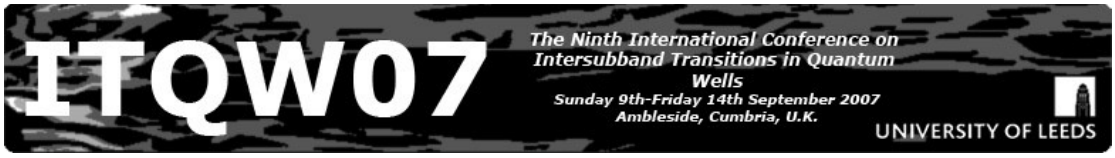

The Proceedings of

The Ninth International Conference on Intersubband Transitions in Quantum Wells

Low Wood Hotel, Ambleside, Cumbria, U.K.

9-14th September 2007

Edited by
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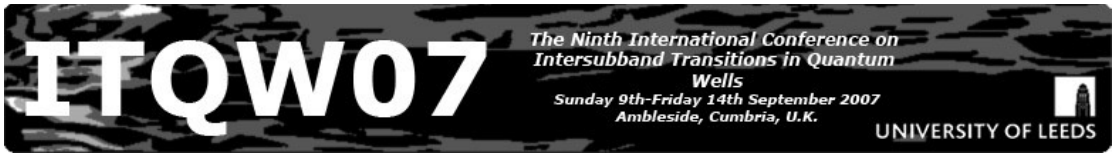

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We are very grateful for sponsorship from:

- The Engineering and Physical Sciences Research Council (EPSRC), U.K.
- The Semiconductor Physics group of the Institute of Physics
- The Quantum Electronics and Photonics group of the Institute of Physics
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ISBN: 978-0-85316-265-0

History and Background

ITQW07 will be the key event in 2007 in the area of intersubband transitions in quantum wells and intersublevel transitions in quantum dots. It is aimed at bringing together researchers from academia, government and industrial laboratories for scientific interaction, the showcasing of new results in the fields and debate on future trends. The conference series has a history dating back to 1991 with the first meeting in Cargese, France, followed by meetings in Whistler, Canada (1993), Ginosar, Israel (1995), Tainan, Taiwan (1997), Bad Ischl, Austria (1999), Monterey, USA (2001), Evolene, Switzerland (2003) and Cape Cod, USA (2005).

ITQW is a workshop style meeting with a mixture of oral presentations and vibrant poster sessions. A tradition of ITQW is to have plenty of opportunity to mix and network outside of the lecture theatre with planned free time and social events.

Scientific Topics

- **Physics and Fundamental Properties:** Intersubband and intersublevel transitions; theoretical studies, optical and electronic characterisation.
- **Novel materials:** Group IV, magnetic, wide-bandgap, Sb-based, advanced low dimensional semiconductors, new computational tools and novel design ideas
- **Mid-infrared and THz detectors:** Quantum well infrared photodetectors (QWIPs), quantum dot infrared photodetectors (QDIPs), non-linear detectors, high sensitivity or phase sensitive detectors, single photon detection and detector arrays from intersubband and intersublevel transitions.
- **Mid-infrared and THz sources:** Theory, design, growth, fabrication, optical and electronic structure characterisation of quantum cascade lasers, optically pumped intersubband/intersublevel lasers
- **Applications:** Near-, mid- and far-infrared (terahertz) sensing and imaging, free space communications

Organising Committee

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Local Organiser	Dragan Indjin
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Local Organiser	Zoran Ikonic
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H. C. Liu, Ottawa, Canada

Programme

Sunday 9th September

Time	Title
18.00-19.00	**Drinks reception**

Monday 10th September

ORALS

Time	Topic		Presenting author	Title
08.50-09.00	**Opening**		P. Harrison, University of Leeds	Welcome and opening remarks
09.00-09.40	**Intersubband Phenomena and Fundamentals** *Chair:* *R. W. Kelsall*	P0	C. C. Phillips, Imperial College, London (Plenary)	Introduction to intersubband transitions in quantum wells
0940-10.00		T1	A. Vasanelli, University Paris Diderot, France	Polaritonic emission from an electrically injected semiconductor device.
10.00-10.20		T2	H. Choi, University of Michigan	Dynamics of Photon-driven Electron Transport in InGaAs/InAlAs Quantum Cascade Lasers
10.20-10.40		T3	I. Savić, University of Leeds	Density matrix description of transport and gain in quantum cascade lasers in a magnetic field
10.40-11.00				**Coffee**
11.00-11.40	**Near- and MID-IR QCLs** *Chair:* *S. Hoefling*	IT 2	R. Teissier, CNRS/Uinversité Montpellier (INVITED)	Short wavelength InAs-based QC Lasers
11.40-12.00		T4	Q. Yang, Fraunhofer Institute	High quantum-efficiency GainAs/Al(Ga)AsSB quantum cascade lasers for the 3-5 μ m
12.00-12.20		T5	D. Revin, University of Sheffield	Short Wavelength and Strain Compensated InGaAs/AlAsSb Quantum Cascade Laseres
12.20-12.40		T6	M. Semtsiv, Humboldt University, Berlin	Inter-Valley Charge Transfer in Short-Wavelength InGaAs-AlAs Quantum Cascade Lasers
12.40-13.00		T7	K. J. Franz, Princeton University	Cascaded Emission from Excited State Mid-Infrared Quantum Cascade Lasers

l-2 pm				**Lunch**
16.00-16.20	**Cavities and Applications** *Chair:* *G. Scamarcio*	T8	M. I. Amanti, University of Neuchâtel	Study and improvement of THz Quantum Cascade laser beam-pattern for different waveguides configurations.
16.20-16.40		T9	E. Orlova, Instit. for Physics of Microstructures, N. Novgorod.	Directivity of sub-wavelength wire lasers.
15.40-17.00		T10	Y. Chassagneux, Universite Paris-Sud	Sub-wavelength optical mode volumes for terahertz quantum cascade lasers.
17.00-17.20		T11	A. Benz, University of Technology, Vienna	Photonic crystals used as resonators for terahertz quantum-cascade lasers.
POSTERS				
	Posters I and refreshment	P1	C. A. Evans, University of Leeds	Thermal modelling of THz quantum cascade lasers.
		P2	A. M. Andrews, Technical University of Vienna	Performance Dependence on Doping of THz Quantum-Cascade Lasers.
		P3	J. Freeman, University of Cambridge	Frequency tuning of THz bound-to-continuum QCLs.
		P4	N. V. Demarina, Nizhny Novgorod State University	Time scale for the semiclassical terahertz gain in a semiconductor superlattice with optically excited charge carriers.
		P5	R. Terazzi, University of Neuchâtel	Transport models for quantum cascade lasers.
5.20-7 pm		P6	N. Péré-Laperne, Ecole normale supérieure, Paris	LO-phonon emission by hot electrons in terahertz quantum cascade lasers.
		P7	J. R. Gao, SRON, Netherlands	Characterize THz quantum cascade lasers for local

				oscillator.
	reception	P8	W. Parz, Technical University of Vienna	Time domain spectroscopy of quantum cascade lasers: Gain clamping, spectral narrowing and short pulse circulation.
		P9	J. Radovanović, University of Belgrade	Contribution of Electron-Electron Interactions to the Total Electron Scattering Rates in Quantum Cascade Laser in Magnetic Field.
		P10	E. Mujagić, Technical University of Vienna	Doping density dependent performance of short-wavelength InP-based quantum-cascade lasers.
		P11	M. D'Souza, University of Wisconsin-Madison	Deep-Well GaAs-InGaAs-AlGaAs Quantum-Cascade-Laser Design for Room-Temperature Operation at 6.8 μm.
		P12	L. Q. Khai, Ajou University, South Korea	A Novel Band Structure Calculation for the Quantum Cascade Lasers with Conduction Band Nonparabolicity Effect.
		P13	F. Choa, University of Maryland	High Growth Temperature Studies of InAlAs/InGaAs Superlattices for High Performance QCL Applications.
		P14	M. V. Kisin, SUNY, New York	Electrically tuneable quantum cascade laser.
		P15	S. S. Howard, Princeton University	Current Injection Transition Broadening in Quantum Cascade Lasers.
		P16	M. Wagner, Institute of Beam Physics and Materials Research, Dresden	Two-colour pump-probe spectroscopy of electron dynamics in doped superlattices.

	Posters I	P17	D Barate, Scuola Normale Superiore, Pisa	InAs/AlSb structures for giant Rabi splitting of intersubband polaritons.
5.20-7 pm	**and refreshment**	P18	R. Steed, Imperial College, London	Optical Saturation of QW Intersubband Transitions in the Valence Band.
		P19	J. B. Khurgin, Johns Hopkins University, Baltimore	Intersubband Devices Operating in the Restrahlen Region.
	reception	P20	A. Leuliet, Univ. Paris	Modelling of Transport in Quantum Cascade Lasers and comparison with experiments.
		P21	M. F. Pereira, Sheffield Hallam University	Controlling bosonic effects in light intersubband-excitation coupling in nanostructures.
		P22	V. A. Harutyunyan, University of Armenia	Intersubband optical transitions in semiconductor cylindrical nanolayer in the presence of radial electrical field.
		P23	L. V. Gavrilenko, Instit. for Physics of Microstructures, N. Novgorod.	Intersubband dipole electron transitions involving donor resonant states in quantum wells.
		P24	S. P. Khanna, University of Leeds	Optimisation of the growth of terahertz quantum cascade lasers
		P25	G. Isić, University of Belgrade	Anisotropy of spin-dependent electron transport in nonmagnetic resonant tunnelling structures.
		P26	P. Dahan, Ruppin Academic Center, Israel	Spin-Selective Tunnelling in Deep Donor States of Interstitial Mn Impurity in GaAs Quantum Well.
		P27	H. Diehl, University of Regensburg	Magneto-Gyrotropic Photocurrents Induced by Intersubband Transitions in

				Quantum Wells.
		P28	E. Dupont, Institute for Microstructural Sciences, Ontario	Giant vacuum-field Rabi splitting of intersubband transitions.
		P29	I. D'Amico, University of York	Interplay between spin Coulomb drag and spin-orbit coupling in intersubband spin plasmons in quantum wells.
		P30	Z. Ikonić, University of Leeds	Interdiffusion effects on hole intersubband absorption in complex GaAs/AlGaAs quantum well structures.
		P31	J. Radovanovic, University of Belgrade,	Contibution of electron-electron Interactions to the total electron Scatteirng rates in Quantum Cascade Laser in Magnetic fields.

Tuesday 11th September

ORALS

Time	Topic		Presenting author	Title
09.00 - 09.40	QWIPS *Chair: M. Vitiello*	IT 3	S. Schartner, Technical University of Vienna (INVITED)	Probing the photonic band structure by resonant responsivity enhancement in QWIPs.
09.40 - 10.00		T12	C. Koeniguer, University of Paris	Quantum Cascade Detector at 5 micrometers.
10.00 - 10.20		T13	G. Bahir, Technion Institute, Israel	Quantum Cascade NIR-detection at room temperature in GaN/AlN heterostructure
10.20 - 10.40		T14	H. Schneider, Forschungszentrum Dresden	Quadratic autocorrelation and photocurrent saturation study in two-photon QWIPs.
10.40 - 11.00				**Coffee**
11.00 - 11.40	THz QCL I *Chair: A. Wacker*	IT 4	H. E.Beere, Cavendish Lab, Cambridge (INVITED)	MBE for THz QCL
11.40 - 12.00		T15	G. Scalari, University of Neuchâtel	Laser emission at 830 and 960 GHz from quantum cascade structures.
12.00 - 12.20		T16	S. Kumar, Massachusetts Institute of Technology	Terahertz quantum-cascade lasers with resonant-phonon depopulation: high-temperature and low-frequency operation.
12.20 - 12.40		T17	R. P. Green, Scuola Normale Superiore, Pisa	Time resolved photocurrent measurements of terahertz QCLs.
12.40 - 13.00		T18	M. S. Vitiello, University of Bari	Demonstration of high wall plug efficiency THz QCLs: investigation of the optical, electronic and

				thermal performance.
1-2 pm	**Lunch**			
	Boat trip		from Low Wood Jetty	
4 pm				
16.00 - 16.20	**MID-IR and THz QCLs** *Chair: E. E. Orlova*	T19	G. Scamarcio, University of Bari	Thermal and electronic analysis of GaInAs/AlInAs mid-IR QCLs.
16.20 - 16.40		T20	Z. Liu, Princeton University	Temperature-dependent Gain and Loss in Room-temperature Continuous-wave Quantum Cascade Lasers between 8.2-10.3 μm.
16.40 - 17.00		T21	M. Giehler, Paul Drude Insitute, Berlin	Mode behaviour, waveguide losses, and gain of two-sectioned, coupled-cavity GaAs/(Al,Ga)As terahertz and mid-infrared quantum-cascade lasers.
17.00 - 17.20		T22	H. Luo, National Research Council, Ottawa	THz-QCLs based on three-well active modules and injection barrier effects on device performance.
5.20-5.40pm	**Tea and Refreshments**			
17.40 - 18.00	**Intersubband Phenomena and Fundamentals II**	T23	I. Waldmueller, Sandia National Laboratories, New Mexico	Who needs population inversion? Automatically phase-matched quantum coherence contributions as a source for THz radiation.
18.00 - 18.20		T24	A. B. Hummel, Physikalisches Institut, Frankfurt	Ultrafast Fiske Effect and the Question of Chaotic Electron Motion Semiconductor Superlattices.
		T2	A. Seilmeier,	Coherent Intersubband Excitations

18.20 - 18.40	*Chair: C. Sirtori*	5	University of Bayreuth, Germany	on a Picosecond Time Scale.
18.40 -1900		T26	S. A. Tarasenko, IOFFE Institute, St Petersburg	Circular Photon Drag Effect in Quantum Wells

Wednesday 12th September

ORALS

Time	Topic		Presenting author	Title
09.00-09.40	**THz QCL II** *Chair: L. Wilson*	IT5	J. Darmo, Technische Universitaet, Wien (INVITED)	THz Quantum Cascade Lasers: THz Time-Domain Spectroscopy Study
09.40-10.00		T27	C. Walther, University of Neuchâtel	Long wavelength Terahertz Quantum Cascade Lasers emitting down to 1.2 THz.
10.00-10.20		T28	R. Nelander, Lund University, Sweden	The Effects of Temperature on the Gain Profile of THz Quantum Cascade Lasers.
10.20-10.40		T29	A. Wade, National High Magnetic Field Laboratory, Tallahassee, Florida	LO-phonon assisted injection observed in a THz Quantum Cascade Laser.
10.40-11.00				**Coffee**
11.00-11.40	**Non-linear Optics** *Chair: R.Colombelli*	IT6	A. Belyanin, Texas A&M University, Texas (INVITED)	Resonant Nonlinear Optics in Coupled Quantum Wells: From Lasers to Detectors.
11.40-12.00		T30	S. Barbieri, Université Denis Diderot, Paris	GHz sideband generation with THz quantum cascade lasers.
12.00-12.20		T31	M. A. Belkin, Harvard University	Development of Terahertz Sources Based on Intra-Cavity Difference-Frequency Generation in Quantum Cascade Lasers.
12.20-12.40		T32	C. C. Phillips, Imperial College, London	Wavelength conversion and All-Optical Switching in Quantum Cascade Lasers.

1-2 pm	**Lunch**			
14.00-14.20	**Quantum Dots**	T3 3	E. A. Zibik, University of Sheffield	Four wave mixing studies of polaron dephasing in InAs/GaAs self-assembled quantum dots.
14.20-14.40	*Chair: H. Sigg*	T3 4	N. Vukmirović, University of Leeds	Quantum transport in quantum dot cascade structures.
14.40-15.00		T3 5	L. Nevou, Université Paris-Sud, Paris	Intraband emission of GaN quantum dots at $\lambda = 1.5$ μm via resonant Raman scattering.
3 pm			**Guided walk to country pub**	

Thursday 13th September

ORALS

Time	Topic		Presenting author	Title
09.00-09.40	**Alternative materials I** *Chair: M. Giehler*	IT 7	N. Iizuka, Toshiba Corporation, Japan (INVITED)	Intersubband Transition in GaN/AlN Multiple Quantum Wells for Optical Switches.
09.40-10.00		T36	F. H. Julien, Université Paris-Sud, Paris	Room-temperature Intersubband Emission from GaN/AlN Quantum Wells at $\lambda \approx 2$ μm.
10.00-10.20		T37	M. Halsall, University of Manchester	Growth by MOVPE of AlGaN/GaN structures with intersubband transitions in the 1.2-1.7 μm region of the spectrum.
10.20-10.40		T38	M. Tchernycheva, Université Paris-Sud, Paris	Intersubband spectroscopy of electron tunnelling in GaN/AlN coupled quantum wells.
10.40-11.00				**Coffee**
11.00-11.40	**Cavities and Applications II** *Chair: M. Wanke*	IT 8	A. A. Anappara, Scuola Normale Superiore, Pisa (INVITED)	Harnessing light-matter interaction in intersubband microcavities.
11.40-12.00		T39	D. Austin, University of Sheffield	Quantum cascade lasers with facet-patterned nano-antennas for near field vibrational spectroscopy.
12.00-12.20		T40	J. Heinrich, Universität Wűrzburg	Quantum Cascade Microlasers with Two-Dimensional Photonics Crystal Reflectors.
12.20-12.40		T41	V. Moreau, Université Paris-Sud, Paris	Direct imaging of a laser mode via mid-infrared near-field microscopy.
12.40-13.00		T42	P. Dean, University of Leeds	Diffuse Terahertz Reflection Imaging Using Quantum Cascade Lasers.
1-2 pm				**Lunch**
16.00-16.20	**Alternative**	T43	K. Akita, Institute of Advanced	Ultrafast Intersubband All-Optical Switch in Wide-gap II-VI Quantum

			Industrial Science and Tech, Japan	Well toward Lower Switching Energy Operation.
16.20-16.40	**materials II** *Chair: C. Gmachl*	T44	G. Sun, University of Massachusetts	Strain Free Ge/GeSiSn Quantum Cascade Laser Based on L-valley Intersubband Transitions.
16.40-17.00		T45	M. Virgilio, University of Pisa	Selection rules for intersubband transitions in valley split [001]-Ge quantum wells.
17.00-17.20		T46	L. Lever, University of Leeds	The effects of inter-diffusion in Si-SiGe quantum cascade devices.
17.20-17.40			**Tea and refreshments**	
POSTERS				
	Posters II **and** **Refreshments**	P31	P. Aivaliotis, University of Sheffield	Increasing the dot density in quantum dot infrared photodetectors via antimony-mediated dot formation.
		P32	S. Menzel, University of Sheffield	Electron Capture and Relaxation in N-Type InAs/GaAs Quantum Dots.
		P33	K. Král, Institute of Physics of the ASCR, Cz.	Quantum effects in optical spectra line shapes and electronic relaxation in quantum dots.
		P34	W. Sheng, Fudan University, Shanghai	Origins of linear polarization of intersubband transitions in InAs/GaAs self-assembled quantum dots: a new picture.
17.40-19.00		P35	A. Vardi, Technion Institute of Technology, Israel	TE Polarized MIR Intraband Photodetection in Self Assembed GaN/AlN Quantum Dots.
		P36	M. Austerer, University of Technology, Vienna	Nonlinear light generation in GaAs quantum-cascade lasers.
		P37	M. Scheinert, Paul Scherrer Institut,	Raman Lasing and Femto-Second Intersubband Relaxation of coupled

			Switzerland	GaInAs/InAlAs QWs.
		P38	J. Bai, Institute of Technology, Georgia, U.S.A.	Performance Analysis of Mid-Infrared Quantum Cascade Lasers with Enhanced Optical Nonlinearity.
		P39	A. Lisauskas, Goethe University, Frankfurt, Germany	Internal Mixing in Active Semiconductor Devices for Room-Temperature Generation of Tuneable Continuous-Wave Terahertz Radiation.
		P40	I. Karabulut, University of Selcuk	The Second-Order Nonlinear Optical Susceptibilities of an Asymmetric Rectangular Quantum Well.
		P41	L. Nevou, Université, Paris-Sud, France	Second-harmonic generation of $\lambda \sim 1\ \mu$m enhanced by intersubband transitions of GaN/AlN quantum wells.
		P42	B. Passmore, Univerersity of Arkansas	Near-Infrared wavelength intersubband transitions in hexagonal and cubic GaN/AlN short period superlattices.
		P43	A. Ishida, Shizuoka University, Japan	Normal Incident Intersubband Absorptions in EuTe/PbTe Superlattices.
		P44	A. Valavanis, University of Leeds	n-type Si/siGe quantum cascade structures.
		P45	A. Valavanis, University of Leeds	Intervalley mixing and intersubband transitions in n-type Si/SiGe quantum wells.
		P46	A. Nafidi, Institute of Physics, New York	Band structures and new magneto-transport properties in HgTe/CdTe superlattices.
		P47	E. Benveniste, University Paris Diderot	Experimental and theoretical study of intersubband electroluminescent diodes based on different material systems.
	Posters II	P48	A. Hugi, University of	Room temperature continuous wave operation of an external

			Neuchâtel	cavity quantum cascade laser.
		P49	M. Zaluzny, M Curie-Sklodowska University	Microcavity effect on the nonlinear intersubband absorption in multiple-quantum-well structures: the strong coupling regime.
		P50	M. Bahriz, Université, Paris-Sud	Design of mid-Ir and THz quantum cascade laser cavities with complete TM photonic bandgap.
	and	P51	M. Maineult, Université Denis Diderot, Paris	Far Field Beam Patterns of Terahertz Quantum Cascade Lasers.
		P52	J. Semmel, Wűrzburg University	Edge Emitting InP based Quantum Cascade Microlasers with Deeply Etched Bragg Mirrors.
		P53	L. Mahler, Scuola Normale Superiore, Pisa	Terahertz quantum cascade lasers with quasi-periodic resonators.
17.40-19.00		P54	G. Fasching, Vienna University	Whispering-Gallery Quantum-Cascade Lasers in the Terahertz Frequency Regime.
		P55	J. Plumridge, Imperial College, London	Quantum Metamaterials for Plasmonics and Strong Coupling.
	Refreshments	P56	J. N Hovenier, Delft University	Beam patterns of distributed feedback surface-plasmon THz quantum cascade lasers.
		P57	M. Carras, QCL Laboratory	Broadband loss measurements in passive and active mid-infrared waveguides using Fabry-Pérot resonances.
		P58	P. Aivaliotis, University of Sheffield	Experimental and theoretical investigation of the spectral Stark shift in quantum dots-in-a-well infrared photodetectors.
		P59	A. Gomez, University of Paris	Magneto-transport measurements in Quantum Cascade Detectors.
		P60	S. K. Haywood, University of Hull	A Strain-compensated Mid-infrared Quantum Well Photodetector Operating at Zero

				Bias up to 250 K and in Photoconductive Mode up to 300K.
		P61	M. R. Matthews, Imperial College, London	Transient photoconductivity measurements of carrier lifetimes in a InAs/$In_{0.15}Ga_{0.85}As$ Dots-in-a-well detector.
		P62	A. Nedelcu, Thales Research and Technology	Quantum Well Infrared Photodetectors for two-colour MWIR imagery.
		P63	E.O. Karabulut, University of Selcuk	Intensity-Dependent Refractive Index of an Asymmetric Rectangular Quantum Well
		P64	V. Berger, University of Paris	QCDs versus QWIPs
		P65	H. Schneider, Forschungszentrum, Dresden	Intersubband relaxation dynamics in InGa/AlAsSb multiple quantum wells.
		P66	K. Nontapot, Virginia Tech.	Carrier Dynamics in InSb Based Quantum Well Structures.
		P67	A. Udal, University of Technology, Tallin	Efficiency Estimation for a Broadband 7 THz Radiation Source with GaAs/AlGaAs Parabolic Quantum Wells.
		P68	G. Bahir, Technion Institute-Israel	Unpolarized Intersubband Photocurrent in Te Doped GaInAsN/GaAlAs Quantum Well Infrared Photodetector
		P70	G. Bahir, Technion Institute-Israel	Negative Intraband NIR Photoconductivity in GaN/AlN Quantum Dots
		P71	J. Freeman, University of Cambridge	Frequency tuning of THz bound-to-continuum QCLs.
			Gala Dinner	
7 pm				

Friday 14th September

Time	Title
09.00-13.00	**Informal meetings and final networking opportunity. Some social activities (to be confirmed).**