



Conference Program

Wednesday 7-10-2009

8.30-9.00: **ROOM B: Welcome-Opening Remarks**

9.00-10.00 **ROOM B: Plenary talk I** (Chair: I.C. Khoo): D. Psaltis, *Optofluidics for biological applications*

ROOM A

Recent Advances in Biophotonics, Supported by the FP6 ToK NOLIMBA “Non Linear Imaging at Microscopic Level for Biological Applications” (Chair: M. Farsari)

10.00-10.25 G. von Bally, P. Langehanenberg, B. Kemper, *Quantitative Phase Contrast Digital Holographic Microscopy in Biophotonics* (Invited)

10.25-10.50 A.V. Kabashin, *Development of nanoplasmonics-based methods for biosensing* (Invited)

10.50-11.15 **Coffee Break**

Recent Advances in Biophotonics, Supported by the FP6 ToK NOLIMBA “Non Linear Imaging at Microscopic Level for Biological Applications” (Chair: P. Tománek)

11.15-11.40 Ion N. Mihailescu, Carmen Ristoscu, Felix Sima, *Biophotonic nanostructured coatings for implantology* (Invited)

11.40-12.05 S. Schlie, E. Fadeeva, A. Ovsianikov, J. Koch, A. Ngezahayo, B. N. Chichkov, *Laser-based nanoengineering for biomedical applications* (Invited)

12.05-12.20 M. Malinauskas, V. Purlys, P. Danilevicius, M. Rutkauskas, L. Bukelskis, A. Zukauskas, G. Bickaускаite, V. Chorosajev, D. Baltriukenė, D. Paipulas, V. Bukelskiene, R. Gadonas, *Large scale laser two-photon polymerization structuring for fabrication of artificial polymeric scaffolds for regenerative medicine*

12.20-12.35 A. Matei, M. Zamfirescu, G. Epurescu, C. Luculescu, M. Dinescu C. Lazar, L. Sima, S.M. Petrescu, *Two Photon Polymerization of ormosils*

12.35-12.50 A. Chorvatova, D. Chorvat Jr, *Cardiac cell as a biological laser: new tool to design advanced nanostructures?*

12.50-13.05 O. Angelsky, A. Ushenko, S. Yermolenko, P. Ivashko, *Polarization structure of biological nanocrystals layers*

13.00-15.00 **Lunch Break**

Novel Photonic Structures I (Chair: C. Riziotis)

15.00-15.25 Krishna Chaitanya Vishnubhatla, Jenny Clark, Guglielmo Lanzani, Roberta Ramponi, Roberto Osellame, Tersilla Virgili, *Femtosecond-laser-based fabrication of microchannels for integrated optofluidic devices* (Invited)

15.25-15.50 V. Zamora, A. Díez, M.V. Andrés, B. Gimeno, *Cylindrical optical microcavities: basic properties and sensor applications* (Invited)

15.50-16.05 Wuzhou Song, Andreas E. Vasdekis, Demetri Psaltis, *Tunable optofluidic dye laser with integrated air-gap etalon*

16.05-16.20 G. Senthil Murugan, J. S. Wilkinson, M. N. Zervas, *Optical Excitation and Probing of Bottle Microresonators*

16.15-17.15 **Coffee Break & Poster Session I***

Nanostructures (Chair: I. Koutselas)

- 17.15-17.40 Min Gu, *Quantum dots/rods in multi-dimensional optical data storage* (Invited)
17.40-18.05 Uri Banin, *Excitons and multi-Excitons in Semiconductor Nanorods* (Invited)
18.05-18.20 Aurelie Chan Yong, Anne Barichard, Tigran Galstian, Yaël Israëlî, *Origin of Photo-induced Movement of Quantum Dot Nanoparticules in Liquid Matrices*
18.20-18.35 Mikhail Bryushinin, Yuri Kumzerov, Igor Sokolov, *Non-steady-state photo-EMF in selenium nanowire array within chrysotile asbestos matrix*
18.35-18.50 A. Kostopoulou, A. Lappas, *Magneto-optical Properties of Iron Oxide Nanoclusters*
18.50-19.05 H. Zoubos, G. Karras, A. Lotsari, E. Lidorikis, Ch.E. Lekka, G.P. Dimitrakopoulos, Ph. Komninou, G.A. Evangelakis, C. Kosmidis, P. Patsalas, *AIN-based Nanocomposites Grown by Pulsed Laser Deposition and Sputtering for Photonic Applications*

ROOM B

COST Action MP0604 on “Optical Micro-Manipulation by Nonlinear Nanophotonics”

(Chair: P. Zemánek)

- 10.00-10.25 F. Simoni, R. Castagna, L. Criante, D.E. Lucchetta, F. Vita, *Novel Polymeric Materials for Photonics* (Invited)
10.25-10.50 V. Toal, I. Naydenova, D. Bade, S. Martin, *Recent and emerging applications of holographic photopolymers and nanocomposites* (Invited)

10.50-11.15 **Coffee Break**

COST Action MP0604 on “Optical Micro-Manipulation by Nonlinear Nanophotonics”

(Chair: D. Petrov)

- 11.15-11.30 A. Meristoudi, K. Iliopoulos, S. Pispas, N.A. Vainos, S. Couris, *Development and Nonlinear Optical Properties of Block Copolymers Encapsulating Metal Nanoparticles*
11:30-11.45 G. Chatzikyriakos, *Nonlinear optical response of noble metal nanoparticles encapsulated into block copolymer micelles*
11.45-12.00 M. J. Huttunen, J. M. Kontio, T. Lehto, H. Husu, J. Simonen, J. Tommila, M. Pessa, M. Kauranen, *Second-harmonic generation microscopy of conical gold nanostructures*
12.00-12.15 L. Athanasekos, C. Mantzaridis, S. Pispas, N.A. Vainos, *Novel micro-nanostructures of common polymers in thin films for photonic applications*
12.15-12.30 T. Tamulevičius, R. Šeperys, M. Andrulevičius, L. Puodžiukynas, V. Morkūnas, S. Tamulevičius, *Total internal reflection based grating sensor for the determination of refractive index of liquids*
12.30-12.45 T. Yovcheva, I. Vlaeva, S. Sainov, I. Naydenova, V. Toal, S. Mintova, *Holographic recording in charged photopolymerisable nanocomposites*
12.45-13.00 T. Babeva, D. Mackey, I. Naydenova, V. Toal, *Surface relief profile of photopolymerisable systems in a single illuminated spot*

13.00-15.00 **Lunch Break**

Optical Fiber Gratings (Chair: S. Selleri)

- 15.00-15.25 T. Geernaert, F. Berghmans, H. Thienpont, *Micro-structured fibre grating sensors* (Invited)
15.25-15.40 K. Schuster, J. Kobelke, Y. Wang, A. Schwuchow, J. Kirchhof, H. Bartelt, S. Pissadakis, *Highly photosensitive PCFs with extremely germanium doped core*

15.40-15.55 N. Péraud, H. Coïc, and L. Quétel, *Pulse stretching with large mode area fiber Bragg gratings for high temporal contrast Multi-Petawatt laser*

15.55-16.10 Maria Konstantaki, Stavros Pissadakis, *Optical fibre long period gratings with photochromic outcladding overlayers*

16.15-17.15 **Coffee Break & Poster Session I***

Lasng Media and Structures (Chair: S. Honkanen)

17.15-17.40 M.J. Adams, *Nonlinear dynamics of optically-injected lasers* (Invited)

17.40-18.05 A. A. Friesem, N. Davidson, *New trends in beam combining of lasers* (Invited)

18.05-18.30 A. Cucinotta, S. Selleri, F. Poli, D. Passaro, *Yb-doped Rod-type Photonic Crystal Fibers for High Brilliance Lasers* (Invited)

18.30-18.45 C.A. Stolz, D. Labukhin, N. Zakhleniuk, R. Loudon, M.J. Adams, *Locking bandwidth of an optically-injected multi-section tunable laser*

18.45-19.00 J. Cascante-Vindas, A. Díez, J. L. Cruz and M.V. Andrés, *Intra-cavity supercontinuum generation in a Q-switched Yb fiber laser using a microstructured fiber*

ROOM C

Photonics in Real Field Applications (Chair: H.P. Herzig)

10.00-10.25 M.N. Zervas, *High Power Fibre Lasers: From Lab Experiments to Real World Applications* (Invited)

10.25-10.50 A. Donval, B. Nemet, T. Fisher, M. Oron, *Nanostructures and their use in passive optical power control* (Invited)

10.50-11.15 **Coffee Break**

Plasmonics (Chair: M.N. Zervas)

11.15-11.40 Piotr Wróbel, Tomasz J. Antosiewicz, Tomasz Szoplik, *High numerical aperture silver nanolens with concentric slits* (Invited)

11.40-11.55 Y. Gu, L. L. Chen, J. Li, H. X. Zhang, Y. Wang, Q. H. Gong, *Green's matrix method and its applications in plasmonic structures*

11.55-12.10 S. Mohan, H. Graener, G. Seifert, *Surface plasmon assisted optical-nonlinearities in metal nano-ellipsoids*

12.10-12.25 Fang Liu, Ruiyuan Wan, Yidong Huang, Jiangde Peng, *High Sensitive Sensor Based on Hybrid Coupler with Long Range Surface Plasmon Polariton and Dielectric Waveguide*

12.25-12.40 Y.-Y. Lin, R.-K. Lee, Y.S. Kivshar, *Transverse instability of TM solitons and nonlinear surface plasmons*

12.40-12.55 E. Kymakis, E. Stratakis, S. Ioannou, E. Koudoumas, *Plasmonic nanoparticles for enhanced performance of organic photovoltaics*

13.00-15.00 **Lunch Break**

Metamaterials (Chair: V. Yannopapas)

15.00-15.25 Costas M. Soukoulis, *Bending Back Light: The Science of Negative Index Materials* (Invited)

15.25-15.50 I.C. Khoo, J. Liou, M. Stinger, J. Huang, A. Diaz, Y. Ma, *Liquid crystals for tunable photonic metamaterials* (Invited)

15.50-16.05 M. Kafesaki, R. Penciu, Th. Koschny, J. Zhou, E.N. Economou, C.M. Soukoulis, *Electromagnetic metamaterials: New prospects in photonics*

16.05-16.20 E. Reyes-Gómez, S.B. Cavalcanti, C.A.A. de Carvalho, L.E. Oliveira, *Plasmon polaritons in 1D heterostructures with left-handed materials*

16.15-17.15 Coffee Break & Poster Session I*

Photonic Crystals and Periodic Structures (Chair: M. Kafesaki)

17.15-17.40 H.P. Herzig, *Diffraction optics-from micro to nano* (Invited)

17.40-18.05 Q.H. Gong, X.Y. Hu, P. Jiang, H. Yang, *Ultrafast photonic crystal functional optical devices* (Invited)

18.05-18.20 M. Golub, *Slanted gradually varying photonic structures*

18.20-18.35 M.P. Hernández-Garay, J.G. Izquierdo, O. Martínez-Matos, M.L. Calvo, R. Weigand, J.A. Rodrigo, L. Bañares, P. Cheben, *Complex field analysis of femtosecond laser pulses diffracted by volume holographic gratings*

ROOM D

Quantum Optics (Chair: B.S. Ham)

10.00-10.25 Christoph H. Keitel, *Ultra-intense laser pulses: From vacuum refractivity to nuclear quantum control* (Invited)

10.25-10.50 A. Guzmán, G. Estrada, C. Ramírez, *Quantum atom-surface interaction in the presence of optical fields* (Invited)

10.50-11.15 Coffee Break

Quantum & Ultrafast Optics (Chair: A.T. Georges)

11.15-11.40 Shangqing Gong, Yueping Niu, Keyu Xia, *Coherent control of extreme nonlinear optical properties via few-cycle laser pulses with transverse distribution* (Invited)

11.40-11.55 M.A. Porras, F. Carreño, I. Gonzalo, *The carrier-envelope phase of ultrashort focused light pulses for strong-field light-matter interactions*

11.55-12.10 Ni Cui, Shangqing Gong, *Nonlinear pulse propagation in intersubband resonance multiple quantum wells*

12.10-12.25 A.F. Terzis, A. Fountoulakis, E. Paspalakis, *Controlled single-electron transfer in a double quantum dot structure*

12.25-12.40 A. Almyras, D. Pentaris, N. Merlemis, T. Efthimiopoulos, *The saturation effect of the parametric emissions in potassium atoms under two-photon excitation*

12.40-12.55 N.E. Karatzas, A.T. Georges, *Modeling of sub-20-fs harmonic generation from a gold surface*

13.00-15.00 Lunch Break

Quantum Computation & Foundations (Chair: A.F. Terzis)

15.00-15.25 A. Politi, J.C.F. Matthews, A. Laing, M.J. Cryan, J.G. Rarity, A. Stefanov, S. Yu, A. Peruzzo, M. Rodas, X.-Q. Zhou, P. Jiang, M. Thompson, D. Bonneau, J.L. O'Brien, *Quantum Information Science with Photons on a Chip* (Invited)

15.25-15.50 V. Torres-Company, H. Lajunen, J. Lancis, A.T. Friberg, *Temporal ghost imaging and nonlocal dispersion cancellation with classical light* (Invited)

15.50-16.05 Wei Zhang, Qiang Zhou, Jierong Cheng, Yidong Huang, Jiangde Peng, *1.5 μm Polarization Entangled Bell States Preparation Using Birefringence in High Nonlinear Microstructure Fiber*

16.05-16.20 J. Evers, K. Xia, *Cooling of nanomechanical resonator coupled to flux qubits*

16.15-17.15 Coffee Break & Poster Session I*

Photonic Applications in Communications (Chair: D. Alexandropoulos)

- 17.15-17.40 R. Millett, K. Dridi, H. Schriemer, K. Hinzer, T. Hall, *Fabrication-tolerant 1310 nm laterally-coupled distributed feedback lasers with high side mode suppression ratios* (Invited)
- 17.40-18.05 M. O'Mahony, C.T. Politi, L. Wosinska, A. Tzanakaki, J. Mitchell, P. Van Daele, *Key Technologies for Optical Networks* (Invited)
- 18.05-18.20 P. Zakyntinos, Ch. Kouloumentas, M. Bougioukos, P. Bakopoulos, E. Kehayas, A. Poustie, G. Maxwell, H. Avramopoulos, *Multi-format all-optical 40 Gb/s regeneration using an integrated SOA-MZI*
- 18.20-18.35 D. Petrantonakis, C. Stamatiadis, L. Stampoulidis, P. Zakyntinos, P. Bakopoulos, E. Kehayas, Ch. Kouloumentas, R. Dekker, E. J. Klein, H. Avramopoulos, *A novel All-Optical Wavelength Conversion scheme using a SOA and a 2nd Order Micro-ring Resonator ROADM*
- 18.35-18.50 C. Matrakidis, D. Alexandropoulos, C.(T.) Politi, A. Stavdas, *T_x and R_x component modelling for 100 Gb/s transmission line simulations*
- 18.50-19.05 S. Mikroulis, S. Karabetsos, E. Pikasis, A. Nassiopoulos, A. Bogris, D. Syvridis, *Investigation on the performance of microring lasers as tunable transmitters for application in future wavelength division multiplexed (WDM)/ultra-wideband (UWB)-over-Fiber hybrid networks*

Thursday 8-10-2009

ROOM A

Nonlinear Optics (Chair: B. Sahraoui)

- 8.30-8.55 D. Strickland, M.C.W. Campbell L.G. Epps, R. Sharma, Y. Mirchandani, L.J.F. Gowing, M.L. Kisilak, J. Sanderson, Q.-B. Lu, *Nonlinear Optical Interactions in the Crystalline Lens* (Invited)
- 8.55-9.20 E.I. Kamitsos, *Thermally Poled Glasses with Non-linear Optical Properties* (Invited)
- 9.20-9.35 G. Guimbretiere, E.I. Kamitsos, D. Palles, *Thermal Poling-induced Second Harmonic Generation in Sodium Niobium-Germanate Glasses*
- 9.35-9.50 D. Möncke, G. Mountrichas, S. Pispas, E.I. Kamitsos, V. Rodriguez, *SHG Generation and Orientation Phenomena in Chromophore DR1 containing Polymer Films*
- 9.50-10.05 A. Koulouklidis, K. Karava, J. Kalef-Ezra, S. Cohen, *Dose-dependent Z-Scan measurements on GAFCHROMIC® dosimetry films*
- 10.05-10.20 K. Moutzouris, I. Stavrakas, C. Anastasiadis, D. Triantis, *Theoretical study of second harmonic generation properties in Strontium and Calcium Tartrato-Antimonates*

10.30-11.00 **Coffee Break**

Classical Analogues of Quantum Optical Processes & Slow Light (Chair: M.M. Sigalas)

- 11.00-11.25 H. Xu, B.S. Ham, *Plasmon induced Photonic Switching* (Invited)
- 11.25-11.50 S. Longhi, *Photonic Bloch oscillations and Zener tunnelling in waveguide arrays: from classical to quantum interference effects* (Invited)
- 11.50-12.05 V. Yannopapas, E. Paspalakis, N.V. Vitanov, *Classical analogue of electromagnetically induced transparency, slow light and zero refractive index in an array of gold nanoparticles*

12.05-12.20 N. Papasimakis, V.A. Fedotov, Y.H. Fu, D.P. Tsai, N.I. Zheludev, *Coherent meta-magnetics: collective resonances and disorder-induced transitions*

12.20-12.35 Guoquan Zhang, Lei Xu, Ningning Xu, Fang Bo, Feng Gao, Jingjun Xu, Kar Pong LOR, Kin Seng Chiang, *Active control on slow and fast lights at arbitrary wavelength in BCB polymer*

ROOM B

COST action MP0805 on “Novel Gain Materials and Devices Based on III-V-N Compounds” (Chair: A. Erol)

8.30-8.55 B. Royall, N. Balkan, M. Guina, *Comparison of a conventional GaAs and a GaInNAs / GaAs multi-quantum well solar cell* (Invited)

8.55-9.20 S.I. Tsintzos, P.G. Savvidis, G. Deligeorgis, P. Tsotsis, Z. Hatzopoulos, N.T. Pelekanos, *Polariton light emitting devices: efficiency and relaxation dynamics* (Invited)

9.20-9.35 A. Balocchi, D. Lagarde, M. Senès, L. Smith, S.E. Hooper, T. Amand, J. Heffernan, X. Marie, *Electrical control of the exciton spin in a p-i-n InGaN/GaN quantum dots structure*

9.35-9.50 H. Carrère, X. Marie, A. Kunold, V. G. Truong, T. Amand, R. Brenot, F. Lelarge, *Band structure engineering of InGaAsP quantum wells for wide optical band SOAs*

9.50-10.05 F.M. Morales, D. González, J.G. Lozano, R. García, S. Hauguth-Frank, V. Lebedev, V. Cimalla, O. Ambacher, *Determination of the composition of In_xGa_{1-x}N from strain measurements and its critical layer thickness on GaN*

10.05-10.20 Olivier Desplats, Guy Lacoste, Alexandre Arnoult, Guillaume Monier, Luc Bideux, Chantal Fontaine, *Molecular beam epitaxy of GaAs-AlAs layers and InAs quantum dots on micro/nano-patterned GaAs substrates*

10.20-10.35 E. Šermukšnis, J. Liberis, A. Matulionis, *Tuning into Plasmon—LO-phonon Resonance: Gateless Two-dimensional Channels for Nitride HEMTs*

10.35-10.50 J.M. Manuel, F.M. Morales, J.G. Lozano, D. González, R. García, T. Lim, L. Kirste, R. Aidam, O. Ambacher, *InAlN nanolayers lattice-matched to GaN for photonic uses*

10.30-11.00 **Coffee Break**

COST Action MP0604 on “Optical Micro-Manipulation by Nonlinear Nanophotonics” (Chair: R. Salathe)

11.00-11.15 R. Bowman, G. Gibson, M. Padgett, *High resolution stereoscopic particle tracking in optical tweezers*

11.15-11.30 L. Criante, L. Lucchetti, F. Bracalente, F. Simoni, *Optical trapping induced by nonlinear optical reorientation of liquid crystals*

11.30-11.45 Franz-Josef Schmitt, Hann-Jörg Eckert, Christoph Theiss, Moritz Grehn, Rachel Olliges, Hans Joachim Eichler, *Energy transfer processes in optical Phycobiliprotein rod antennas*

11.45-12.00 S. Rao, D. Petrov, *Momentum transfer from the emission of Raman and fluorescence photons detected by an optically trapped probe*

12.00-12.15 S. Nic Chormaic, M. Frawley, *Particle manipulation using optical nanofibres*

12.15-12.30 R. Petruskevicius, G. Seniutinas, L. Krasauskas, R. Tomasiunas, *Study of electro-optic polymers via all-optical poling*

12.30-12.45 W. Horn, J.v. Bassewitz, C. Denz, *Phase-conjugated Slow- and Fast-Light in photorefractive SBN:60*

ROOM C

Photonic Materials I (Chair: A. Ikiades)

- 8.30-8.55 S. Mailis, *Ferroelectric domain engineering and micro-structuring of lithium niobate* (Invited)
- 8.55-9.20 M. Anyfantakis, B. Loppinet, G. Fytas, C. Matzaridis, S. Pispas, H.J. Butt, *Polydiene solutions: a surprising versatile non linear optics material* (Invited)
- 9.20-9.35 L. Turyanska, U. Elfurawi, T.D. Bradshaw, M.W. Fay, M. Li, S. Mann, N.R. Thomas, A. Patanè, *Novel nanocomposites based on PbS quantum dots*
- 9.35-9.50 S. Aravazhi, D. Geskus, D. Günther, K. Wörhoff, M. Pollnau, *Growth, characterization, and waveguide lasing of Yb³⁺, Lu³⁺, Gd³⁺ co-doped KY(WO₄)₂ thin layers*
- 9.50-10.05 Y. Orphanos, S. Brezas, I. Tzianaki, M. Eleftheriou, M. Bakarezos, A. Lyras, C.E. Kosmidis, N.A. Papadogiannis, *Ultra-high frequency elastic waves generation, detection and modelling in metallic and dielectric surfaces using ultrafast laser pulses*
- 10.05-10.20 P.K. Buah-Bassuah, Richard Kwabena Dollah, Moses Jojo Eghan, *Micro shrinkage and stretching of Ghanaian fabrics through washing using Moire analysis*

10.30-11.00 **Coffee Break**

Photonic Materials II (Chair: G. Kakarantzas)

- 11.00-11.25 V. Reboud, T. Kehoe, N. Kehagias, C.M. Sotomayor Torres, *Nanoprocessing of photonic printable polymers and the control of their critical dimension* (Invited)
- 11.25-11.50 M.L. Calvo, P. Cheben, O. Martínez-Matos, J.A. Rodrigo, M.P. Hernández-Garay, F. del Monte, *New insights on photopolymerizable glasses: toward green holography* (Invited)
- 11.50-12.15 S.D. Peroukidis, P.K. Karahaliou, A.G. Vanakaras, D.J. Photinos, *Biaxial nematic liquid crystals for electro-optic devices* (Invited)
- 12.15-12.30 C. Boutopoulos, C. Pandis, V. Tsouti, S. Chatzandroulis, P. Pissis, I. Zergioti, *Laser printing of polymers and carbon nanotube-polymer nanocomposites for chemical sensing applications*
- 12.30-12.45 Y.H. Lin, J.K. Lee, T.Y. Chu, H.K. Hsu, W.Y. Li, F. Lu, W.C. Tsai, *Droplet manipulation on a liquid crystal and polymer composite film*

ROOM D

Silicon Photonics (Chair: P. Argitis)

- 8.30-8.55 Richard M. De La Rue, *Sensitive Silicon Based Photonics* (Invited)
- 8.55-9.20 S. Honkanen, A. Tervonen, A. Säynätjoki, A. Khanna, T. Alasaarela, *Silicon Slot Waveguides Filled with Atomic Layer Deposition* (Invited)
- 9.20-9.45 Lorenzo Pavesi, *Nanosilicon as an enabling photonic material* (Invited)
- 9.45-10.00 M.M. Sigalas, N.A. Lagos, D. Niarchos, *The optical absorption in Silicon Nanowire Arrays*
- 10.00-10.15 G. Kakarantzas, C.G. Poulton, C. Riziotis, *Tailoring the waveguide dispersion of silica nanofibers using multiple thin dielectric film*
- 10.15-10.30 Emmanouil Lioudakis, *Probing surface-related phenomena on silicon nanoparticles*

10.30-11.00 **Coffee Break**

11.00-12.45 **Management Committee Meeting of COST action MP0805 on “Novel Gain Materials and Devices Based on III-V-N Compounds”**

12.45 **Lunch Break & Museum and Archeological Site Visit**

ROOM B

16.00-16.15 F. Mendoza Santoyo, Presentation of the ICO-22 Congress, Puebla Mexico 2011

16.15-17.30 **European Research Policy in Photonics** (Chair: C. Fotakis)

16.15-16.35 Anna Katrami-Bezirtzoglou, Photonics Sector, Information Society & Media Directorate General, European Commission

16.35-16.55 Caroline Whelan, Physical and Nanosciences, COST Office

16.55-17.15 Roberta Ramponi, Photonics21 Representative and Stakeholder, Politecnico di Milano

17.15-17.35 Trevor J. Hall, Canada Research Chair in Photonic Network Technology, University of Ottawa

17.35-17.55 Representative of Hellenic Telecommunications Organization (OTE)

Formal Conference Ceremony

Honored by the presence of the invited: Governor of the Prefecture of Fokida Mr. Nikolaos Fousekis, Mayor of Amfissa Mr. Assimakis Assimakopoulos, Mayor of Delphi Mr. Panagiotis Kaltsis, Rector of the University of Patras Professor Stavros Koubias, General Regional Director of Hellenic Telecommunications Organization (OTE) Mr. Miltiadis Sotiropoulos and other honorary guests.

18.00-18.30 Ceremonial Reception

18.30 Opening by Professor Maria L. Calvo, President of ICO

18.40 Addressing by Honorary Guests

19.00 Addressing by the ICO Prize Committee and ICO 2007 Galileo Galilei Award Ceremony, chaired by A. Guzmán.

19.15-20.00 Galileo Galilei Honorary Lecture by O.V. Angelsky, *Speckles and Phase Singularities in Polychromatic Fields*

20.00 Addressing by the ICO Prize Committee and **ICO** prize 2008 Award Ceremony, chaired by M.L. Calvo.

20.15-21.00 Ernst Abbe Honorary Lecture by Z. Zalevsky, *Super Resolved Photonic Sensing*

21.30 Conference Gala

Friday 9-10-2009

8.30-9.30 **ROOM B: Plenary talk II** (Chair: C.H. Keitel): R.W. Boyd, *Tailoring the properties of light and matter for photonics*

ROOM A

Photonic Materials III (Chair: M.G. Papadopoulos)

- 9.30-9.55 P. Argitis, M. Vasilopoulou, L.C. Palilis, G. Papadimitropoulos, D.G. Georgiadou, A.M. Douvas, K. Kotsovos, E. Ntantoumis, I. Kostis, A. Iliadis, N. Konofaos, D. Davazoglou, *Improved performance hybrid-polymer optoelectronic devices using polyoxotungstates and tungsten oxides as cathode interfacial layers* (Invited)
- 9.55-10.20 Bouchta Sahraoui, Zacaria Essaidi, Robert Czaplicki, *Functionalized azo-containing molecules for modern application in photonics* (Invited)
- 10.20-10.35 R. Czaplicki, J.-Y. Balandier, M. Chas, M. Sallé, B. Sahraoui, *Tetrathiafulvalene (TTF)-based self-assembled molecular corners and polygons for applications in photonics*
- 10.35-10.50 N.A. Stathopoulos, S.P. Savaidis, S. Yesayan, L.C. Palilis, M. Vasilopoulou, P. Argitis, *Simulations of the electric field in Hybrid Organic Photovoltaics using a transmission line model - Comparison with experimental results*

10.50-11.50 **Coffee Break & Poster Session II****

Photonic Materials IV (Chair: M. Vasilopoulou)

- 11.50-12.15 Gerasimos Konstantatos, *Solution-processed quantum dot photodetectors* (Invited)
- 12.15-12.40 M.A. Loi, *Solution processable near infrared photodetectors based on electron transfer from PbS nanocrystals to fullerene derivatives* (Invited)
- 12.40-12.55 E. Maratou, I. Koutselas, *Optical and related properties of hybrid organic-inorganic low-dimensional semiconductors based on triazine derivatives and metal halide units*
- 12.55-13.10 Manthos G. Papadopoulos, *Materials for photonic applications*

ROOM B

COST Action MP0604 on “Optical Micro-Manipulation by Nonlinear Nanophotonics”
(Chair: I. Naydenova)

- 9.30-9.55 C. Denz, P. Rose, J. Xavier, B. Terhalle, W. Horn, D. Göries, M. Boguslawski, J.P. von Bassewitz, J. Imbrock, J. Joseph, *Nonlinear photonics in optically-induced multidimensional photonic lattices* (Invited)
- 9.55-10.20 T. Čižmár, K. Dholakia, *Novel methods for adaptive optics utilisation in Biophotonics applications* (Invited)
- 10.20-10.35 P. Rose, M. Boguslawski, B. Terhalle, J. Imbrock, C. Denz, *Complex photonic superlattices optically induced in nonlinear media*
- 10.35-10.50 O. Brzobohatý, J. Trojek, V. Karásek, P. Ják, M. Šiler, P. Zemánek A. Arzola, K. Volke-Sepúlveda, T. Čižmár, K. Dholakia, *Particle self-organization with and without optical lattices*

11.50-13.15 **Management Committee Meeting of COST Action MP0604 on “Optical Micro-Manipulation by Nonlinear Nanophotonics”**

ROOM C

Novel Photonic Structures II (Chair: K. Schuster)

- 9.30-9.55 V. Finazzi, J. Villatoro, G. Coviello, N. Lou, R. Jha, V. Pruneri, *Photonic crystal fibre and nanowire based sensors* (Invited)
- 9.55-10.20 H.G. Limberger, *Low coherence interferometric interrogation of fiber Bragg gratings with sub-grating length resolution for characterization and sensing* (Invited)

10.20-10.35 G. T. Kanellos, C. Mitrogiannis, G. Nianios, N. Pleros, G. Papaioannou, *High spatial resolution FBG-array based strain sensor*

10.35-10.50 A. Ikiades, K. Tripolitis, Z. Riga, *Fibre Bragg Gratings for stress measurement of surface cracks in aerospace applications*

10.50-11.50 **Coffee Break & Poster Session II****

Biophotonics (Chair: N. Bouropoulos)

11.50-12.15 Vasilis Ntziachristos, *Going deeper than microscopy with multi-spectral optoacoustic tomography (MSOT)* (Invited)

12.15-12.40 P. Tománek, L. Grmela, J. Mikláš, *Optical sensing of polarization states changes in biological tissues* (Invited)

12.40-12.55 A.V. Zvyagin, X. Zhao, Z. Song, T. Kelf, W. Sanchez, M.S. Roberts, *Nonlinear optical imaging of nanoparticle penetration in human skin*

12.55-13.10 Felix Sima, Patricia Davidson, Emmanuel Pauthe, Olivier Gallet, Karine Anselme, Ion N. Mihailescu, *Vitronectin nanostructures immobilized by laser techniques for osteoblast adhesion improvement*

ROOM D

Quantum Coherence in Nanostructures (Chair: E. Paspalakis)

9.30-9.55 U. Woggon, *Photonics in hybrid quantum structures* (Inv.)

9.55-10.20 Johannes Gambari, Mary Matthews, Hemmel Amrania, Antonio Fernandez-Dominguez, Stefan Maier, Jon Plumridge, Benjamin Williams, Sushil Kumar, Qing Hu, Chris Phillips, *EIT, Ultra-Strong-Coupling and Thresholdless Lasing in Semiconductor Nanostructures* (Invited)

10.20-10.35 D. Pinotsi, P. Fallahi, T. Yilmaz, A. Imamoglu, *Coupling QD spins to nanocavities*

10.35-10.50 F. Carreño, M.A. Antón, F. Arrieta-Yáñez, O.G. Calderón, S. Melle, I. Gonzalo, M.A. Porrás, *Controlled release of stored pulses in a double quantum-well structure*

10.50-11.05 I. Thanopoulos, E. Paspalakis, V. Yannopoulos, *Laser-controlled porphyrin-based molecular current router*

Applied Optics (Chair: S. Mailis)

11.50-12.15 A. Perrone, *State of the art of metallic photocathodes for application to bright electron sources* (Invited)

12.15-12.30 Y. Ushenko, M. Gorsky, A. Ushenko, *Singular structure of organic crystal polarization properties*

12.30-12.45 I. Mokhun, Yu. Galushko and Yu. Viktorovskaya, *Poynting-singularities and angular momentum of heterogeneously polarized vector field*

12.45-13.00 Oleg V. Angelsky, Sergij B. Yermolenko, Claudia Yu. Zenkova, Alla O. Angelskaya, *About the Correlation of Linearly Polarized Plane Waves*

13.00 **Lunch Break**

14.30-16.30 **Round Table** on “*Photonics and Nanotechnologies: Parallel Roads Intersect*” coordinated by R.W. Eason

16.45 **Excursion to Amfissa**

ROOM E

Training School on “New Trends in III-V-N materials and devices” to be held in Delphi.

Duration of the training school: 2 days

Dates:

- Thursday 08/10/09 – Friday 09/10/09

Number of training school attendants: 23

The school is organized in two thematic sessions:

I. Growth and characterization of III-V-N materials

II. Theory, design and applications of III-V-N materials

Time schedule

Thursday				
08 October 2009 – START TIME: 08: 30 END TIME 17:30				
	Lecturer		Topic	LECTURE TIME
1	M. Guinea	I	MBE growth of Dilute Nitrides	09:00- 10:30
2	E. Iliopoulos	I	MBE growth of InGaN and related alloys	11:00-13:00
3	A. Patané	I	Magneto-tunneling and photocurrent spectroscopy	13:00-14:30
4	X. Marie	II	Room temperature Spin dynamics in dilute nitride semiconductors	16:00-17:30
Friday				
09 October 2009- START TIME: 08: 30 END TIME 18:30				
	Lecturer		Topic	LECTURE TIME
1	J. Misiewicz	I	Electromodulation – absorption type spectroscopy of semiconductor structures	08:30-10:00
2	E. O’ Reilly	II	Bundstructure theory of Dilute Nitrides	10:00-12:00
3	S. Calvez	II	Dilute nitrides for optical surface-normal operating devices	12:30-14:00
5	G. Konstantinidis	II	Acoustic devices based on III-V-Nitride materials	15:30-17:00
6	M. Sigalas	II	GaN LEDs	17:30-18:30

There will be two quick 15 minute coffee breaks between the lectures and one 30 min coffee break.

***Poster Session I, Wednesday 16.15-17.15 (Chair: A. Díez)**

Quantum & Nonlinear Optics :

S.G. Kosionis, A.F. Terzis, E. Paspalakis, *Nonlinear optical effects in intersubband transitions of a semiconductor quantum well*

A. Dimitriou, I. Lontos, S. Cohen, *Strong laser-induced-coupling between autoionizing states in the vicinity of four-photon excitation of Mg $3p^2\ ^1S_0$ state*

John Boviatsis, Evangelos Voutsinas, *Population Dynamics in a Driven Semiconductor Quantum Well Structure: Effects of Initial Conditions*

Evangelos Voutsinas, John Boviatsis, *Controlled Two-Electron Entanglement in a Driven Double Quantum Dot System: Analytic Solution*

Sofia Evangelou, Emmanuel Paspalakis, *Pulsed four-wave mixing in intersubband semiconductor quantum well transitions*

W.-X. Yang, J.-M. Hou, Y.Y. Lin, R.-K. Lee, *Slow-light solitons in coupled quantum wells*

X.H. Wang, *Switching Control of Spontaneous Emission by Polarized Atoms in Two-Dimensional Photonic Crystals*

R. Etemadpour, L. Kasaei, M. Sahrai, *Transient absorption and dispersion in a Λ -type atomic system with two fold lower levels*

L. Kasaei, R. Etemadpour, M. Sahrai, *The effect of incoherent pumping field on light propagation in a dispersive medium*

Meilana Siswanto, Gunawan Witjaksono, Suhairi Saharudin, *Random Analog Voltage Quad-Level Generator for Quantum Cryptography System*

K. Pipergias, D. Yiasemides, E. Reppa, N. Merlemis, V. Giannetas, T. Efthimiopoulos, *VUV emission of Ar dimmers in a supersonic expansion excited by a low energy discharge*

Claudia Yu. Zenkova, *Dynamics of Layer Crystal Light Induced Properties and the Formation of Optical Bistability*

E. Paspalakis, V. Yannopoulos, N.V. Vitanov, *Creation and enhancement of quantum interference in spontaneous emission near plasmonic nanostructures*

V.E. Lembessis, S. Al-Awfi, M. Babiker, D.L. Andrews, *Plasmonic surface optical vortices (PSOVs) and their influence on adsorbed atoms*

I. Papagiannouli, N. Liaros, G. Chatzikyriakos, E. Maratou, I. Koutselas, S. Couris, *Nonlinear optical properties of Pb_xI_y quantum confined nanostructures*

G. Chatzikyriakos, P. Aloukos, S. Couris, G.C. Anyfantis, G.C. Papavassiliou, *Nickel and Gold Dithiolene Complexes: Nonlinear Optical Properties in the IR*

Classical Optics:

T. Setälä, F. Nunziata, A.T. Friberg, *Partial polarization in the space-time and space-frequency domains*

O.V. Angelsky, C.Yu. Zenkova, M.P. Gorsky, N.V. Gorodys'ka, *About the Estimation of the Degree of Coherence in the Near Field*

Biophotonics:

O. Angelsky, S. Yermolenko, A. Angelskaya, Ion Gruia, Maria Iuliana Gruia, *Novel spectropolarimetry methods for the malignant transformations identification in biotissues*

M. Fakis, I. Trantakis, S. Tragoulias, T. Christopoulos, V. Giannetas, P. Persephonis, *Fluorescence time resolved studies of Sybr Green I/DNA complexes in the femtosecond regime*

K. Terzaki A. Gaidukeviciute, E. Kasotakis, A. Ranella M. Farsari, A. Mitraki, C. Fotakis, *Fabrication of Three-Dimensional Structures by Nonlinear Lithography and their Functionalization with Amyloid Peptides*

A.G. Ushenko, Yu.A. Ushenko, A.I. Dubolazov, V.I. Istratyy, *Complex Degree of Mutual Anisotropy of Birefringent Nets of Biological Crystals*

K. Zoubourlis, I. D. Bassukas, A. Ikiades, *Differential Optical scattering in frozen phantoms for Optical tomography applications*

Photonic Structures:

J. J. Lozada, S.B. Cavalcanti, *Nonlinear Pulse Propagation in One-Dimensional Band Gap Structures*
Y.-Y. Lin, R.-K. Lee, B.A. Malomed, *Formation of standing-light pulses through collisions of gap solitons in nonlocal media*

Sofyan A. Taya, Mazen M. Abadla, Mohammed M. Shabat, *Characteristics of multilayer slab waveguide structure with a left-handed material*

Jun Lei, Guoquan Zhang, Jingjun Xu, Kin Wah Yu, *Narrow-bandwidth spectral filter with extraordinary transmission through sub-wavelength metal slit*

T. Hakkarainen, T. Setälä, A.T. Friberg, *Near-field imaging of point-dipole field with a lossy metamaterial nanoslab*

I. Ftilis, M. Fakis, I. Polyzos, V. Giannetas, P. Persephonis, *Comparison of two-photon polymerization with the use of two fluorene derivative photoinitiators*

F. Thetiot, A. Kostopoulou M. Androulidaki, P.D. Cozzoli, A. Lappas, *Magnetic-Fluorescent Hybrid Nanocrystals of Zinc Oxide*

Photonic Applications in Communications:

C.(T). Politi, D. Alexandropoulos, C. Matrakidis, A. Stavdas, *Power consumption of optical switching technology for core networks*

****Poster Session II, Friday 10.50-11.50** (Chair: S. Baskoutas)

Photonic Materials:

F. Kezzoula, S.E.H. Abaidia, A. Keffous, *Structural and optical properties of amorphous silicon (a-Si) prepared by magnetron sputtering*

A.T. Efremidis, N.C. Deliolanis, S.Ves, E.D. Vanidhis, *Theoretical calculations to determine the optical activity (g_{11}) and electro-gyration (ζ_{41}) coefficients in $\bar{4}2m$ point group of KDP*

A.T. Efremidis, N.C. Deliolanis, C. Manolikas, E.D. Vanidhis, *Theoretical calculations to determine the optical (n_{01} , n_{03}) and electro-optical (r_{41ef} , r_{63ef}) coefficients in $\bar{4}2m$ point group of KDP*

I. Apostol, V. Damian, P. Logofatu, D. Apostol, I. Iordache, *UV light controlled surface modulation of polymeric films*

D. Dominko, D. Starešinić, K. Biljakovic, A. Tomelj, D. Mihailovic, J. Demsar, G. Socol, C. Ristoscu, I. N. Mihailescu, J. Marcus, *Charge Density Wave $K_{0.3}MoO_3$ thin films grown by pulsed laser deposition*

C. Markos, K.G. Vlachos, G. Kakarantzas, *Fibre-optic interferometric pressure sensor based on droplet-shaped PDMS elastomer*

I. Kostis, M. Vasilopoulou, L.C. Palilis, D.G. Georgiadou, P. Argitis, N.A. Stathopoulos, A. Iliadis, N. Konofaos, D. Davazoglou, *Characterization of MoO_x nanostructured thin films for application in organic photonic devices*

H. Zoubos, L.E. Koutsokeras, D.F. Anagnostopoulos, A.R. Wildes, G. Karras, G.A. Evangelakis, C. Kosmidis and P. Patsalas, *Amorphous carbon/metal nanocomposite films grown by Pulsed Laser Deposition*

S. Aissiou, T. Hadjersi, L. Guerbus, A. Manseri, *Formation of porous silicon on p-type Si by etching in HF/CrN_3O_9 solution*

O. Fellahi, T. Hadjersi, M. Maamache, S. Bouanik, A. Manseri, L. Guerbus, *Morphology of Nanowires formed in Silicon by Ag-Assisted Electroless Etching in HF/H_2O_2 Solution using Ag Nanoparticles as Catalysts*

S. Kaci, O. Fellahi, O. Mansri, H. Menari, A. Keffous, *Effect of PEG300 addition on size and structure of PbS nanocrystalline thin films*

M. Vasilopoulou, L.C. Palilis, D.G. Georgiadou, P. Argitis, I. Kostis, G. Papadimitropoulos, N.A. Stathopoulos, A. Iliadis, N. Konofaos, D. Davazoglou, *Improving electron injection in hybrid light-emitting diodes using tungsten oxides as cathode interfacial layers*

S. Tzani, I. Koutselas, *Stable hybrid plasmonic nanoparticle materials*

E. Maratou, I. Koutselas, *Quantum well materials for photonic applications based on metal halide units*

Athanassios Chrissanthopoulos, Sotirios Baskoutas, Nikolaos Bouropoulos, Vassilios Dracopoulos, Demetrios Tassis, Spyros N. Yannopoulos, *ZnO nanostructures grown on carbon nanotubes by thermal evaporation*

A. Gavriilelli, I. Theodorakos, J. Tang, I. Raptis, A. Gerardino, Th. Speliotis, N. Papanikolaou, I. Zergioti, D. Tsoukalas, Y.S. Raptis, *Raman studies (SERS) of rhodamine 6G on random and periodic arrays of silver nanoparticles*

COST Action MP0604 on “Optical Micro-Manipulation by Nonlinear Nanophotonics”:

T. Yovcheva, I. Vlaeva, K. Petkov, S. Sainov, *Electric charge influence of the diffraction efficiency of total internal reflection holograms, recorded in very thin chalcogenide films*

K. Pavani, L. Athanasekos, S. Martin, N. A. Vainos, V. Toal, I. Naydenova, *A new low cost manufacturing technique for optical elements*

M. Grehn, C. Theiss, A. Kaltenbach, F.-J. Schmitt, H.J. Eichler, *Fs-Laser induced ablation in dielectrics*

D. Pentaris, G. Chatzikyriakos, T. Efthimiopoulos, *Emissions in potassium vapour under 4S-7S two-photon nsec excitation*

E. Sarantopoulou, Z. Kollia, L. Athanasekos, M. Vasileiadis, N. Aspiotis, D. Alexandropoulos, *Surface modification properties of sol-gel and PDMS materials upon 193 nm and 157 nm laser light illumination*

K. Wearen, K. Trainer, D. Nazarova, I. Naydenova, V. Toal, *Optical patterning of the surface of photopolymerisable materials*

G. Chatzikyriakos, K. Iliopoulos, S. Couris, A. Meristoudi, S. Pispas, *Nonlinear Optical Properties of Au and Ag Nanoparticles Embedded into Hybrid-block Copolymer Micelles*

V. Filidou, K. Iliopoulos, G. Chatzikyriakos, S. Couris, D. Bonifazi, *Charge Transfer and NLO Response of some Porphyrin-[60]fullerene dyads*

M. Vasileiadis, L. Athanasekos, D. Alexandropoulos, A. Meristoudi, G. Mousdis, N. Vainos, *Optical Sensor Sensitivity Enhancement by Use of Diffraction Gratings*

COST action MP0805 on “Novel Gain Materials and Devices Based on III-V-N Compounds”:

M. Vasileiadis, D. Alexandropoulos, M.J. Adams, N. Vainos, *Performance Characteristics of Quantum Dot Microring Amplifiers under Steady State Operation*

D. Alexandropoulos, C.(T.) Politi, M. Vasileiadis, A. Stavdas, N. Vainos, *Performance evaluation of GaInNAs- based semiconductor optical amplifiers*

O. Donmez, A. Erol, M.C. Arikan, *Reflectance and Photomodulated Reflectance Studies of $Al_xGa_{1-x}As/GaAs$ Hot Electron Lasing and Light Emitting in Semiconductor Heterostructures*

F. Chaqmaqchee, M. Oduncuoglu, S. Mazzucato, N. Balkan, *HELLISH Vertical Cavity Semiconductor Optical Amplifier/Wavelength convertor for 1.3 μm operation*

F.G. Kalaitzakis, E. Iliopoulos, G. Konstantinidis, P. Prystawko, M. Leszczynski, N.T. Pelekanos, *Monolithic integration of nitride-based transistor with light emitting diode for unique sensing applications*

M. Gunes, N. Balkan, C. Gumus, A. Erol, M.C. Arikan, M. Yilmaz, B. Ulug, *Electronic transport in GaInAs/GaAs and dilute nitride GaInNAs/GaAs Quantum Wells: Effect of nitrogen on momentum relaxation of holes*

Y. Sun, H. Khalil, N. Balkan, *Temporal dynamics of non-equilibrium holes in p-type modulation doped GaInNAs/GaAs quantum wells*

N.A. Lagos, M.M. Sigalas, D. Niarchos, *Nano-particle detection with a two Si micro-disks sensor*

H. Başak, A. Erol, M.Ç. Arıkan, *Annealing Effects on Defect Levels in GaInNAs/GaAs QW Structures*

V.-M. Korpijärvi, J. Puustinen, M. Guina, T. Leinonen, J. Rautiainen, A. Härkönen, *Efficient GaInNAs Gain Mirrors for Semiconductor Disk Lasers at 1.18 μm and 1.22 μm*

Janne Puustinen, Mircea Guina, Ville-Markus Korpijärvi, Saulius Marcinkevicius, Martin Albrecht, Antti Tukiainen, Samuli Kivistö, Markus Pessa, *1.22 μm GaInNAs Saturable Absorber Mirrors with Tailored Recovery Time*

B. Royall, N. Balkan, *GaInNAs n-i-p-i Doping Superlattice Solar Cells*

W.H.M. Feu, A. Patané, O. Makarovsky, G. Allison, and L. Eaves Q.D. Zhuang, M. Delamare and A. Krier G. Hill, *Magnetoresistance and electron mobility in dilute nitride InAsN alloys*

G.E. Dialynas, S. Kalliakos, S. Germanis, P.G. Savvidis, Z. Hatzopoulos, N.T. Pelekanos, *Giant piezoelectric field in (211)B InAs/GaAs quantum dots: opportunity for novel photonic devices*

Key Technologies for Optical Networks

M. O'Mahony^{1*}, C. T. Politi², L. Wosinska³, A. Tzanakaki⁴, J. Mitchell⁵, P. Van Daele⁶

1: University of Essex, Wivenhoe Park, CO43SQ, UK, mikej@essex.ac.uk (*)

2: University of Peloponnese, Department of Telecommunication Science and Technology, Karaiskaki St, 20200, Tripolis Greece

3: KTH, ELECTRUM 299, 16440 KISTA, Sweden

4: Athens Information Technology, PO Box 68, 19.5 km, Markopoulo Avenue, Peania 19002, Athens, Greece

5: Department of Electronic and Electrical Engineering, UCL, Torrington Place, London, WC1E 7JE, UK

6: IBBT, Ghent University, Belgium

Keywords: Optical networking

The invention of the laser in 1958, followed by the work of Kao and Hockham on optical fibres and the subsequent demonstration of optical fibre as a practical communication medium in 1970 brought into being a technology platform capable of supporting long haul communication requirements. As the fibre began to replace coaxial cable as the transmission medium in the trunk systems of telecommunication networks many technical and economic advantages were brought about by the huge bandwidth of this medium. At the same time the advent semiconductor technology in the use of laser, modulators and receivers made the use of this bandwidth possible. Until recently the advantage of optical communications lied in the area of high bitrate optical transmission due to the wide bandwidth of optical components. As optical networking has been evolved towards a network with a very key role envisaged for the optical layer many key functional subsystems will be needed for this flexible network based on photonic technology. Transmission speeds are still predicted to increase as before, (e.g. to 160 Gb/s probably using alternative modulation formats), however within a context of a more dynamic and granular network, supported by appropriate control plane. In the decade from 1985-2000 four significant events heralded the possibility of optical networking where both transmission and switching might be based on optics. These were (1) the realisation of optical amplifiers allowing (2) the economic deployment of wavelength division multiplexing, (3) the demonstration of an optical cross-connect [OXC] enabling the rapid reconfiguration of lightpaths based on wavelength channels and (4) the convergence of service and transport transmission rates in the networks.

In this paper we will discuss key networking approaches and technologies as seen in the Roadmap for Optical Communications for the IST ephoton/One+ and the ICT BONE Network of Excellence. There are a number of key functions necessary, at a link and network level, to enable efficient operation of the future optical network. As transmission and reconfiguration speeds advance, so does the complexity of the suggested subsystems, hence the reasonable way forward is to re-examine new technologies and materials with emphasis to their characteristics with respect to the specific applications. Examples of such functionalities that new materials and technologies may lead to are:

Optical switching: To advance to optical networking, optical switches are required, both at microsecond, millisecond and nanosecond reconfiguration times depending on the network scenario. Although switches with ms reconfiguration (3-D MEMS switches) are now available, fast (ns) switch fabrics are still under investigation and are either realised through the combination of tunable lasers/wavelength converters together with arrayed waveguides; or with Semiconductor Optical Amplifiers for example. Furthermore recent advances in fabrication have made it possible to fabricate compact micro-ring resonators with radii as small as 2.5 μm and quality factors as high as 10000 by tightly confining semiconductor waveguides. However optical switching with a scalable and fast technology is still an open issue for research.

Wavelength conversion and regeneration: All-optical wavelength conversion and regeneration is desirable for networks operating at speeds >40 Gb/s. To achieve conversion the physical properties of a nonlinear element are used to perform a logic function between the input signal and a pump. The main nonlinear elements used are an: SOA, EAM (Electro-Absorption Modulator, fiber, photonic crystal and periodically poled LiNbO₃ waveguides (PPLN). Multi-wavelength all-optical regeneration, if feasible, will dramatically decrease the cost of DWDM transmission links.

Optical encryption: Security will always be of great importance in networks, and it proves difficult to perform electronic encryption at speeds beyond 10 Gb/s. Thus there is a strong interest in the investigation of encryption possibilities in the optical medium. Two main techniques have been investigated based on (a) quantum cryptography and (b) chaos cryptography.

Optical memory: All optical buffering through fibre delay lines is an approach that requires complex control and packets are delayed rather than stored. Recent research has established that it is possible to exercise control of the velocity of light pulses propagating through a material. Light propagation with a very low group velocity (slow light) has been observed in atomic vapors and solid state crystal via electromagnetically induced transparency (EIT) and coherent population oscillation (CPO).

Many of the key functional subsystems needed for this future flexible network have already been described, with experimental demonstrations, others are still gleams in the eye of the network designer with, as yet, no sure route for realisation for example optical memory and multi-wavelength optical regeneration.

Acknowledgment. The work described in this paper was carried out with the support of the BONE-project ("Building the Future Optical Network in Europe"), a Network of Excellence funded by the European Commission through the 7th ICT-Framework Programme.