Wargaming for Professionals

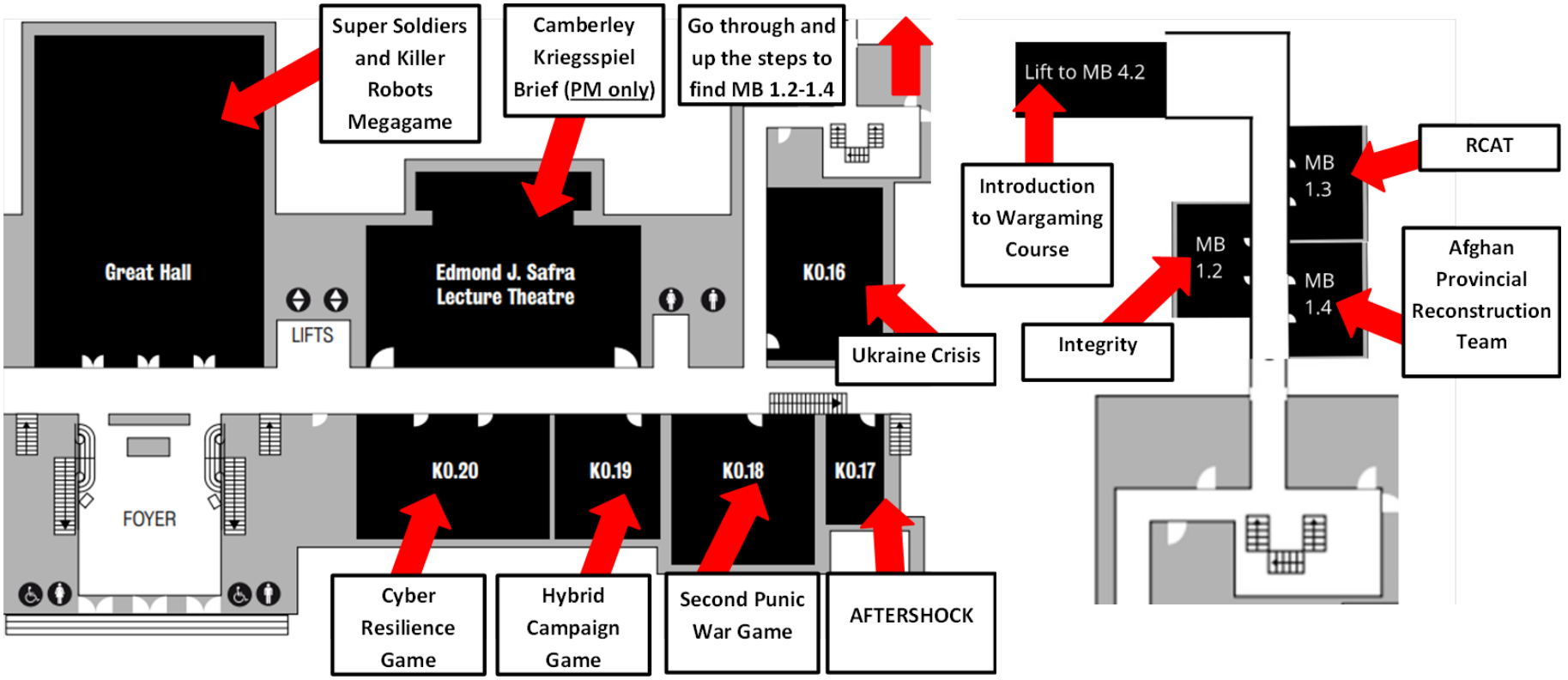
King's College London

September 3rd – 5th 2019

Day 1: Tuesday 3 September 2019

Time	Event	Chair/Speakers	Remarks
0900 - 0930	Arrival and drinks – KCL Great Hall Entrance		
0930 - 0945	Welcome and introduction – Safra Lecture Theatre	Maj Tom Mouat, Prof Philip Sabin, Colin Marston and Graham Longley-Brown	Daily conference structure and locations, followed by move to various locations
1000 - 1300	**Introduction to Wargaming Course** – K4.2	Maj Tom Mouat and Jerry Elsmore	All day
1000 - 1300	**Diverse Game Formats and Adjudication Methods** – Great Hall, MB1.1, 1.2, 1.3 and 1.4, K0.16, 0.17, 0.18, 0.19 and 0.20 Drinks 1100 -1130 – Great Hall Entrance	**Games:** (signed up to pre-conference) 1. *Megagame*: Super Soldiers & Killer Robots 2035– Jim Wallman 2. *Map & counter*: Ukraine crisis – Rik Stolk and Graeme Goldsworthy 3. *Map & counter computer-assisted wargame*: RCAT Full-Spectrum Adjudication – Graham Longley-Brown, Jeremy Smith, Dstl, NSC and Slitherine 4. *Card-driven* game: Cyber resilience game – LTC Thorsten Kodalle	Megagame all day; others 2 x ½ day sessions. See map on next page for locations 5. '*Euro-style' board game*: AFTERSHOCK Humanitarian Crisis Game – Prof Rex Brynen 6. *Board game*: Integrity: Conflict Sensitivity and Corruption – Paul Howarth 7. *Matrix game*: Hybrid campaign game – Anja van der Hulst 8. *Map & counter*: Afghanistan Provincial Reconstruction Team (PRT) Game – Roger Mason 9. *Map & counter plus negotiation*: 2nd Punic War – Phil Sabin
1300 - 1400	Lunch		Pay as you dine in King's Kitchen or snack bar
1400 - 1745	**Introduction to Wargaming Course** – K4.2	Maj Tom Mouat and Jerry Elsmore	
1400 - 1745	**Diverse Game Formats and Adjudication Methods** – Great Hall, MB1.1, 1.2, 1.3 and 1.4, K0.16, 0.17, 0.18, 0.19 and 0.20 and Safra Lecture Theatre Drinks 1530-1600 – Great Hall Entrance	**Games:** (signed up to pre-conference) Megagame all day; others 2 x ½ day sessions **As morning session** plus at 1400 in the Safra Lecture Theatre: *Three-table double-blind wargame*: Camberley Kriegsspiel – Ivor Gardiner. This is a briefing only, which will include recruiting participants for the Day 2 Games Fair	
1800 – 1900	Wargame component production and map generation – K4.2	Maj Tom Mouat	Informal evening session

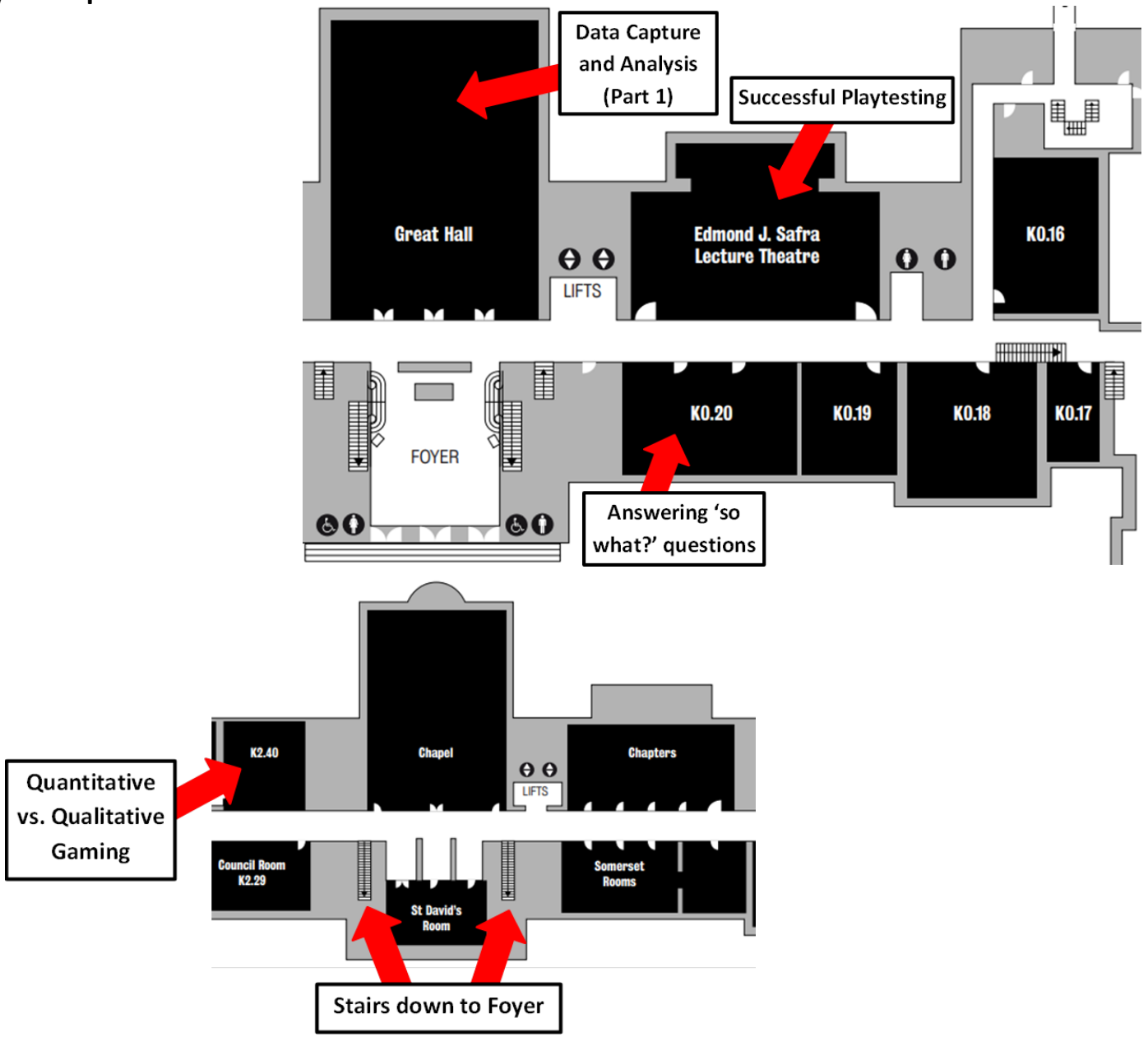
Day 1 Game Locations



Day 2: Wednesday 4 September 2019

Time	Event	Chair/Speakers	Remarks
0830 - 0900	Arrival and drinks – KCL Great Hall Entrance		
0900 - 0915	Welcome and introduction – Great Hall	Maj Tom Mouat, Prof Philip Sabin, Colin Marston and Graham Longley-Brown	Daily conference structure and locations
0915 - 1020	**Plenary 1: The Psychology of Wargaming** – Great Hall Drinks 1020-1045 – Great Hall Entrance	Chair: Dr Aggie Hirst Capt Philip Matlary, Norwegian Army Prof Neil Verrall, Dstl Dr Yuna Wong	15 minutes per speaker then 15 minutes Q&A Chair 5 minutes
1045 - 1145	**Deep Dive 1**. Simultaneous: • **Quantitative vs Qualitative Gaming** • **Answering 'So what?' Questions** • **Successful Playtesting** • **Data Capture & Analysis (Part 1)**	Prof Phil Sabin Jim Wallman Graham Longley-Brown and Dr James Bennett Colin Marston	Sessions signed up to pre-conference. See map on next page for locations
1150 - 1230	**Keynote. Dr Lynette Nusbacher: There's No Pro like an Old Pro: Professionalism and Wargaming** – Great Hall		
1230 - 1245	**Games Fair Introduction** – Great Hall	Prof Phil Sabin	Games signed up to pre-conference
1245 - 1345	Lunch		Pay as you dine in King's Kitchen or snack bar.
1345 - 1615	**Games Fair Session 1 -** Venues to be confirmed during Introduction Drinks 1615-1645 – Great Hall Entrance	1. Anti-Submarine Warfare: a game for understanding the basics – Ed Oates 2. *Crisis in Zefra*: An analytical matrix game – US Naval Postgraduate School 3. The Camberley Kriegsspiel – Ivor Gardiner 4. Signal – Sandia Labs and Berkeley 5. *Sweeping Satellites* –Mike Sheehan and Mark Flanagan 6. FITNA: The global war in the Middle East – Pierre Razoux 7. *Dogfight* – Phil Sabin 8. *Decisions and Disruptions* cyber game – Dr Ben Shreeve 9. *Rosenstrasse* – Graham Longley-Brown 10. *Fire and Movement* - Mark Flanagan 11. *Next War: Poland* – Callum Nicholson	12. Confrontation Analysis: Wargaming the US/China trade war - Dstl 13. *We Are Coming, Nineveh!* –Rex Brynen 14. *A Reckoning of Vultures* –Rex Brynen 15. *The Al Asqa Intifada* - Stella Guesnet 16. *Beggars in Red: The Battle of Waterloo* – James Bridgman 17. Cyber card game - Dstl 18. Combat mission tactical computer wargame - Dstl 19. *STRIKE!* – Dstl 20. Strategic Wargame *Verden Crisis* – Dstl 21. *Canvas Aces* –Phil Sabin 22. *Kursk to Kamenets: The battle for the Ukraine 1943-1944* – James Halstead	
1645 - 1915	**Games Fair Session 2 -** Venues to be confirmed during Introduction		

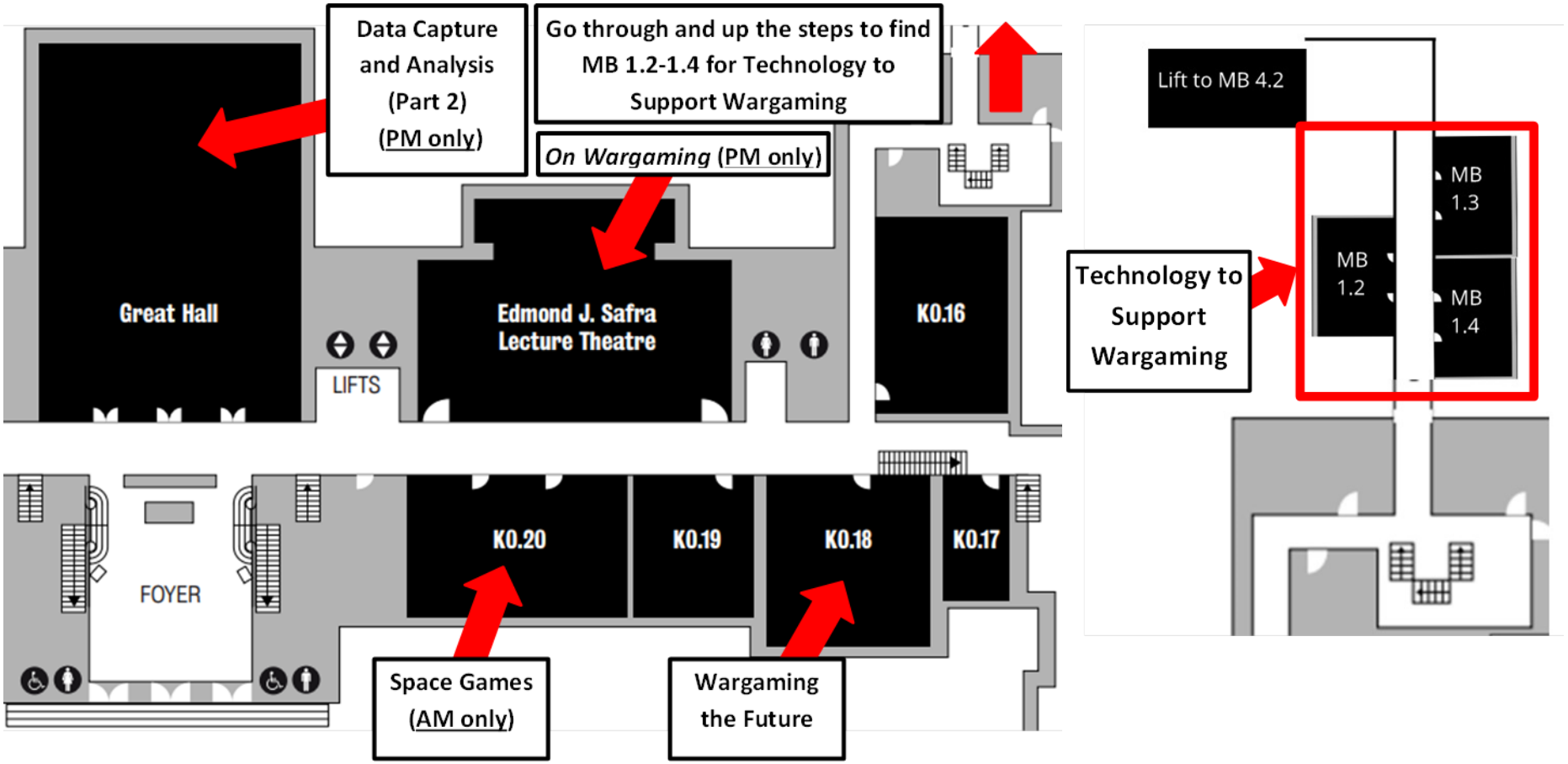
Day 2 Deep Dive Locations



Day 3: Thursday 5 September 2019

Time	Event	Chair/Speakers	Remarks
0830 - 0845	Arrival and drinks – KCL Great Hall Entrance		
0845 - 0915	Welcome and introduction – Great Hall	Maj Tom Mouat, Prof Philip Sabin, Colin Marston and Graham Longley-Brown	Daily conference structure and locations
0915 - 1020	**Plenary 2: Wargaming Hybrid Operations (including Cyber)** – Great Hall Drinks 1020-1045 – Great Hall Entrance	Chair: John Curry Dr Ben Shreeve Roger Mason	15 minutes per speaker then 15 minutes Q&A Chair 5 minutes
1045 - 1215	**Deep Dive 2**. Simultaneous: • **Wargaming the Future** • **Space Games** • **Technology to Support Wargaming**	Dr Stephen Downes-Martin and Stephen Aguilar-Millan Jim Wallman, Prof Mike Sheehan, Stephen Etheridge Andrew Elliott, Dstl, NSC, Slitherine, DIEM, Smithery, Red Scientific/HQ ARRC and DeepBlue/MWC	Sessions signed up to pre-conference. See map on next page for locations
1215 - 1315	Lunch		Pay as you dine in King's Kitchen or snack bar
1315 - 1400	**Deep Dive 2** *continued*: • **Wargaming the Future** • ***On Wargaming*** • **Data Capture & Analysis (Part 2)** • **Technology to Support Wargaming**	Stephen Downes-Martin and Stephen Aguilar-Millan Matt Caffrey and Dr James McClelland Colin Marston NSC, Slitherine, DIEM, Smithery, Red Scientific/HQ ARRC and DeepBlue/MWC	Sessions signed up to pre-conference. See map on next page for locations
1400 - 1515	**Plenary 3: The Selection and Use of Commercial off the Shelf and Modified off the Shelf (COTS/MOTS) Games** – Great Hall Drinks 1515 - 1530 – Great Hall Entrance	Chair: Colin Marston Jim Wallman and Jeremy Smith (Dstl air games review) Paul Beaves (Dstl land games review) William F. Owen (Wilf) Lt Col Ranald Shepherd	15 minutes per speaker then 10 minutes Q&A Chair 5 minutes
1530 - 1615	**Keynote:** Senior Military Officer – Great Hall		
1620 - 1700	**Plenary 4: Gaming Peace and Stabilisation Operations** – Great Hall	Prof Rex Brynen	
1700	Closing remarks	Prof Phil Sabin and Colin Marston	

Day 3 Deep Dive Locations



Speaker and chair biographies

Stephen Aguilar-Millan is the Director of Research of the European Futures Observatory, a Foresight Research Institute based in the UK, where he manages the research of a team of 12. The Observatory specialises in providing insights into how the world might be in the second half of this century. Stephen's specialisation within the team is directed towards the economy and the financial system, and how this may impinge upon future geo-politics. In wargaming terms, Stephen specialises in economic and financial wargaming, of which he has over 25 years of experience. He holds a number of advisory positions with a number of public bodies around the world, and he advises a number of private sector firms on these matters.

Paul Beaves is an independent defence consultant with 16 years' experience in the British Army, serving in the Royal Armoured Corps, with operational tours of Kosovo, Iraq and Afghanistan. He has a BA from Kings in War Studies, and an in service MA, again with Kings, 'War in the Modern World', where his dissertation was on Urban Combat. Paul has conducted numerous manual wargames, constructive and virtual simulations, both as a Dstl Military Adviser and latterly as a consultant. Whilst working at Roke Manor Research he designed the Cyberstrike tactical CEMA wargame, which was used by CD Info for understanding the problem space of using cyber and EW effects at the tactical level. Paul specialises in using Surrogate Red Team wargaming methodology to understand threats and vulnerabilities to capability, recently using this technique to assist the National Crime Agency. A lifelong fan of painting things then making them fight each other, Paul is currently working with Dstl as a Red cell player for their analysis work in support of British Army Force development.

Rex Brynen is Professor of Political Science at McGill University, specializing in Middle East politics and regional security; peace, stabilization, and humanitarian operations; and political-military wargaming. He is author or editor of a dozen books on the Middle East and related topics, including Beyond the Arab Spring (2012). He is also senior editor of the conflict simulation website PAXsims (http://www.paxsims.org), designer of the humanitarian crisis simulation AFTERSHOCK, and a co-designer of MaGCK: Matrix Game Construction Kit and We Are Coming Nineveh! Prof. Brynen received the International Studies Association's Deborah Gerner Innovative Teaching Award for his work on classroom simulations. In addition to his academic work, he has served as an intelligence analyst, and as a consultant to various governments, United Nations agencies, and the World Bank.

Matt Caffrey is currently a civil servant assigned to Headquarters Air Force Research Laboratory (AFRL) at Wright Patterson AFB. His duties include leading Future Analytical Science and Technology (FAST) wargames, teaching the Air Force Material Command (AFMC) Wargame Course and AFRL and liaison to AFMC for wargaming. His prior positions include helping to stand up the HQ AFMC wargame branch and lead of the Future Warfare Analysis Team, Directorate of Plans and Programs, Headquarters AFRL. He has previously served as Professor of Wargaming and Campaign Planning at the Air Command and Staff College (ACSC), Research Associate at the School of Advanced Airpower Studies, and Senior Analyst for the SYSCON Corporation, supporting the Air Force Wargaming Institute (all at Air University, Maxwell Air Force Base, Alabama). He is a retired colonel in the Air Force Reserve. His final military assignment was as Senior Reservist, Information Directorate, AFRL. Previous duty assignments were as Chief of Wargaming Strategy Development in the Air Staff's Checkmate Division, in Washington, D.C., and at the major air command, wing, group, and squadron levels. Colonel Caffrey is the developer of the "third-generation war game" concept, the Strategy Cycle (sometimes called the "Caffrey Loop"), and the Caffrey Triangle. In 1993 he helped found the Connections interdisciplinary wargame conference and in 2013 helped found Connections UK. He created the ACSC wargame elective course, the AFRL wargame course and the AFMC wargame course. Colonel Caffrey is the designer of AFMC's Agile Combat Support Science and Technology Wargame, the AFRL/Royal Air Force Agile Combat Support Science and Technology Wargame, the Air

Force Research Laboratory Wargame, the Engineer/Strategist Exercise, the Joint Resource Allocation Exercise (JRAX), the Joint Deployment Employment Exercise (JDEX), and several others.
He is the author of On Wargaming, Newport, Naval War College Press, 2019, co-author (with Frank Chadwick) of Gulf War Fact Book, Normal, Ill.: Game Designers Workshop, 1991, and has written several chapters and many articles on wargaming, airpower, and defense issues. He has spoken on wargaming; internationally from the German War College, to the United Kingdom's Defense Research Establishment, and in the United States from the Pentagon to Silicon Valley. A former member of the Air University Red Team, he has served on Blue, Red or White teams for Air Force, Navy, and Army Title 10 wargames.

John Curry has an international reputation in conflict simulations/ serious games and has worked with many of the key personalities in the field. He is a senior lecturer in games development and cyber security at Bath Spa University, in the UK. As the chief editor of the History of Wargaming Project, he has authored/ co-authored/ edited more than 80 books on various aspects of wargaming. This includes handbooks on the application of innovations such as Matrix Games and Confrontation analysis to professional wargaming. He has worked on games with the MOD, DSTL, RN, BAE, Pentagon (Office for Net Assessment) and other public sector organisations. These games have ranged from conflict on the Cold War Central Front, to confrontations short of war, such as over resources, banking crises and BREXIT. Currently, he is spending a lot of time considering new ways of modelling cyber conflict. In his spare time, he plays games.

Dr Stephen Downes-Martin is a Research Fellow at the US Naval War College and an independent scholar analysing the use and abuse of wargaming and other decision support tools at the strategic, operational and tactical levels of warfare and business. His current research focus is how to manipulate wargame design, adjudication and analysis to deceive decision makers, how decision makers deceive themselves and allow themselves to be deceived, how to detect such manipulation and protect decision makers from them. His full bio, contact details and published papers are at https://sites.google.com/site/stephendownesmartin/

Laura Epifanovskaya is a systems engineer and deterrence research analyst at Sandia National Laboratories specializing in cyber resilience of high-consequence systems and the dynamics of interconnected nations in conflict as they relate to nuclear deterrence. In her eight years at the laboratory, she has worked on several national security programs, including as an analyst for various government agencies and as a system and electrical component designer on multiple nuclear weapon programs. She received a Bachelor's degree in Chemistry and Spanish Language from Loyola University in 2004, and a PhD in Physical Chemistry from the University of Southern California in 2010.

Stephen Etheridge has been wargaming with rules, a measure and dice since he was twelve years old. Prior to that he used marbles fired from a spring loaded model of a Colt 45. He has studied military history even longer. For the past 20 years Stephen's "day job" has been in the field of Natural Language Processing and Information Extraction. He has consulted to most of the UK security and law enforcement agencies at one time or another and continues to do so. Another

client of his was ESA. He is (currently) the Principal Solution Architect at BMT Defence and Security, where he is associated with BMT's emerging space initiatives and Operational Research work. Stephen is a member of the 'Abbeywood Irregulars' and as such regularly designs and runs games, particularly asymmetric and naval games.

Bethany L. Goldblum is an Associate Research Engineer in the Department of Nuclear Engineering at the University of California, Berkeley and Executive Director of the Nuclear Science and Security Consortium, a multi-institution initiative established by the National Nuclear Security Administration to conduct research and development supporting the nation's non-proliferation mission while expanding the talent pipeline. Her research explores fundamental and applied nuclear physics, scintillator characterization, multi-source analytics, experimental wargaming, and nuclear security policy. Goldblum leads the Bay Area Neutron Group, a research team focused on applied neutron physics for nuclear security applications, and founded and directs the Nuclear Policy Working Group, an interdisciplinary team of scholars developing policy solutions to strengthen global nuclear security. She has been involved with the Public Policy and Nuclear Threats Boot Camp nearly since its inception, and acted as director of the program since 2014. Goldblum maintains active collaborations with the US DOE National Laboratories, and is an affiliate at Lawrence Berkeley, Lawrence Livermore, and Sandia National Laboratories. She is author or co-author of more than 60 scientific publications. Goldblum received a Ph.D. in Nuclear Engineering from the University of California, Berkeley.

Tom Halliday has a 1st Class Honours Degree in War Studies and a 1st Class Post Graduate Degree in the same. Tom has been in the Defence Science and Technology Laboratory Wargaming and Historical Analysis team for a year and a half. In that time, he has designed a strategic level manual air game for a joint wargame and supported a number of wargames for land analysis, both manual and computerised. Tom is the Software Model Custodian for Combat Mission, and has overseen the development of the tool since the contract was agreed with the publishers and developer.

Dr Aggie Hirst is Lecturer in International Relations Theory and Methods in the Department of War Studies at King's College London. She is Principal Investigator on a Leverhulme Trust and British Academy funded research project exploring the US military's use of wargames to teach and train service members. She is author of Leo Strauss and the Invasion of Iraq (Routledge, 2013) and a number of scholarly articles, most recently 'Play in(g) International Theory' (Review of International Studies, 2019). She is currently writing a book titled The Politics of Play: Wargaming with the US Military, two chapters of which are under review with Oxford University Press.

LTC Thorsten Kodalle is a lecturer on security policy at the Command and Staff College of the German Armed Forces with a special focus on NATO, Critical Infrastructure and Cyber. He has a diploma in Social Science, assignments as a youth information officer, in the MoD, lecture on management and leadership and supported for several years computer assisted exercises at the Command and Staff College with constructive simulation. He is a member of the NATO research task group "Gamification of Cyber Defense/Resilience", an experienced facilitator of manual wargaming on the operational level for courses of action analysis, for operational analysis, operations research,

serious gaming and especially for matrix wargaming. His next project is the "Gamification of Strategic thinking" using "Scythe" to let players experience agile strategic planning techniques in a 5 teams competition (5x5=25 players experience) and the construction of a "Global Matrix Wargame" with a special focus on cyber warfare on the semantic level. You can reach Thorsten Kodalle on Linkedin: linkedin.com/in/thorstenkodalle

Kiran Lakkaraju is a Senior Member of the Technical Staff at Sandia National Laboratories, New Mexico in the Systems Research & Analysis III group. Kiran's research has been marked by extensive interdisciplinary efforts that bring together the social and computational sciences. Kiran has been investigating how games, including Massively Multiplayer Online Games and wargames can be used as a means to systematically and quantitatively study conflict escalation and global strategic stability. Kiran is a member of the Project on Nuclear Gaming (http://pong.berkeley.edu) which has developed one of the first experimental wargames, SIGNAL (https://pong.berkeley.edu/e-game/). Kiran has a background in artificial intelligence, multi-agent systems and computational social science. He holds a M.S. and Ph.D. in Computer Science from the University of Illinois at Urbana-Champaign.

Graham Longley-Brown has wargamed since aged six. A British Army Officer since 1986 (and still in the Reserves), he has used wargaming for professional purposes throughout his career, often as a lone champion for the technique. He was the UK Joint Services Command and Staff College Directing Staff Subject Matter Expert for wargaming from 2000-2002. Since leaving the Regular Army in 2003, Graham has consulted on all-matters professional wargaming. He has designed and delivered wargames at UK, European and Gulf State Staff Colleges, for the UK Army (at all levels), RAF, Royal Navy and Royal Marines, the NATO Joint Warfare Centre, UK Force Development and experimentation, Dstl, the American, British, Canadian and Australian Armies Programme, the Royal Brunei Armed Forces, the Pakistan National Defence University, the US Army in Europe and others. He is the leading developer of the Dstl/Cranfield Rapid Campaign Analysis Toolset (RCAT) manual simulation. He is a published author on professional wargaming: he was lead author for the MOD *Wargaming Handbook*; wrote the current Course of Action Wargaming section for the UK Army's *Planning and Execution Handbook*; and is about to publish *Successful Professional Wargames: A Practitioner's Handbook*. He is a co-founder of Connections UK.

Colin Marston is a Senior Principal Analyst within the Wargaming Team at the Defence Science and Technology Laboratory (Dstl). He has predominantly worked in the Support to Operations (S2O) environment, having been deployed as an Operational Analyst to Afghanistan and Iraq. At Dstl, he has project managed and provided technical leadership to a range of projects and has been involved in numerous international research collaborations. He ran Dstl's Stabilisation Programme for five years, which involved delivering numerous wargames using PSOM (a Peace Support Operations Model) for a range of NATO and MOD customers. In 2011 he was the Field Team Leader responsible for two large deployments of analysts (Dstl and US) to deliver wargames to support the future planning of the International Security Assistance Force (ISAF) mission in Afghanistan. This work received a Chief Scientific Award. It was also awarded the OR Society's President's Medal in 2012. He is the Technical Partner, alongside Cranfield University, for the Rapid Campaign Analysis Toolset (RCAT), a manual simulation tool that is used to support /enable a wargame. More recently, he has sponsored the development of the Matrix Game Construction Kit (MaGCK). He is a Fellow of the OR Society (FORS), has a BSc (Hons) in Physics with Astrophysics and served in the Army Reserve (Infantry). He is also a co-founder and member of the organising committee for the Connections UK professional wargaming conference in addition to being a co-author on the UK MOD Wargaming Handbook.

Roger C. Mason is the vice president of LECMgt LLC located in Camarillo California, USA. LECMgt produces wargames for a variety of clients including the US Center for Naval Analysis and National Défense University. He is the faculty member for wargaming at the Institute of Intelligence Analysis, Juan Carlos University in Madrid, Spain. He is a frequent presenter for the wargaming working group of the Military Operations Research Society. Roger is a contributor to wargaming magazines and serves as a play tester for several commercial game companies. He is a published author including contributing to the 2019 Art of Intelligence: More Simulations, exercises and games. He has a Master of Public Administration and a Ph.D. in Management and Decision Sciences. He is retired with 37 years of service with the United States Air Force Reserve/Air National Guard.

Captain Philip Matlary is a Norwegian army officer and teaches tactics at the Military Academy in Oslo. Prior to this, he has served mainly in cavalry regiments aboard CV90s and Leopard 2s, and was deployed to Afghanistan in 2007. Philip has spent the last year (re)introducing wargaming to the curriculum of Norwegian cadets, based on his research conducted during a number of study trips including those to Quantico, Shrivenham, Sandhurst and Brecon. He has been responsible for organising reciprocal visits of US and UK officers to Oslo to train the academy staff in wargaming. Philip also runs Stratagem.no, a website established to provide a platform for contemporary Norwegian military thinking. Philip holds an MA in War Studies from King's College London, a BA from the Norwegian Krigsskole, and has completed three years at the French engineering college INSA Toulouse.

Tom Mouat is a serving officer currently working at the Defence Academy of the UK where he is the Directing Staff Officer for Simulation and Modelling. He has over 30 years of experience in training, military exercise planning, simulation systems and wargaming. He has an MSc in Defence Simulation and Modelling and holds a PGCE. He has experience in a wide range of military training systems from the lower tactical level to the higher strategic level, as well as spending 5 years in the procurement of these systems. In addition, he lectures on simulation, modelling and wargaming (most recently in China and Poland); has designed games for education, including the MaGCK: Matrix Game Construction Kit; and facilitated Wargame events for diverse audiences, worldwide.

Dr Lynette Nusbacher is Devil's Advocate and Principal at Nusbacher & Associates, a boutique strategy firm operating largely in the City of London. She uses structured techniques, including wargaming, in order to help clients run strategically aligned businesses. She was Head of the Strategic Horizons Unit in the Cabinet Office's National Security Secretariat, where she led the futures work on two National Security Strategies of the United Kingdom. Before that she was Devil's Advocate to the Joint Intelligence Committee. Dr Nusbacher was Senior Lecturer in War Studies at the Royal Military Academy Sandhurst, and lectured in the Army Junior Division at the Joint Services Command and Staff College. She was a commissioned officer in the Canadian Forces and the British Army. She makes educational television programmes for the BBC and Discovery Channel. Dr Nusbacher took her doctorate in Modern History at Somerville College, Oxford, her MA in War Studies at Royal Military College of Canada, and her honours BA in History and Economics at the University of Toronto.

William (Wilf) Owen is a lifelong wargamer from 15mm through Micro-armour, to PC based online games, simulation and Dungeons and Dragons. His interest in professional wargaming has emerged in recent years due to his work consulting and advising on command, capability and doctrine in terms of testing force structures and tactical conduct. He served in both the Regular and Territorial Army from 1980-1993.

Paul Pearce has a 1st Class Honours Degree in Computer Science, a Post Graduate Diploma in Psychology and 36 years of operational analysis experience ranging across a number of areas but focusing mainly on computer modelling, simulations and wargaming, in support of analytical work.

Paul was active in Command and Control (C2) research and was appointed as UK lead on the NATO SAS-085 panel examining C2 Agility and Requisite C2 Maturity in 2009, becoming co-chair of SAS-085 during this period and leading the experimental programme of work. In March 2014 SAS-085 members were given a NATO Scientific Achievement Award recognising exceptional effort in significant research activities. Paul remained active in the field of C2 operational analysis and has written two book chapters related to C2 concepts and one book chapter on C2 simulation and modelling. Paul has championed the development of an approach to improve evidence based decision making within MOD and has been instrumental in developing an Evidence Framework which is transforming OA evidence assessment and in May 2016 Paul was awarded the Dstl Ken Bowen award in recognition of a significant innovative or inventive contribution to Dstl capability. Paul is currently involved in delivering analytical wargames in support of UK Army analysis and is a key member of the leadership team within the Dstl Wargaming Team.

Andrew Reddie is a doctoral candidate in the Charles and Louise Travers Department of Political Science at the University of California, Berkeley. He currently serves as deputy director for the Nuclear Policy Working Group and as a researcher for the Department of Nuclear Engineering, Goldman School of Public Policy, Center for Long-Term Cybersecurity, Berkeley Asia-Pacific Study Center at UC Berkeley, and the Project for Nuclear Gaming. He is also a Nuclear Science and Security Consortium Fellow and Bridging the Gap Fellow. He holds an MPhil in International Relations from Oxford University as well as an M.A. and a B.A. (hons.) from the University of California, Berkeley. Previously, he held research and editorial roles at the Center for Global Security Research at Lawrence Livermore National Laboratory, Business and Politics, the Canadian International Council, and the Council on Foreign Relations in Washington, DC. Andrew's work has appeared in a variety of academic and policy-oriented publications including Science, Journal of Cyber Policy, and the Bulletin of Atomic Scientists.

David Robson is a military simulation engineer and programmer with over 20 years' experience of supporting exercises for in UK, NATO and Middle East, including the UK Joint Command and Staff College at Shrivenham. Specialist areas include Air Campaigning, ISTAR, IADS, A2AD, Space Warfare and Military Assistance to Civil Authorities. Recent activity has focused on modelling emerging concepts such as Human Terrain, Urban operations and the impact of distributed C2 and autonomous systems. David has a background in hard sciences (Molecular Biology and Geology) and a MSc in Information Technology. In his spare time, he is a keen hobbyist wargamer and board gamer.

Philip Sabin is Professor of Strategic Studies in the Department of War Studies at King's College London. He has worked closely with the UK military for many years, especially through the University of London Military Education Committee, the Chief of the Air Staff's Air Power Workshop, and KCL's academic links with the Defence Academy and the Royal College of Defence Studies. Professor Sabin's research and teaching involves strategic and tactical analysis of conflict dynamics, with a particular focus on ancient warfare and modern air power. He makes extensive use of conflict simulation techniques to model the dynamics of various conflicts, and since 2003 he has taught a highly innovative MA option module in which students design their own simulations of past conflicts. He has written or edited 15 books and monographs and several dozen chapters and articles on a wide variety of military topics. His books Lost Battles (2007) and Simulating War (2012) both make major contributions to the scholarly application of conflict simulation techniques. Besides co-organising the annual Connections UK conference at KCL, he has taken part in several defence wargaming projects, and he worked with the British Army's Centre for Historical Analysis and Conflict Research on the initial design of the Camberley Kriegsspiel with which officers may practise battlegroup tactics. Professor Sabin is co-director of the King's Wargaming Network, which will take forward KCL's leading role in the academic study of wargaming after his upcoming retirement.

Michael Sheehan is Emeritus Professor of International Relations at Swansea University. He was previously Director of the Scottish Centre for International Security, University of Aberdeen, and the Callaghan Centre for the Study of Conflict at Swansea University. During the 1980's he also moonlighted for the Army Education Corps on the PQS2 programme, teaching at bases in GB, Northern Ireland, Germany, Cyprus and Oman. He is the author or editor of twelve books on international security, including The Arms Race (Martin Robertson, 1983), Arms Control: Theory and Practice (Basil Blackwell, 1986), Balance of Power: History and Theory (Routledge, 1996), National and International Security (Ashgate, 2000), Security: An Analytical Survey (Lynne Rienner, 2005), The International Politics of Space (Routledge, 2007) and (with Natalie Bormann), Securing Outer Space (Routledge, 2009). For the past 20 years he has specialised in military space issues. He has been a wargamer for 45 years, mainly with historical miniatures from the horse and musket period. Until Connections he had managed to keep his professional military space persona and wargaming hobby separate, but having been 'outed' as a wargamer for this conference, is combining the two for a game based on exploring the advantages and limitations of space satellites for military reconnaissance and force multiplication.

Lieutenant Colonel Ranald Shepherd was commissioned into the Royal Artillery in 1987. His operational experience includes; deployment with 7th Armoured Brigade as a FOO during the 1st Gulf War, Military Assistant, to the Senior British Military Officer, at US Central Command and Deputy Chief CJ35 in HQ RESOLUTE SUPPORT, Afghanistan. A qualified Instructor in Gunnery, he has been responsible for integrated artillery, air defence and combined arms training in Canada and the UK. After passing the UK's Advanced, Command and Staff Course in 2009; he has focused the later part of his career in the Army Personnel Centre. He has MAs from the University of Glasgow, Cranfield University and King's College London. A keen military historian he organises and leads Battlefield Studies to both UK and European battlefields. He has been wargaming since a teenager and is developing the use of COTS wargames for the professional development of military and civilian personnel.

Dr Ben Shreeve is a research associate at the University of Bristol. His work explores how individuals and organizations go about making cyber security decisions. He has been exploring this using the Decisions & Disruptions game. D-D challenges teams to help a fictional hydro-electric company (built in Lego) to improve their cyber security by identifying which investments the organization should make to maximize their finite budget and minimize the number of attacks suffered. He has worked closely with the Metropolitan Police Service to create new scenarios for D-D, and these are now being used by Police Forces across the UK. He has recently started working with City of London Police to create a new exercise (as part of the Cyber Griffin project) to help C-suite and senior management within the finance sector experience what it is like to suffer a major cyber incident. Collaboration with industry is key to this work and Ben has worked closely with a wide range of Government Departments and Multinational Organizations to help raise awareness of the importance of cyber security decision making.

Jeremy Smith is Head of the Centre for Simulation and Analytics, Cranfield University, UK Defence Academy. He has 15 years' experience in academia with Cranfield University at the UK Defence Academy. He previously worked in BAE Systems and for EASAMS Ltd on weapons development and assessment. He is head of the Centre for Simulation and Analytics at Cranfield which includes all of the Operational Analysis, Modelling and Simulation and Mathematical Analysis activities. This role involves teaching management and project management and consultancy and research. He lectures in systems engineering, defence acquisition, technology management and operational analysis/research topics. He leads research and consultancy activities including wargaming and other operational analysis/research developments, dismounted close combat systems, vehicle system developments, infantry training system simulations and technology trend analysis.

Professor Neil Verrall is a Senior Principal Psychologist with the UK's Defence Science and Technology Laboratory (DSTL) and has spent 20 years addressing the human aspects of behaviour and performance for numerous Defence & Security challenges. He holds degrees in psychology at bachelors, masters and doctoral levels, and is a chartered psychologist and Fellow of the British Psychological Society. Neil is currently a visiting professor at Royal Holloway University of London and a visiting fellow at the University of Oxford.

Jim Wallman is a professional game designer specialising in manual games for developing insights, strategy and team development and for education, with over twenty five years' experience in the field. These wargame game designs are informed by many years as senior civil servant in the Ministry of Defence, as well as senior roles in the voluntary sector. He has designed and delivered map wargames at political, strategic and operational level for the UK Defence community; board games, map games and concept development games for the British Army; over 40 sets of wargaming rules; and command and decision games covering issues such as equipment development, political crises, strategic planning, and civil disorder. He has worked extensively with the corporate, public, educational, entertainment and voluntary sectors, in particular designing and implementing games for senior leadership development and analytical wargames for the UK MOD, corporate and the voluntary sector. Also a regular guest lecturer on wargame design and development at Wolverhampton University. His background and training is primarily in the social science, psychology and military history fields, with a particular interest in the practical application of positive psychology to game structures and the development of immersive gameplay. His game designs in the recreational arena have now been played world wide in the USA, Canada, Australia, the Netherlands, France, Italy, Germany, Austria and New Zealand as well across the UK.

Yuna Huh Wong is a policy researcher whose work includes wargaming human-machine collaboration and manned-unmanned teaming in the Third Offset; surveying wargaming tools and approaches in support of Marine Corps wargaming; Army satellite bandwidth demand to support training; developing capacity metrics for Marine Corps wargaming; and developing scenarios using future trends for the Air Force. She is also a professor at the Pardee RAND Graduate School. Methodological areas of interest include scenario development, futures methods, multi-method approaches, wargaming, problem-structuring methods, and applied social science. She was previously an operations research analysis for Marine Corps. Her work there included joint scenarios and studies, interagency approaches, analyses for irregular warfare, and various Marine Corps topics such as civil affairs and enlisted professional military education. She holds a Ph.D. in policy analysis from the Pardee RAND Graduate School, where her dissertation was on non-combatants in urban operations and in military models and simulations. She has a M.A. in political science from Columbia University and a B.S. in economics and a B.S. political science from the Massachusetts Institute of Technology.

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King's College London is committed to creating an inclusive environment that promotes equality of opportunity for everyone in its community. A key guiding principle is to create an environment where diversity is welcomed and all individuals are valued and able to succeed. Please be mindful throughout the conference of the need to respect fellow attendees, to treat them equally and professionally at all times, and to avoid doing or saying anything which (however unintentionally) might cause personal offence or distress. If you have any queries or concerns, please speak in confidence to the conference organisers.