frequency Mixing

14:00	<i>Analysis of novel phase conjugating systems and four-wave mixing</i> G. R. Barrett, A. K. Powell and T. J. Hall (King's College London)	69
14:20	<i>Efficient phase conjugation via DFWM in BSO with AC-electric field</i> Gan Xu, Saeed Naqvi and T. A. King (University of Manchester)	71
14:40	<i>High power beam steering using Brillouin induced four wave mixing</i> G. Cook, A. M. Scott and K. D. Ridley (RSRE)	73
15:00	<i>Nonlinear frequency generation in barium borate</i> G. C. Bhar and S. Das (Burdwan University)	75
15:20	TEA	

Session 3: Optical Processing and Switching

15:50	<i>All optical complete switching in a polarisation-maintaining fibre</i> B.K. Nayar and H. Vanherzeele (British Telecom Research Labs)	79
16:10	<i>Parallel optical digital data transfer</i> D. J. McKnight, I. R. Redmond, A. C. Walker, J. G. H. Mathew, G. S. Buller, M. R. Taghizadeh and S. D. Smith (Heriot-Watt University)	81
16:30	<i>Design criteria for digital optical computing</i> J. F. Snowdon, S. Bowman and B. S. Wherrett (Heriot-Watt University)	83
16:50	<i>A single channel looped digital optical processor</i> R. G. A. Craig, F. A. P. Tooley, S. D. Smith, A. C. Walker and B. S. Wherrett (Heriot-Watt University)	85

TUESDAY 18th SEPTEMBER

08:00 - 18:00	Registration (T1 reception area)
12:00 - 17:00	Exhibition (Rooms T1-18 & T1-34)
19:00 - 21:30	Exhibition (Rooms T1-18 & T1-34)
19:30 - 21:30	Reception in Exhibition Area

PLENARY SESSION Chair: M Wall

09:00	<i>Multiple Light Scattering</i> E. Jakeman (Royal Signals and Radar Establishment) [Invited]	89
09:40	<i>Mode locked, diode pumped solid-state lasers</i> A. I. Ferguson (Strathclyde University) [Invited]	91
10:20	COFFEE, POSTER SESSION (in Exhibition Halls)	

ACTUATORS, SENSORS and INSTRUMENTATION

Session 4: Actuators and Instrumentation

10:50	<i>An analysis of passive photo-mechanical transduction processes</i> R. Jones, N.J. Kerry, M. S. Hazell (Cambridge Consultants)	95
11:10	<i>A high speed opto-pneumatic digital actuator</i> F. Q. Hu, J. M. Watson and M. Page (UMIST)	97
11:30	<i>Calibration of optical beam deflection technique for the monitoring of ultrasound in thin films</i> L. Noui and R. J. Dewhurst (UMIST)	99
11:50	<i>Photoelastic measurements using image processing techniques</i> D. Kershaw, G. R. Jones and R. Holmes (University of Liverpool)	101
12:10	<i>Development of industrial PD instruments for particle sizing</i> C. R. Negus, G. R. Burton, R. F. Gillespie and D. M. Livesley (AEA Technology)	103
12:30	LUNCH AND POSTER SESSION	

OPTICS '90

Session 1: Interferometry and Metrology I

14:30	<i>Interpolated moire phase measurement topography</i> J. H. Moore	107
14:50	<i>Interferometric form metrology applied to a rotating surface</i> A. E. Gee (Cranfield Institute of Technology)	109
15:10	<i>Performance of fringe-projection systems for surface topography measurement</i> C. Wykes, M. R. Morshedizadeh (University of Nottingham)	111
15:30	<i>The application of holographic and electronic speckle pattern interferometry to the measurement of piston deformation</i> M. M. Ratnam (Polytechnic of Wales)	113
15:50	TEA, POSTER SESSION (in Exhibition Halls)	

Session 2: Interferometry and Metrology II

16:20	<i>Mutual phase locking of television holography and laser velocimetry</i> J. Valera, D. Harvey and J. D. C. Jones (Heriot-Watt University)	117
16:40	<i>A novel scanning heterodyne differential intensity and phase optical microscope using parallel interferometers</i> M. S. Valera, M. G. Somekh and M. J. Offside (University of Nottingham)	119
17:00	<i>High frequency vibration measurement using Sagnac interferometry</i> D. Harvey, R. McBride, J. S. Barton and J. D. C. Jones (Heriot-Watt University)	121
17:20	<i>The measurement of optical thickness and dispersion in liquid crystal prisms</i> G. D. Love and J. V. Major (University of Durham)	123

17:40	<i>Interference micrometrology of integrated circuit wafers</i> D. M. Gale and M. Pether (Imperial College)	125
	<i>(OPTICS '90 continues on Wednesday morning.)</i>	

LASERS AND SPECTROSCOPY

Session 1: Applications of Spectroscopy

10:50	<i>Laser-based systems for monitoring atmospheric pollution</i> P. T. Woods and R. H. Partridge (National Physical Laboratory) [Invited]	129
11:30	<i>Multiphoton absorption and photostructural change in optical fibres</i> R. J. Potton (University of Salford)	131
11:50	<i>Raman spectroscopy as an analytical tool for fibre optics</i> J. M. Benson, C. J. Chunnillall (National Physical Laboratory)	133
12:10	<i>Laser spectroscopy of trapped ions</i> D. J. Bate, R. C. Thompson and D. C. Wilson (Imperial College)	135
12:30	LUNCH AND POSTER SESSION	

Session 2: Lasers I

14:30	<i>Materials consideration for tunable solid state lasers</i> B. Henderson and K. P. O'Donnell (University of Strathclyde)	139
14:50	<i>Unidirectional operation of diode-pumped, Q-switched Nd: YAG ring lasers</i> L. J. Bromley, W. A. Clarkson and D. C. Hanna (University of Southampton)	141
15:10	<i>FLN and ODMR in Cr doped glasses</i> C. Ogihara, Y. Gao, K. P. O'Donnell and B. Henderson (Strathclyde University)	143
15:30	<i>Thulium-doped fibre lasers</i> J. N. Carter, D. C. Hanna, J. R. Lincoln, I. R. Perry, R. G. Smart and A. C. Tropper (University of Southampton)	145
15:50	TEA, POSTER SESSION (in Exhibition Halls)	

Session 3: Lasers II

16:20	<i>Terawatt output from the vulcan glass laser using chirped pulse amplification</i> R. Bann, C. N. Danson, D. Pepler and I. Watson (Rutherford Appleton Laboratory)	149
16:40	<i>Equivalent circuit model of dynamic-single-mode laser diode with frequency chirping</i> L. F. Nagy and A. S. Marincic (University of Novi Sad)	151

17:00 *A numerical model of a synchronously pumped mode-locked dye laser based on the rate equations for four levels* 153
D. G. H. Andrews (University of Essex)

17:20 Post-deadline paper

POSTERS

Actuators, Sensors and Instrumentation

Fabrication and characterization of optical fibres for sensing applications 157
B. A. Alvi and R. J. Potton (University of Salford)

Computer aided design of an optical fibre sensor based upon chromatic modulation 159
P. C. Russell, K. Morse, E. Glavas, G. R. Jones (Liverpool University)

A stable, high quantum efficiency silicon photodiode detector 161
T. C. E. Jones and N. P. Fox (National Physical Laboratory)

A mobile tunable diode laser spectroscopy system for sub-ppb measurement of atmospheric species 163
D. J. Brassington (National Power)

A new polarization modulated ellipsometer 165
A. L. Collins, A. W. Palmer, K. T. V. Grattan (City University)

Development of a technique for accurate measurement of optical power in fibre optic systems 167
F. M. Cairns (National Physical Laboratory)

A transmissive quasi-distributed optical fibre sensing scheme for two-state sensors 169
A. Prewett (University College London)

A miniature electronically tunable Fabry-Perot filter 171
B. O'Sullivan and K. A. R. B. Pietraszewski (Queensgate Instruments)

A microcomputer controlled pupillometer using dual linear CCD arrays 173
D. P. Jones, S. J. Harris and S. Scicinski (St. Barthomomews Hospital Medical College)

Nonlinear Optics

Low power and array operation of liquid crystal devices for optical processing 175
A. D. Lloyd, C. H. Wang, E. J. Restall, M. Taghizadeh and B. S. Wherrett (Heriot-Watt University)

TM nonlinear electromagnetic waves in a metal film bounded by inhomogeneous and nonlinear dielectric media 177
M. M. Shabat (UMIST)

Side absorption lines in NH₃ due to a four-wave interaction 179
S. Marchetti, R. Simili (IFAM-CNR)

Optics '90

- Interference in a thick plate at large angles of incidence* 181
M. T. Tavassoli, F. Shah-Shehany (University of Tehran)
- Coherent-mode representation of propagation of partially beams through first-order optical systems* 183
Jixiong Pu (Huachiao University)
- Laser focal spot smoothing and shaping using random phase plates* 185
R. Bann, C. N. Danson, J. Exley and D. Pepler (Rutherford Appleton Laboratory)
- Coherent processor F.T. scale parameter - a nomograph* 187
W. Sillitto (University of Edinburgh)
- Thermobonding of liquid crystal displays* 189
B Robshaw (Challenger Components)
- Numerical modelling of image formation in the optical microscope* 191
M. Pether (Imperial College)

Lasers and Spectroscopy

- Efficient amplification of a single-mode laser diode via photorefractive beam combination using an injection locked diode array pump* 193
S. MacCormack and R. W. Eason (University of Southampton)
- Spectroscopic measurements of directly activated photochromic filters* 195
P. W. King (Paisley College of Technology)
- Growth and characteristics of single crystal sapphire fibres doped with titanium ions* 197
J. H. Sharp, T. J. P. Han, B. Henderson, R. Illingworth, I. S. Ruddock (University of Strathclyde)
- Numerical calculation of stability of synchronously pumped mode-locked dye lasers* 199
D. G. H. Andrews (University of Essex)
- CARS thermography using an unintensified CCD detector* 201
J. D. Black (Rolls Royce)

WEDNESDAY 19th SEPTEMBER

- 08:00 - 18:00 Registration (T1 Reception area)
- 10:00 - 17:00 Exhibition (Rooms T1-18 and T1-34)
- 19:00 for 19:30 Conference Dinner (Cripps Hall)

PLENARY SESSION Chair: N Halliwell

- 09:00 *Fringe analysis: a survey with applications* 205
H. J. Tiziani (Universität Stuttgart) [**Invited**]

09:40	<i>Engineering diffraction: customising submicron grating structures</i> M. T. Gale (Paul Scherer Institute) [Invited]	207
10:20	COFFEE, POSTER SESSION (in Exhibition Halls)	
OPTICS '90		
Session 3: Imaging and Scattering		
10:50	<i>Multiple scattering from rough surfaces using the Kirchhoff approximation</i> N. C. Bruce (Imperial College)	211
11:10	<i>Experimental observation of enhanced backscatter from a rough dielectric film on a reflecting substrate</i> A. J. Sant and J. C. Dainty (Imperial College)	213
11:30	<i>Double passage imaging through atmospheric turbulence</i> T. Mavroidis, C. J. Solomon and J. C. Dainty (Imperial College)	215
11:50	<i>Reconstruction of objects from simulated photon-limited stellar speckle data using the exponential filtering method</i> J. V. Black and J. G. Walker (King's College, London)	217
12:10	<i>Superresolving scanning optical microscopy: the practical application of singular system theory</i> J. G. Walker, E. R. Pike, R. E. Davies, M. R. Young, and M. Bertero (King's College London)	219
12:30 LUNCH AND POSTER SESSION		
Session 4: Components and Devices I		
14:30	<i>The optics of spatial-light-modulator pixels</i> R. M. Sillitto et al (University of Edinburgh)	223
14:50	<i>Design criteria and fringing field effects on the optical performance of liquid crystal Fresnel lenses</i> G. Williams, A. Purvis and M. C. K. Wiltshire (University of Durham)	225
15:10	<i>The use of microlens arrays in integral imagery</i> M. C. Hutley and R. F. Stevens (National Physical Laboratory)	227
15:30	<i>Miniature silicon micromachined Fabry-Perot interferometers for use in optical fibre WDM systems</i> D. J. Clift, P. A. Rosher, S. Fenning, S. R. Mallinson, J. H. Jerman (British Telecom Research Laboratories)	229
15:50	TEA, POSTER SESSION (in Exhibition Halls)	

Session 5: Components and Devices II

16:20	<i>Genetic algorithm solution to computer generated holograms</i> A. G. Kirk, R. G. Hoptroff and Dr. T. J. Hall (King's College London)	233
16:40	<i>Mirror backed volume transmission gratings</i> G. R. Chamberlin and D. E. Sheat (British Telecom Research Laboratories)	235
17:00	<i>Diffractive optical elements for optical interconnects using surface relief structures</i> G. C. Baister, T. J. Hall (King's College London)	237
17:20	<i>Balanced fibre interferometry: effect of dispersion on visibility</i> J. G. Burnett, J. D. C. Jones and A. H. Greenaway (Heriot-Watt University)	239
17:40	<i>Local deadtime effects in imaging photon detectors</i> A. Sharma, J. G. Walker (King's College, London)	241

FRINGE ANALYSIS [FASIG]

Session 1: Techniques I

10:50	<i>Phase stepping fringe analysis applied to moiré interferometry</i> J. B. Brownell and R. J. Parker (Rolls-Royce)	245
11:10	<i>The extraction of quantitative data from digitally stored images</i> P J Brynanston-Cross, T J Judge, D P Towers and C A Towers (Warwick University)	247
11:30	<i>Techniques and application of online fringe analysis</i> Dr. B. Breuckmann (Opto-Tech)	249
11:50	<i>Computerized TV-holography for fast analysis of low-amplitude vibrations</i> G. O. Rosvold and S. Ellingsrud (Norwegian Institute of Technology)	251
12:10	<i>Phase-stepping methods of fringe pattern analysis in moiré interferometry</i> M. Kujawinska, K Patorski (Warsaw University of Technology)	253
12:30	LUNCH AND POSTER SESSION	

Session 2: Techniques II

14:30	<i>High accuracy Fourier transform fringe pattern analysis</i> M. Kujawinska, J. Wojciak (Warsaw University of Technology)	257
14:50	<i>Fringe-contrast evaluation by Fourier-transform method</i> Marek J Matczak (University of Szczecin)	259
15:00	<i>The potential of neural networks for the analysis of interferometric contour maps</i> D. R. Burton and M. J. Lalor (Liverpool Polytechnic)	261
15:20	<i>Ordered phase unwrapping</i> D. M. Shough (Lockheed Palo Alto Research Labs)	263

15:50 TEA, POSTER SESSION (in Exhibition Halls)

Session 3: Applications 1

16:20	<i>Phase-shifting speckle interferometry for complete in-plane displacement measurement</i> A. J. Moore and J. R. Tyrer (Loughborough University of Technology)	267
16:40	<i>Two-wavelength phase-stepping interferometry for absolute length measurement</i> A. Lewis (National Physical Laboratory)	269
17:00	<i>Phase-stepping pulsed holography for vibration analysis: A numerical simulation and the application of the technique in an industrial environment</i> V. B. McKee and R. J. Parker (Rolls Royce)	271
17:20	<i>Holographic interferometry using anisotropic self-diffraction in $Bi_{12}SiO_{20}$</i> R. C. Troth and J C Dainty (Imperial College)	273
17:40	<i>Digital phase-shifting interferometry and its application to automotive structures</i> C. Buckberry and J. Davies (Rover Group)	275

POSTER SESSION

Optics '90

	<i>Antireflection coating of semiconductor injection laser facets using resistive-heating evaporated SiO_x</i> R. W. Adama-Acquah (Leicester Polytechnic)	279
	<i>Fiber Mechanoptics</i> S-A Zhou (Royal Institute of Technology)	281
	<i>3D Deformation measurements using ESPI and DSPI</i> B. L. Button, B. N. Dobbins, S. P. He, S. Kapasi and L. S. Wang (Nottingham Polytechnic)	283
	<i>A source of stable, spatially uniform and tunable monochromatic radiation and its application</i> V. E. Anderson, N. P. Fox and D. H. Nettleton (National Physical Laboratory)	285
	<i>Bend losses in large core multimode optical fibre</i> A. A. P. Boechat, D. Su, D. R. Hall and J. D. C. Jones (Heriot-Watt University)	287
	<i>Compensation for thermal time constant induced distortions in current induced frequency modulation of diode lasers</i> P. G. Sinha, D. Anderson, S. Kidd, H. J. Baker, J. S. Barton and J. D.C. Jones (Heriot-Watt University)	289
	<i>Temperature dependence of bending loss in monomode optical fibres</i> R. Morgan, J. S. Barton, P. G. Harper, J. D. C. Jones (Heriot-Watt University)	291
	<i>Estimation of a 2D phase distribution using a Fourier iteration method: effect of the number of quantization levels</i> S. Komatsu and J. C. Dainty (Imperial College)	293

<i>Blind deconvolution of a blurred picture using an iterative algorithm</i> S. Komatsu and J. C. Dainty (Imperial College)	295
<i>Enhanced image quality obtained from lens-array systems by the use of wavelength multiplexing</i> R. F. Stevens (National Physical Laboratory)	297

Fringe Analysis

<i>The application of sub-micron particle visualisation for PIV (particle image velocimetry) at transonic speeds</i> P J Bryanston-Cross (Warwick University)	299
<i>A modified shearing interferometer and interferogram analysis</i> L. Ping, L. Changjiang, C. Xiaolan (Physikalisch Technische Bundesanstalt)	301
<i>Surface profile determination by real time digital signal processing of interferometric contour fringe data</i> G. R. Halsall, D. R. Burton, and M. J. Lalor (Liverpool Polytechnic)	303

THURSDAY 20th SEPTEMBER

08:00 - 12:00 Registration

PLENARY SESSION Chair: M. Hutley

09:00	<i>Progress and problems in optical coatings</i> H. A. Macleod (Optical Sciences Center) [Invited]	307
09:40	<i>Generalization of phase-measuring interferometry</i> T. Yatagai and G. Lai (University of Tsukuba) [Invited]	309

10:20 COFFEE

OPTICS '90

Session 6: Thin Films

10:50	<i>Developments in optical thin film coatings by molecular beam deposition</i> I. T. Muirhead, S. P. Fisher, J. F. Leonard, J. G. H. Mathew, P. P. M. Meredith (OCLI Optical Coatings)	313
11:10	<i>Novel techniques for optical thin films</i> J. A. Savage (Royal Signals & Radar Establishment)	315
11:30	<i>MPACVD of rugate filters</i> R. M. Wood, B. A. Nichols, A. C. Greenham and N. Nourshargh (GEC Hirst Research Centre)	317

- 11:50 Post-deadline paper
 12:10 Post-deadline paper
 12:30 LUNCH

FRINGE ANALYSIS

Session 4: Applications II

- | | | |
|-------|---|------------|
| 10:50 | <i>Flame temperature measurement using ESPI and Holography</i>
B. L. Button, B. N. Dobbins, S. P. He, S. Kapasi and L. S. Wang (Nottingham Polytechnic) | 321 |
| 11:10 | <i>Recording and analysis of sinusoidal vibrations using TV-holography and PC-based digital image processing</i>
S. Ellingsrud and G. O. Rosvold (Norwegian Institute of Technology) | 323 |
| 11:30 | <i>Fourier analysis of partial field fringe patterns</i>
P. C. O'Donovan, D. R. Burton and M. J. Lalor (Liverpool Polytechnic) | 325 |
| 11:50 | <i>CCD detection of an interference correlogram in white-light interferometry for precision position sensing</i>
S. Chen, B. T. Meggitt and A. J. Rogers (King's College, London) | 327 |
| 12:10 | <i>Automatic holographic fringe pattern analysis</i>
D. P. Towers, P. J. Bryanston-Cross and C. E. Towers (Warwick University) | 329 |

INSTRUCTIONS FOR SPEAKERS

All speakers should check-in at the Slide Preview room (close to the reception area in Building T1) **30 minutes** before the start of their Session. This should be done even if the speaker is not using slides or other material requiring to be previewed.

Each Lecture Room is equipped with a 35mm slide projector, overhead transparency projector, portable microphone and laser pointer. Since the Rooms are large, holding a maximum of 250 persons, speakers should pay particular attention to giving an audible presentation that can be heard clearly by everyone in the room.

As a guideline for legibility of slides and overheads, there should be no more than six lines of text on each transparency. Complex mathematical formulae should be avoided unless they are essential to the point being made.

Invited Papers have been allocated 35 minutes plus 5 minutes for discussion.

Contributed Oral Papers have been allocated 15 minutes plus 5 minutes for discussion.

These times must not be exceeded and speakers are strongly urged to respect the time allowed for discussion.