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Quarter 2 – April to June 2011

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**Integrated Assessment Team
Environment Agency
Horizon House,
Deanery Road,
Bristol BS1 5AH
Email: Ask_Evidence@environment-agency.gov.uk**

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Introduction

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Background

The scope of the monitoring service was developed with Kathryn Monk, Science Strategy Manager, Environment Agency Wales. This project monitors the environmental and social research outputs from Welsh Universities. Through this scan, we can see what research is being undertaken, to avoid duplication of research and helps ensure readers are fully aware of current research programmes.

If you have any questions regarding the scope of the project, please contact Kathryn Monk on 02920 466121, or Manuela Weber, Integrated Assessment Team, on 07825 826357.

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Agriculture and food

POLLOCK, C., 2011. **CLIMATE SCIENCE Agricultural greenhouse gases.** *Nature Geoscience*, 4(5), pp. 277-278.

Mitigating greenhouse gas emissions from agriculture is important and achievable. However, cutting emissions to meet the UK's legal targets for 2050 will bring technical and political challenges, and may affect food production. *Aberystwyth Univ, Aberystwyth SY23 3DA, Dyfed, Wales.; Pollock, C, Aberystwyth Univ, Aberystwyth SY23 3DA, Dyfed, Wales.; cjp@aber.ac.uk.*

Air

KYRIAKIDIS, I., KARATZAS, K. and PAPADOURAKIS, G., 2010. **Predicting QoL Parameters for the Atmospheric Environment in Athens, Greece.** *Artificial Neural Networks (Icann 2010), Pt Iii*, 6354, pp. 457-463.

Air quality has a direct impact on the quality of life and on the general environment. Understanding and managing urban air quality is a suitable problem domain for the application of artificial intelligence (AI), methods towards knowledge discovery for the purposes of modeling and forecasting. In the present paper Artificial Neural Networks are supplemented by a set of mathematical tools including statistical analysis and Fast Fourier Transformations for the investigation and forecasting of hourly benzene concentrations and highest daily 8 hour mean of (8-HRA) ozone concentrations for two locations in Athens, Greece. The methodology is tested for its forecasting ability. Results verify the approach that has been applied, and the ability to analyze and model the specific knowledge domain and to forecast key parameters that provide direct input to the environmental decision making process. *[Kyriakidis, Ioannis; Papadourakis, George] Univ Glamorgan, Sch Comp, Pontypridd CF37 1DL, M Glam, Wales.; Kyriakidis, I, Univ Glamorgan, Sch Comp, Pontypridd CF37 1DL, M Glam, Wales.; kyriakidis@teicrete.gr papadour@cs.teicrete.gr kkara@eng.auth.gr.*

Chemicals

CARCEDO, C., KNIGHT, J.C., POPE, S.J.A., FALLIS, I.A. and DERVISI, A., 2011. **Chiral Silver and Gold Rings: Synthesis and Structural, Spectroscopic, and Photophysical Properties of Ag and Au Metallamacrocycles of Bridging NHC Ligands.** *Organometallics*, 30(9), pp. 2553-2562.

The synthesis and silver(I) and gold(I) coordination chemistry of a new chiral, bidentate N-heterocyclic carbene (NHC) dehydrohexitol derivative (3) are reported. The imidazolium salt [H(2)3] [PF6](2) reacts with Ag₂O and Au(tht)Cl (tht = tetrahydrothiophene) precursors to form the isostructural 18-membered metallamacrocyclic dinuclears [Ag-2(μ-3)(2)] [PF6](2) and [Au-2(μ-3)(2)] [PF6](2) and the monocarbene complex [(AuCl)(2)(μ-3)]. Single-crystal X-ray structures have been determined; for the bis-imidazolium precursor [H(2)3] [PF6]2 and corresponding Ag(I) and Au(I) complexes of ligand 3. Comparison between the X-ray-derived structures and solution-phase NMR data for [Ag-2(μ-3)(2)][PF6](2)

and [Au-2(μ -3)(2)][PF6](2) demonstrate that the complexes adopt a conformation in solution different from that found in the solid state, implying a conformational flexibility of the metallamacrocycle in solution. Both [(AuCl)(2)(μ -3)] and [Au-2(μ -3)(2)][PF6](2) are emissive in the solid state at ca. 380 nm (λ_{ex} = 295 nm). Time-resolved luminescence measurements indicate different excited-state lifetimes for the two species, with [(AuCl)(2)(μ -3)] measured at 35 ns and [Au-2(μ -3)(2)] [PF6](2) at 379 ns. The chiroptical properties of the silver and gold NHC complexes have been studied by circular dichroism (CD). [Carcedo, Cristina; Knight, James C.; Pope, Simon J. A.; Fallis, Ian A.; Dervisi, Athanasia] Cardiff Univ, Sch Chem, Cardiff CF10 3AT, S Glam, Wales.; Dervisi, A, Cardiff Univ, Sch Chem, Main Bldg, Pk Pl, Cardiff CF10 3AT, S Glam, Wales.; dervisia@cardiff.ac.uk.

GRIFFITHS, S.M., SINGH, N., JENKINS, G.J.S., WILLIAMS, P.M., ORBAEK, A.W., BARRON, A.R., WRIGHT, C.J. and DOAK, S.H., 2011. **Dextran Coated Ultrafine Superparamagnetic Iron Oxide Nanoparticles: Compatibility with Common Fluorometric and Colorimetric Dyes.** *Analytical Chemistry*, 83(10), pp. 3778-3785.

Due to the unique physicochemical properties of nanomaterials (NM) and their unknown reactivity, the possibility of NM altering the optical properties of fluorometric/colorimetric probes that are used to measure their cyto- and genotoxicity may lead to inaccurate readings. This could have potential implications given that NM, such as ultrafine superparamagnetic iron oxide nanoparticles (USPION), are increasingly finding their use in nanomedicine and the absorbance/fluorescence based assays are used to assess their toxicity. This study looks at the potential of dextran-coated USPION (dUSPION) (maghemite and magnetite) to alter the background signal of common probes used for evaluating cytotoxicity (MTS, CyQUANT, Calcein, and EthD-1) and oxidative stress (DCFH-DA and APP). In the present study, both forms of dUSPION caused an increase in MTS signal but a decrease in background signal from calcein and 3'-(p-aminophenyl) fluorescein (APF) and no effect on CyQUANT and EthD-1 fluorescence responses. Magnetite caused a decrease in fluorescence signal of DCFH, but it did not decrease fluorescence signal in the presence of the reactive oxygen species-inducer tert-butyl hydroperoxide (TBHP). In contrast, maghemite caused an increase in fluorescence, which was substantially reduced in the presence of the antioxidant N-acetyl cysteine. This study emphasizes the importance of considering and controlling for possible interactions between NM and fluorometric/colorimetric dyes and, most importantly, the oxidation state of dUSPION that may confound their sensitivity and specificity. [Griffiths, Sioned M.; Singh, Neenu; Jenkins, Gareth J. S.; Doak, Shareen H.] Swansea Univ, Sch Med, Inst Life Sci, Swansea SA2 8PP, W Glam, Wales. [Williams, Paul M.; Wright, Chris J.] Swansea Univ, Sch Engrn, Multidisciplinary Nanotechnol Ctr, Swansea SA2 8PP, W Glam, Wales. [Orbaek, Alvin W.; Barron, Andrew R.] Rice Univ, Dept Chem, Richard E Smalley Inst Nanoscale Sci & Technol, Houston, TX 77005 USA.; Doak, SH, Swansea Univ, Sch Med, Inst Life Sci, Singleton Pk, Swansea SA2 8PP, W Glam, Wales.; S.H.Doak@swansea.ac.uk.

Climate

FIRTH, L.B. and HAWKINS, S.J., 2011. **Introductory comments - Global change in marine ecosystems: Patterns, processes and interactions with regional and local scale impacts.** *Journal of experimental marine biology and ecology*, 400(1-2), pp. 1-6.

Background to volume: The world is changing rapidly, ultimately due to the pressure of human population growth driving change at global, regional and local scales. There is convincing and widely accepted evidence that the climate is changing as a result of anthropogenic forcing due to greenhouse gas emissions ([Mitchell et al., 1995], [Lee et al., 2006] and [IPCC, 2007]). Increased concentrations of one greenhouse gas — carbon dioxide is causing a reduction in the pH of the oceans ([Caldeira and Wickett, 2003], [The Royal Society, 2005] and [Doney et al., 2009]). Global trade is also leading to homogenization of floras and faunas as species are deliberately and/or accidentally transported around the world ([Mack et al., 2000], [Kolar and Lodge, 2002] and [Ruiz and Carlton, 2003]; [Drake and Lodge, 2004] and [Rahel, 2007]).

Overfishing is occurring globally for large pelagic species at the top of food webs ([Jackson et al., 2001], [Myers and Worm, 2003], [Worm and Myers, 2003], [Heithaus et al., 2008] and [Baum and Worm, 2009]), and at a regional scale for benthic species in most shallow seas ([Solan et al., 2004], [Steneck, 2006], [Kaiser et al., 2007] and [Genner et al., 2010]). Pollution, whilst being more regulated, especially from point sources, is all pervasive (Thompson et al., 2002) and plastic litter is a global problem (Fig. 1; [Thompson et al., 2004] and [Thompson et al., 2009]). Despite preventative efforts, oil spills can still be a major threat to the marine environment ([Southward and Southward, 1978], [Gundlach et al., 1983] and [Hawkins and Southward, 1992]), with the 2010 sinking of the *Deepwater Horizon* oilrig in the Gulf of Mexico representing one of the worst oil disasters in United States history. The coasts are becoming increasingly developed leading to habitat loss at local and regional scales ([Lotze et al., 2006] and Airoldi and Beck, 2007 L. Airoldi and M.W. Beck). Responses to rising and stormier seas will inevitably lead to intervention in coastal processes as people and infrastructure will need to be protected, leading to even more coastal habitat modification and loss (Fig. 2; [Airoldi et al., 2005], [Martin et al., 2005], [Moschella et al., 2005], [Bulleri and Chapman, 2010] and [Chapman and Underwood, 2011]). [Firth, Louise B.; Hawkins, Stephen J.] Bangor Univ, Sch Ocean Sci, Menai Bridge LL59 5AB, Anglesey, Wales. [Hawkins, Stephen J.] Univ Southampton, Natl Oceanog Ctr Southampton, Sch Ocean & Earth Sci, Southampton SO14 3ZH, Hants, England. [Hawkins, Stephen J.] Marine Biol Assoc UK, Plymouth PL1 2PB, Devon, England.; Firth, LB, Bangor Univ, Sch Ocean Sci, Menai Bridge LL59 5AB, Anglesey, Wales.; l.firth@bangor.ac.uk.

GLASSER, N.F., HARRISON, S., JANSSON, K.N., ANDERSON, K. and COWLEY, A., 2011. **Global sea-level contribution from the Patagonian Icefields since the Little Ice Age maximum.** *Nature Geoscience*, 4(5), pp. 303-307.

The melting of mountain glaciers and ice caps is expected to contribute significantly to sea-level rise in the twenty-first century(1-)3, although the magnitude of this contribution is not fully constrained. Glaciers in the Patagonian Icefields of South America are thought to have contributed about 10% of the total

sea-level rise attributable to mountain glaciers in the past 50 years(3). However, it is unclear whether recent rates of glacier recession in Patagonia are unusual relative to the past few centuries. Here we reconstruct the recession of these glaciers using remote sensing and field determinations of trimline and terminal moraine location. We estimate that the North Patagonian Icefield has lost 103 +/- 20.7 km(3) of ice since its late Holocene peak extent in AD 1870 and that the South Patagonian Icefield has lost 503 +/- 101.1 km(3) since its peak in AD 1650. This equates to a sea-level contribution of 0.0018 +/- 0.0004 mm yr(-1) since 1870 from the north and 0.0034 +/- 0.0007 mm yr(-1) since 1650 from the south. The centennial rates of sea-level contribution we derive are one order of magnitude lower than estimates of melting over the past 50 years(3), even when we account for possible thinning above the trimline. We conclude that the melt rate and sea-level contribution of the Patagonian Icefields increased markedly in the twentieth century. [Glasser, N. F.] *Aberystwyth Univ, Inst Geog & Earth Sci, Aberystwyth SY23 3DB, Dyfed, Wales.* [Harrison, S.; Anderson, K.; Cowley, A.] *Univ Exeter, Coll Life & Environm Sci, Penryn TR10 9EZ, England.* [Jansson, K. N.] *Stockholm Univ, Dept Phys Geog & Quaternary Geol, SE-10691 Stockholm, Sweden.;* Glasser, NF, *Aberystwyth Univ, Inst Geog & Earth Sci, Aberystwyth SY23 3DB, Dyfed, Wales.;* nfg@aber.ac.uk.

GREEN, C.L., GREEN, J.A.M. and BIGG, G.R., 2011. **Simulating the impact of freshwater inputs and deep-draft icebergs formed during a MIS 6 Barents Ice Sheet collapse.** *Paleoceanography*, 26, pp. PA2211.

An intermediate complexity climate model is used to simulate the collapse of the Barents Ice Sheet during Marine Isotope Stage 6 (MIS 6; 140 ka B.P) with the purpose of investigating whether a mass input of freshwater from the collapse could have affected the convection and deep water formation in the North Atlantic Ocean. Further experiments used a coupled dynamic and thermodynamic iceberg model to determine the effects of deep-draft icebergs, rather than freshwater alone, on the ocean circulation. The results predict that the collapse of the Barents Ice Sheet had a significant impact on the meridional overturning circulation in both the Atlantic and Pacific oceans. Freshwater fluxes have more of an impact on the Atlantic overturning circulation during the actual release period compared to icebergs, but the bergs induce effects over longer time scales even after the pulse is removed. Freshwater fluxes of 0.15 sverdrup (Sv) and iceberg surges of 0.1 Sv trigger significant changes in the global patterns, particularly in the North Pacific where there is strengthening of the overturning circulation at the expense of that in the North Atlantic, and associated increases in Pacific sea surface temperatures. These results highlight the importance of simulating not only the correct flux but also the form of the freshwater input from ice sheet collapses appropriately. [Green, Clare L.; Bigg, Grant R.] *Univ Sheffield, Dept Geog, Sheffield S10 2TN, S Yorkshire, England.* [Green, J. A. Mattias] *Bangor Univ, Sch Ocean Sci, Coll Nat Sci, Menai Bridge LL59 5AB, Gwynedd, Wales.;* Green, CL, *Univ Sheffield, Dept Geog, Sheffield S10 2TN, S Yorkshire, England.;* m.green@bangor.ac.uk.

KLEIVEN, H.(F., HALL, I.R., MCCAVE, I.N., KNORR, G. and JANSEN, E., 2011. **Coupled deep-water flow and climate variability in the middle Pleistocene North Atlantic.** *Geology*, 39(4), pp. 343-346.

Abrupt changes in the strength of the Atlantic Meridional Overturning Circulation

(comprising northward flow of warm water and a cold southward return flow) are implicated in abrupt climate changes in the late Pleistocene. A sensitive place to assess this circulation is in the cold return flow of Deep Western Boundary Currents. Here, in records of flow speed and isotopic composition of surface and bottom waters from a Deep Western Boundary Current location near the northern source of North Atlantic Deep Water, we show both orbital and millennial-scale coupling between deep ocean flow and climate in the middle Pleistocene (0.75-0.87 Ma), when the boundary conditions in terms of the mean state and amplitude of climate change were different from more recent periods. The coupling appears as a phased series of events initiated by reduced vertical density gradients and initial ventilation of deep waters. The occurrence of these events in interglacials during the middle Pleistocene suggests that the millennial-scale climate variability in the North Atlantic was more pronounced at that time than previously thought. This demonstrates that, given the right boundary conditions, rapid climate shifts can also occur during relatively warm climate conditions. [Kleiven, Helga (Kikki) F.; Jansen, E.] Univ Bergen, Dept Earth Sci, N-5007 Bergen, Norway. [Kleiven, Helga (Kikki) F.; Jansen, E.] Uni Res, Bjerknnes Ctr Climate Res, N-5007 Bergen, Norway. [Hall, I. R.; Knorr, G.] Cardiff Univ, Sch Earth & Ocean Sci, Cardiff CF10 3YE, S Glam, Wales. [McCave, I. N.] Univ Cambridge, Dept Earth Sci, Godwin Lab Palaeoclimate Res, Cambridge CB2 3EQ, England. [Knorr, G.] Alfred Wegener Inst Polar & Marine Res, D-27515 Bremerhaven, Germany.; Kleiven, HF, Univ Bergen, Dept Earth Sci, Allegaten 41, N-5007 Bergen, Norway.; hall@cardiff.ac.uk.

MEINERS, K.M., NORMAN, L., GRANSKOG, M.A., KRELL, A., HEIL, P. and THOMAS, D.N., 2011. **Physico-ecobiogeochemistry of East Antarctic pack ice during the winter-spring transition.** *Deep-Sea Research Part II-Topical Studies in Oceanography*, 58(9-10), pp. 1172-1181.

Our study provides information on the relationships between physical, chemical, and biological properties of East Antarctic sea ice sampled as part of the Sea Ice Physics and Ecosystem experiment (SIPEX) during the winter-spring transition in 2007. The sampled sea ice showed a high contribution of granular ice, indicating the turbulent conditions during sea ice formation off East Antarctica. The sea ice was cold, with brine volumes often below or very close to the theoretical percolation threshold of sea ice. Dissolved inorganic nutrient concentrations showed both positive and negative deviations from theoretical dilution lines, indicating both nutrient uptake as well as nutrient remineralisation in sea ice brines. Cold temperatures, high brine salinities, and low brine volumes limited high ice algal biomass to the warmer and more porous sea ice layers at the ice-water interface. We hypothesise that East Antarctic sea ice shows generally low ice algal biomass accumulation due to a combination of relatively low snow-loading, relatively cold ice temperatures, and short persistence of sea ice into the warm forcing regime, all of which prevent the development of significant internal and surface communities. (C) 2010 Elsevier Ltd. All rights reserved. [Meiners, Klaus M.; Heil, Petra] Antarctic Climate & Ecosyst Cooperat Res Ctr, Hobart, Tas 7001, Australia. [Norman, Louiza; Thomas, David N.] Bangor Univ, Coll Nat Sci, Sch Ocean Sci, Menai Bridge LL59 5AB, Anglesey, Wales. [Granskog, Mats A.] Univ Lapland, Arctic Ctr, Rovaniemi 96101, Finland. [Granskog, Mats A.] Polar Environm Ctr, Norwegian Polar Inst, N-9296 Tromso, Norway. [Krell, Andreas] Alfred Wegener Inst Polar & Marine Res, D-27515 Bremerhaven, Germany. [Heil,

Petra] Australian Antarctic Div, Dept Sustainable Environm Water Populat & Communi, Kingston, Tas 7050, Australia.; Meiners, KM, Antarctic Climate & Ecosyst Cooperat Res Ctr, Private Bag 80, Hobart, Tas 7001, Australia.; klaus.meiners@acecrc.org.au l.norman@bangor.ac.uk mats.granskog@npolar.no andreas.krell@awi.de petra.heil@utas.edu.au d.thomas@bangor.ac.uk.

ROBERTS, T.J., HODSON, A., EVANS, C.D. and HOLMEN, K., 2010. **Modelling the impacts of a nitrogen pollution event on the biogeochemistry of an Arctic glacier.** *Annals of Glaciology*, 51(56), pp. 163-170.

A highly polluted rain event deposited ammonium and nitrate on Midtre Lovénbreen, Svalbard, European High Arctic, during the melt season in June 1999. Quasi-daily sampling of glacial runoff showed elevated ion concentrations of both ammonium (NH₄⁺) and nitrate (NO₃⁻), collectively dissolved inorganic nitrogen (DIN) in the two supraglacial meltwater flows, but only elevated NO₃⁻ in the subglacial outburst. Time-series analysis and flow-chemistry modelling showed that supra- and subglacial assimilation of NH₄⁺ were major impacts of this deposition event. Supraglacial assimilation likely occurred while the pollution-event DIN resided within a/the supraglacial slush layer (estimated DIN half-life 40-50 hours, with the lifetime of NO₃⁻ exceeding that of NH₄⁺ by 30%). Potentially, such processes could affect preservation of DIN in melt-influenced ice cores. Subglacial routing of event DIN and its multi-day storage beneath the glacier also enabled significant assimilation of NH₄⁺ to occur here (60% of input), which may have been either released as particulate N later during the melt season, or stored until the following year. Our results complement existing mass-balance approaches to the study of glacial biogeochemistry, show how modelling can enable time-resolved interpretation of process dynamics within the biologically active melt season, and highlight the importance of episodic polluted precipitation events as DIN inputs to Arctic glacial ecosystems. [Roberts, Tjarda J.; Holmen, Kim] Norwegian Polar Res Inst, Fram Ctr, NO-9296 Tromsø, Norway. [Hodson, Andy] Univ Sheffield, Dept Geog, Sheffield S10 2TN, S Yorkshire, England. [Evans, Chris D.] Environm Ctr Wales, Ctr Ecol & Hydrol, Bangor LL57 2UW, Gwynedd, Wales.; Roberts, T.J., Norwegian Polar Res Inst, Fram Ctr, NO-9296 Tromsø, Norway.; tjarda@cantab.net.

YOUNG, G.H.F., DEMMLER, J.C., GUNNARSON, B.E., KIRCHHEFER, A.J., LOADER, N.J. and MCCARROLL, D., 2011. **Age trends in tree ring growth and isotopic archives: A case study of Pinus sylvestris L. from northwestern Norway.** *Global Biogeochemical Cycles*, 25, pp. GB2020.

Measurements of tree ring width and relative density have contributed significantly to many of the large-scale reconstructions of past climatic change, but to extract the climate signal it is first necessary to remove any nonclimatic age-related trends. This detrending can limit the lower-frequency climate information that may be extracted from the archive (the "segment length curse"). This paper uses a data set of ring widths, maximum latewood density and stable carbon and oxygen isotopes from 28 annually resolved series of known-age Pinus sylvestris L. trees in northwestern Norway to test whether stable isotopes in tree rings require an equivalent statistical detrending. Results indicate that stable oxygen and carbon isotope ratios from tree rings whose cambial age exceeds c.50 years exhibit no significant age trends and thus may be used to reconstruct environmental variability and physiological processes at this site without the potential loss of low-

frequency information associated with detrending.[Young, Giles H. F.; Demmler, Joanne C.; Loader, Neil J.; McCarroll, Danny] Swansea Univ, Dept Geog, Swansea SA2 8PP, W Glam, Wales. [Gunnarson, Bjorn E.] Swedish Univ Agr Sci, Dept Forest Ecol & Management, SE-90183 Umea, Sweden. [Kirchhefer, Andreas J.] Univ Tromso, Dept Biol, N-9037 Tromso, Norway. [Gunnarson, Bjorn E.] Stockholm Univ, Dept Phys Geog & Quaternary Geol, S-10691 Stockholm, Sweden.; Young, GHF, Swansea Univ, Dept Geog, Singleton Pk, Swansea SA2 8PP, W Glam, Wales.; g.h.f.young@swansea.ac.uk.

Conservation and biodiversity

BRUKHIN, V. and MOROZOVA, N., 2011. **Plant Growth and Development - Basic Knowledge and Current Views.** *Mathematical Modelling of Natural Phenomena*, 6(2), pp. 1-53.

One of the most intriguing questions in life science is how living organisms develop and maintain their predominant form and shape via the cascade of the processes of differentiation starting from the single cell. Mathematical modeling of these developmental processes could be a very important tool to properly describe the complex processes of evolution and geometry of morphogenesis in time and space. Here, we summarize the most important biological knowledge on plant development, exploring the different layers of investigation in developmental processes such as plant morphology, genetics, plant physiology, molecular biology and epigenetics. As knowledge on the fundamentals of plant embryogenesis, growth and development is constantly improving, we gather here the latest data on genetic, molecular and hormonal regulation of plant development together with the basic background knowledge. Special emphasis is placed on the regulation of cell cycle progression, on the role of the signal molecules phytohormones in plant development and on the details of plant meristems (loci containing plant stem cells) function. We also explore several proposed biological models regarding regulating plant development. The information presented here could be used as a basis for mathematical modeling and computer simulation of developmental processes in plants.[Morozova, N.] Inst Andre Lwoff, IFRE CNRS 3239, Villejuif, France. [Brukhin, V.] Univ Wales, IBERS Dept, Aberystwyth, Dyfed, Wales.; Morozova, N, Inst Andre Lwoff, IFRE CNRS 3239, Villejuif, France.; morozova@vjf.cnrs.fr.

CHIAPPETTA, A., BRUNO, L., SALIMONTI, A., MUTO, A., JONES, J., ROGERS, H.J., FRANCIS, D. and BITONTI, M.B., 2011. **Differential spatial expression of A- and B-type CDKs, and distribution of auxins and cytokinins in the open transverse root apical meristem of Cucurbita maxima.** *Annals of Botany*, 107(7), pp. 1223-1234.

Background and Aims Aside from those on Arabidopsis, very few studies have focused on spatial expression of cyclin-dependent kinases (CDKs) in root apical meristems (RAMs), and, indeed, none has been undertaken for open meristems. The extent of interfacing between cell cycle genes and plant growth regulators is also an increasingly important issue in plant cell cycle studies. Here spatial expression/localization of an A-type and B-type CDK, auxin and cytokinins are reported in relation to the hitherto unexplored anatomy of RAMs of Cucurbita maxima. Methods Median longitudinal sections were cut from 1-cm-long primary

root tips of *C. maxima*. Full-length A-type CDKs and a B-type CDK were cloned from *C. maxima* using degenerate primers, probes of which were localized on sections of RAMs using in situ hybridization. Isopentenyladenine (iPA), trans-zeatin (t-Z) and indole-3yl-acetic acid (IAA) were identified on sections by immunolocalization. Key Results The *C. cucurbita* RAM conformed to an open transverse (OT) meristem typified by an absence of a clear boundary between the eumeristem and root cap columella, but with a distinctive longitudinally thickened epidermis. *Cucma;CDKA;1* expression was detected strongly in the longitudinally thickened epidermis, a tissue with mitotic competence that contributes cells radially to the root cap of OT meristems. *Cucma;CDKB2* was expressed mainly in proliferative regions of the RAM and in lateral root primordia. iPA and t-Z were mainly distributed in differentiated cells whilst IAA was distributed more uniformly in all tissues of the RAM. Conclusions *Cucma;CDKA;1* was expressed most strongly in cells that have proliferative competence whereas *Cucma; CDKB2* was confined mainly to mitotic cells. iPA and t-Z marked differentiated cells in the RAM, consistent with the known effect of cytokinins in promoting differentiation in root systems. iPA/t-Z were distributed in a converse pattern to *Cucma;CDKB2* expression whereas IAA was detected in most cells in the RAM regardless of their proliferative potential. [Chiappetta, Adriana; Bruno, Leonardo; Salimonti, Amelia; Muto, Antonella; Bitonti, Maria Beatrice] Univ Calabria, Dipartimento Ecol, I-87030 Cosenza, Italy. [Jones, Jessica; Rogers, Hilary J.; Francis, Dennis] Univ Cardiff, Sch Biosci, Cardiff CF10 3TL, S Glam, Wales.; Bitonti, MB, Univ Calabria, Dipartimento Ecol, I-87030 Cosenza, Italy.; b.bitonti@unical.it.

DAVENPORT, J., HUGHES, R.N., SHORTEN, M. and LARSEN, P.S., 2011. **Drag reduction by air release promotes fast ascent in jumping emperor penguins—a novel hypothesis.** *Marine Ecology-Progress Series*, 430, pp. 171-182. To jump out of water onto sea ice, emperor penguins must achieve sufficient underwater speed to overcome the influence of gravity when they leave the water. The relevant combination of density and kinematic viscosity of air is much lower than for water. Injection of air into boundary layers ('air lubrication') has been used by engineers to speed movement of vehicles (ships, torpedoes) through sea water. Analysis of published and unpublished underwater film leads us to present a hypothesis that free-ranging emperor penguins employ air lubrication in achieving high, probably maximal, underwater speeds (mean +/- SD: 5.3 +/- 1.01 m s⁻¹), prior to jumps. Here we show evidence that penguins dive to 15 to 20 m with air in their plumage and that this compressed air is released as the birds subsequently ascend whilst maintaining depressed feathers. Fine bubbles emerge continuously from the entire plumage, forming a smooth layer over the body and generating bubbly wakes behind the penguins. In several hours of film of hundreds of penguins, none were seen to swim rapidly upwards without bubbly wakes. Penguins descend and swim horizontally at about 2 m s⁻¹; from simple physical models and calculations presented, we hypothesize that a significant proportion of the enhanced ascent speed is due to air lubrication reducing frictional and form drag, that buoyancy forces alone cannot explain the observed speeds, and that cavitation plays no part in bubble formation. [Davenport, John; Shorten, Marc] Univ Coll Cork, Dept Zool Ecol & Plant Sci, Distillery Fields, Cork, Ireland. [Hughes, Roger N.] Bangor Univ, Sch Biol Sci, Bangor LL57 2UW, Gwynedd, Wales. [Larsen, Poul S.] Tech Univ Denmark, Dept Mech Engr, Fluid Mech Sect, DK-

2800 Lyngby, Denmark.; Davenport, J, Univ Coll Cork, Dept Zool Ecol & Plant Sci, Distillery Fields, Cork, Ireland.; j.davenport@ucc.ie.

DOMINGUES, C.P., CREER, S., TAYLOR, M.I., QUEIROGA, H. and CARVALHO, G.R., 2011. **Temporal genetic homogeneity among shore crab (*Carcinus maenas*) larval events supplied to an estuarine system on the Portuguese northwest coast.** *Heredity*, 106(5), pp. 832-840.

Despite the importance of larval biology in the life histories of many marine animals, relatively little information exists on the dynamics and genetic composition of larval cohorts. The supply of megalopae larvae of the shore crab, *Carcinus maenas*, was measured on a daily basis during 8 months spread along two larval periods (2006 and 2007) at the Ria de Aveiro estuary, on the Portuguese northwest coast. A total of 10 microsatellite DNA loci were employed to explore the genetic structure, variability and relatedness of temporally distinct megalopal events, selected from the major pulses of supply. Larval variation was also compared genetically with that of a previously studied adult crabs sample, at the same loci, collected in 2006 and 2007 along the Iberian Peninsula. Results revealed a lack of genetic differentiation and identical diversity levels among larval events over time. No evidence of reduced genetic diversity between megalopae relative to the diversity assessed from the pooled sample of adults was found. Moreover, there was no evidence of any family relatedness among larvae from temporal events. The results obtained for *C. maenas* contradict predictions made by the sweepstakes reproduction hypothesis, in which large variance in reproductive success is expected, which is presumably detectable as sharp genetic discontinuities among separate larval events. Data here indicate conversely a high degree of temporal genetic stability among larval supply to a given estuary under variable oceanographic conditions, consistent with the hypothesis that sampled larvae were drawn from a large number of adults that do not differ in reproductive success. *Heredity* (2011) 106, 832-840; doi:10.1038/hdy.2010.126; published online 20 October 2010 [Domingues, C. P.; Queiroga, H.] Univ Aveiro, CESAM, P-3810193 Aveiro, Portugal. [Domingues, C. P.; Queiroga, H.] Univ Aveiro, Dept Biol, P-3810193 Aveiro, Portugal. [Domingues, C. P.; Creer, S.; Taylor, M. I.; Carvalho, G. R.] Bangor Univ, Environm Ctr Wales, Sch Biol Sci, Mol Ecol & Fisheries Genet Lab, Bangor, Gwynedd, Wales.; Domingues, CP, Univ Aveiro, CESAM, Campus Univ Santiago, P-3810193 Aveiro, Portugal.; cdomingues@ua.pt.

FARIA, P.J., KAVEMBE, G.D., JUNG'A, J.O., KIMWELE, C.N., ESTES, L.D., REILLO, P.R., MWANGI, A.G. and BRUFORD, M.W., 2011. **The use of non-invasive molecular techniques to confirm the presence of mountain bongo *Tragelaphus eurycerus isaaci* populations in Kenya and preliminary inference of their mitochondrial genetic variation.** *Conservation Genetics*, 12(3), pp. 745-751.

The mountain bongo antelope *Tragelaphus eurycerus isaaci* has rapidly declined in recent decades, due to a combination of hunting, habitat degradation and disease. Endemic to Kenya, mountain bongo populations have shrunk to approximately 100 individuals now mainly confined to the Aberdares mountain ranges. Indirect observation of bongo signs (e.g. tracks, dung) can be misleading, thus methods to ensure reliable species identification, such as DNA-based techniques, are necessary to effectively study and monitor this species. We

assessed bongo presence in four mountain habitats in Kenya (Mount Kenya National Park, Aberdare National Park, Eburu and Mau forests) and carried out a preliminary analysis of genetic variation by examining 466 bp of the first domain of the mtDNA control region using DNA extracted from faecal samples. Of the 201 dung samples collected in the field, 102 samples were molecularly identified as bongo, 97 as waterbuck, one as African buffalo and one as Aders' duiker. Overall species-identification accuracy by experienced trackers was 64%, with very high error of commission when identifying bongo sign (37%), and high error of omission for waterbuck sign (82%), suggesting that the two species' signs are easily confused. Despite high variation in the mtDNA control region in most antelope species, our results suggest low genetic variation in mountain bongo as only two haplotypes were detected in 102 samples analyzed. In contrast, the analysis of 63 waterbuck samples from the same sites revealed 21 haplotypes. Nevertheless, further examination using nuclear DNA markers (e.g. microsatellites) in a multi-locus approach is still required, especially because the use of mitochondrial DNA can result in population overestimation as distinct dung samples can potentially be originated from the same individual. [Faria, P. J.; Bruford, M. W.] Cardiff Univ, Sch Biosci, Cardiff CF10 3AX, S Glam, Wales. [Kavembe, G. D.; Jung'a, J. O.] Univ Nairobi, Fac Vet Med, Dept Anim Prod, Nairobi, Kenya. [Jung'a, J. O.] Univ Nairobi, Fac Vet Med, Dept Anim Physiol & Anat, Nairobi, Kenya. [Kimwele, C. N.] Natl Museums Kenya, Inst Primate Res, Dept Mol Genet, Nairobi, Kenya. [Estes, L. D.; Reillo, P. R.] Rare Species Conservatory Fdn, Loxahatchee, FL 33470 USA. [Estes, L. D.] Univ Virginia, Dept Environm Sci, Ctr Reg Environm Studies, Charlottesville, VA 22903 USA. [Mwangi, A. G.] Rhino Ark Charitable Trust, Nairobi 00517, Kenya.; Faria, PJ, Cardiff Univ, Sch Biosci, Cardiff CF10 3AX, S Glam, Wales.; patriciajaria@yahoo.com.br.

FERNANDEZ-CALVINO, D., ROUSK, J., BROOKES, P.C. and BATH, E., 2011. **Bacterial pH-optima for growth track soil pH, but are higher than expected at low pH.** *Soil Biology & Biochemistry*, 43(7), pp. 1569-1575.

One of the most influential factors determining the growth and composition of soil bacterial communities is pH. However, soil pH is often correlated with many other factors, including nutrient availability and plant community, and causality among factors is not easily determined. If soil pH is directly influencing the bacterial community, this must lead to a bacterial community growth optimised for the in situ pH. Using one set of Iberian soils (46 soils covering pH 4.2-7.3) and one set of UK grassland soils (16 soils covering pH 3.3-7.5) we measured the pH-optima for the growth of bacterial communities. Bacterial growth was estimated by the leucine incorporation method. The pH-optima for bacterial growth were positively correlated with soil pH, demonstrating its direct influence on the soil bacterial community. We found that the pH from a water extraction better matched the bacterial growth optimum compared with salt extractions of soil. Furthermore, we also showed a more subtle pattern between bacterial pH growth optima and soil pH. While closely matched at neutral pHs, pH-optima became higher than the in situ pH in more acid soils, resulting in a difference of about one pH-unit at the low-pH end. We propose that an explanation for the pattern is an interaction between increasing overall bacterial growth with higher pHs and the unimodal pH-response for growth of bacterial communities. (C) 2011 Elsevier Ltd. All rights reserved. [Rousk, Johannes] Bangor Univ, Environm Ctr Wales, Bangor LL57 2UW, Gwynedd, Wales. [Fernandez-Calvino, David] Univ Vigo, Dept Biol Vexetal

& *Ciencia Solo, Fac Ciencias Ourense, Orense 32004, Spain. [Fernandez-Calvino, David; Rousk, Johannes; Baath, Erland] Lund Univ, Dept Biol, SE-22362 Lund, Sweden. [Brookes, Philip C.] Rothamsted Res, Sustainable Soils & Grassland Syst Dept, Harpenden ALS 2JQ, Herts, England.; Rousk, J, Bangor Univ, Environm Ctr Wales, Bangor LL57 2UW, Gwynedd, Wales.; j.rousk@bangor.ac.uk.*

FRIBERG, I.M., LOWE, A., RALLI, C., BRADLEY, J.E. and JACKSON, J.A., 2011. **Temporal Anomalies in Immunological Gene Expression in a Time Series of Wild Mice: Signature of an Epidemic?** *Plos One*, 6(5), pp. e20070.

Although the ecological importance of coinfection is increasingly recognized, analyses of microbial pathogen dynamics in wildlife usually focus on an ad hoc subset of the species present due to technological limitations on detection. Here we demonstrate the use of expression profiles for immunological genes (pattern recognition receptors, cytokines and transcription factors) as a means to identify, without preconception, the likelihood of important acute microbial infections in wildlife. Using a wood mouse population in the UK as a model we identified significant temporal clusters of individuals with extreme expression of immunological mediators across multiple loci, typical of an acute microbial infection. These clusters were circumstantially associated with demographic perturbation in the summertime wood mouse population. Animals in one cluster also had significantly higher individual macroparasite burdens than contemporaries with "normal" expression patterns. If the extreme transcriptional profiles observed are induced by an infectious agent then this implicates macroparasites as a possible player in mediating individual susceptibility or resilience to infection. The form of survey described here, combined with next generation nucleic acids sequencing methods for the broad detection of microbial infectious agents in individuals with anomalous immunological transcriptional profiles, could be a powerful tool for revealing unrecognized, ecologically important infectious agents circulating in wildlife populations. [Friberg, Ida M.; Lowe, Ann; Ralli, Catriona; Bradley, Janette E.] *Univ Nottingham, Sch Biol, Nottingham NG7 2RD, England. [Friberg, Ida M.; Jackson, Joseph A.] Aberystwyth Univ, IBERS, Aberystwyth, Ceredigion, Wales.; Friberg, IM, Univ Nottingham, Sch Biol, Nottingham NG7 2RD, England.; plximf@Nottingham.ac.uk.*

GIMENEZ, L., 2011. **Exploring mechanisms linking temperature increase and larval phenology: The importance of variance effects.** *Journal of experimental marine biology and ecology*, 400(1-2), pp. 227-235.

In temperate environments, many animals and plants show seasonal peaks of abundance. Rising temperatures due to climate change could affect the timing of these peaks with important consequences for populations of organisms positioned higher in the food web. If the peak of consumer species shifts with respect to the resources a trophic mismatch occurs by which many individuals of a population of consumers may not encounter the food source. I show that increased temperatures can lead to trophic mismatch through an alteration of the variance of the abundance distributions of consumers or resources over time; such change would reduce the overlap between the temporal distribution of consumers and resources. This occurs through: (1) a non-linear effect of temperature on the developmental rates; and (2) variations in the shape of the temperature curve during the year. These effects should be widespread among different kinds of

organisms. Temperature increase may therefore have consequences for trophic mismatch through the combined effect of differential shifts in the average timing of life history events and through the reduction in the spread or variance of these events. (C) 2011 Elsevier B.V. All rights reserved. *Bangor Univ, Sch Ocean Sci, Bangor LL59 5HP, Gwynedd, Wales.; Gimenez, L, Bangor Univ, Sch Ocean Sci, Bangor LL59 5HP, Gwynedd, Wales.; L.gimenez@bangor.ac.uk.*

HALLBERG, K.B., HEDRICH, S. and JOHNSON, D.B., 2011. **Acidiferrobacter thiooxydans, gen. nov. sp. nov.; an acidophilic, thermo-tolerant, facultatively anaerobic iron- and sulfur-oxidizer of the family Ectothiorhodospiraceae.** *Extremophiles*, 15(2), pp. 271-279.

A comprehensive physiological and phylogenetic characterisation was carried out of "Thiobacillus ferrooxidans" m-1, an acidophilic iron-oxidizing bacterium first described over 25 years ago. Phylogenetically, strain m-1 is a gammaproteobacterium, most closely related to alkaliphilic Ectothiorhodospira spp. and only distantly to iron-oxidizing acidithiobacilli. Physiological examination confirmed that strain m-1 can grow autotrophically not only by ferrous iron oxidation but also, in contrast to previous reports, by oxidation of elemental sulfur, sulfide and tetrathionate, using either oxygen or ferric iron as terminal electron acceptor. The bacterium was also found to be thermo-tolerant, growing optimally at 38 degrees C and up to a maximum of 47 degrees C. Growth in liquid media required an external osmotic potential of > 2 bar, and was optimal at similar to 5 bar, though no growth occurred where the medium osmotic potential was close to that of sea water (similar to 26 bar). From this, it was concluded that strain m-1 is a moderate osmophile. Strain m-1 was also shown to be diazotrophic and tolerant of elevated concentrations of many metals typically found in mine-impacted environments. On the basis of these data, m-1 is proposed as the type strain of a new genus and species of bacteria, Acidiferrobacter thiooxydans (DSM 2392, JCM 17358). [Hallberg, Kevin B.; Hedrich, Sabrina; Johnson, D. Barrie] Bangor Univ, Sch Biol Sci, Coll Nat Sci, Bangor LL57 2UW, Gwynedd, Wales.; Hallberg, KB, Bangor Univ, Sch Biol Sci, Coll Nat Sci, Deiniol Rd, Bangor LL57 2UW, Gwynedd, Wales.; k.hallberg@bangor.ac.uk.

HAWKES, L.A., BALACHANDRAN, S., BATBAYAR, N., BUTLER, P.J., FRAPPELL, P.B., MILSOM, W.K., TSEVEENMYADAG, N., NEWMAN, S.H., SCOTT, G.R., SATHIYASELVAM, P., TAKEKAWA, J.Y., WIKELSKI, M. and BISHOP, C.M., 2011. **The trans-Himalayan flights of bar-headed geese (*Anser indicus*).** *Proceedings of the National Academy of Sciences of the United States of America*, 108(23), pp. 9516-9519.

Birds that fly over mountain barriers must be capable of meeting the increased energetic cost of climbing in low-density air, even though less oxygen may be available to support their metabolism. This challenge is magnified by the reduction in maximum sustained climbing rates in large birds. Bar-headed geese (*Anser indicus*) make one of the highest and most iconic transmountain migrations in the world. We show that those populations of geese that winter at sea level in India are capable of passing over the Himalayas in 1 d, typically climbing between 4,000 and 6,000m in 7-8 h. Surprisingly, these birds do not rely on the assistance of upslope tailwinds that usually occur during the day and can support minimum climb rates of 0.8-2.2 km.h(-1), even in the relative stillness of the night. They

appear to strategically avoid higher speed winds during the afternoon, thus maximizing safety and control during flight. It would seem, therefore, that bar-headed geese are capable of sustained climbing flight over the passes of the Himalaya under their own aerobic power. [Hawkes, Lucy A.; Bishop, Charles M.] Bangor Univ, Sch Biol Sci, Bangor LL57 2UW, Gwynedd, Wales. [Balachandran, Sivananthaperumal; Sathiyaselvam, Ponnusamy] Bombay Nat Hist Soc, Bombay 400001, Maharashtra, India. [Batbayar, Nyambayar; Tseveenmyadag, Natsagdorj] Mongolian Acad Sci, Ulaanbataar 210351, Mongol Peo Rep. [Butler, Patrick J.] Univ Birmingham, Sch Biosci, Birmingham B15 2TT, W Midlands, England. [Frappell, Peter B.] Univ Tasmania, Sch Zool, Hobart, Tas 7001, Australia. [Milsom, William K.; Scott, Graham R.] Univ British Columbia, Dept Zool, Vancouver, BC V6T 1Z4, Canada. [Newman, Scott H.] Food & Agr Org United Nations, EMPRES Wildlife Hlth & Ecol Unit, I-00153 Rome, Italy. [Takekawa, John Y.] US Geol Survey, Western Ecol Res Ctr, Vallejo, CA 94592 USA. [Wikelski, Martin] Max Planck Inst Ornithol, D-78315 Radolfzell am Bodensee, Germany.; Bishop, CM, Bangor Univ, Sch Biol Sci, Bangor LL57 2UW, Gwynedd, Wales.; c.bishop@bangor.ac.uk.

MADJDZADEH, S.M., DAWAH, H.A. and BRUFORD, M., 2011. **Morphometric differentiation of *Tetramesa leucospae* Zerova & Madjdzadeh, 2005, populations associated with two geographically isolated grass species in Iran (Hymenoptera: Eurytomidae).** *Zoology in the Middle East*, 52, pp. 79-88. Discriminant function and cluster analyses were performed on 19 morphometric variables of the head, thorax, propodeum, wing, antenna and leg to determine whether individuals of *Tetramesa* sp. are distinguishable from the morphologically similar *Tetramesa leucospae* Zerova & Madjdzadeh, 2005. The former was reared from the grass *Leucopoa pseudosclerophylla* (Krivot.), an endemic species in the alpine region of southern Iran, and the latter from *Festuca sclerophylla* (Boiss. Ex Bisch.) that is found on stony slopes in northern Iran. Our results showed significant differences between individuals of *Tetramesa* reared from these two geographically isolated grasses. A stepwise discriminant function analysis selected six morphological characters (distance between two top ocelli, length of compound eye, breadth of thorax, width of propodeal foramen, stigmal vein and tarsal segment 2 of hind leg) from which two characters (width of propodeal foramen and distance between two top ocelli) provided the greatest discrimination between these geographically isolated populations of *Tetramesa*. 84% of individuals were reclassified correctly into their original populations using these characters. A dendrogram of the cluster analysis based on data of squared Euclidean distances between *Tetramesa* showed two main branches, one that combined *Tetramesa* reared from *L. pseudosclerophylla* and the other that represented the individuals reared from *F. sclerophylla*. This analysis clearly implies that each host-associated population is restricted to one grass species. We therefore concluded that the two *Tetramesa* populations represent two host-adapted forms and we consider that they are an example of superficially cryptic allopatric speciation in insects. [Madjdzadeh, Seyed Massoud] Shahid Bahonar Univ Kerman, Fac Sci, Dept Biol, Kerman, Iran. [Bruford, Mike] Cardiff Univ, Cardiff Sch Biosci, Cardiff CF10 3AX, S Glam, Wales.; Madjdzadeh, SM, Shahid Bahonar Univ Kerman, Fac Sci, Dept Biol, Kerman, Iran.; madjdzadeh@yahoo.co.uk.

MALHOTRA, A., DAWSON, K., GUO, P. and THORPE, R.S., 2011. **Phylogenetic structure and species boundaries in the mountain pitviper *Ovophis monticola* (Serpentes: Viperidae: Crotalinae) in Asia.** *Molecular phylogenetics and evolution*, 59(2), pp. 444-457.

We investigated phylogenetic structure and morphological variation in Asian mountain pitvipers of the genus *Ovophis* (comprising 3-4 species some of which are considered polytypic) by sequencing four mitochondrial markers (cytochrome b, NADH dehydrogenase subunit 4, 12S and 16S rRNA) from 72 specimens, and analysed them in a Bayesian framework together with another 26 sequences from closely related genera. We reconstructed the region of origin and direction of dispersal of the major clades, and of *Ovophis* as a whole, using likelihood framework analysis. We also defined morphogroups from 280 specimens from across the range of *Ovophis* to allow the geographic extent of the major clades to be determined, as well as to allow inclusion of specimens lacking sequence data. Phylogenetic analyses confirmed the monophyly of *Ovophis* as currently defined, and revealed that it contains two major lineages, eastern (mainly Chinese) and western, with both occurring in southwestern China, central and northern Viet Nam. The most likely origin of the genus, and of individual lineages, coincides with the northeastern boundary of the Indomalayan hotspot. Major diversification in this species group likely corresponded to major climatic changes arising from the uplift of the Tibetan Plateau in the early to mid Miocene. With reference to the defined morphogroups, we suggest that at least five species are present and provide appropriate names. With a few exceptions, the newly defined species boundaries do not correspond to the existing taxonomy. (C) 2011 Elsevier Inc. All rights reserved. [Malhotra, Anita; Dawson, Karen; Thorpe, Roger S.] Bangor Univ, Sch Biol Sci, Coll Nat Sci, Bangor LL57 2UW, Gwynedd, Wales. [Guo, Peng] Yibin Univ, Coll Life Sci & Food Engr, Yibin 644007, Sichuan, Peoples R China. [Guo, Peng] Chinese Acad Sci, Chengdu 610041, Peoples R China.; Malhotra, A, Bangor Univ, Sch Biol Sci, Coll Nat Sci, 3rd Floor ECW, Deiniol Rd, Bangor LL57 2UW, Gwynedd, Wales.; a.malhotra@bangor.ac.uk.

MEYER, C.F.J., AGUIAR, L.M.S., AGUIRRE, L.F., BAUMGARTEN, J., CLARKE, F.M., COSSON, J., VILLEGAS, S.E., FAHR, J., FARIA, D., FUREY, N., HENRY, M., HODGKISON, R., JENKINS, R.K.B., JUNG, K.G., KINGSTON, T., KUNZ, T.H., MACSWINEY, M.C., MOYA, I., PATTERSON, B.D., PONS, J., RACEY, P.A., REX, K., SAMPAIO, E.M., SOLARI, S., STONER, K.E., VOIGT, C.C., VON STADEN, D., WEISE, C.D. and KALKO, E.K.V., 2011. **Accounting for detectability improves estimates of species richness in tropical bat surveys.** *Journal of Applied Ecology*, 48(3), pp. 777-787.

1. Species richness is a state variable of some interest in monitoring programmes but raw species counts are often biased due to imperfect species detectability. Therefore, monitoring programmes should quantify detectability for target taxa to assess whether it varies over temporal or spatial scales. We assessed the potential for tropical bat monitoring programmes to reliably estimate trends in species richness. 2. Using data from 25 bat assemblages from the Old and New World tropics, we estimated detectability for all species in an assemblage (mean proportion of species detected per sampling plot) and for individual species (species-specific detectability). We further assessed how these estimates of detectability were affected by external sources of variation relating to time, space, survey effort and biological traits. 3. The mean proportion of species detected

across 96 sampling plots was estimated at 0 center dot 76 (range 0 center dot 57-1 center dot 00) and was significantly greater for phytophagous than for animalivorous species. Species-averaged detectability for phytophagous species was influenced by the number of surveys and season, whereas the number of surveys and sampling methods [ground- or canopy-level mist nets, harp traps and acoustic sampling (AS)] most strongly affected estimates of detectability for animalivorous bats. Species-specific detectability averaged 0 center dot 4 and was highly heterogeneous across 232 species, with estimates ranging from 0 center dot 03 to 0 center dot 84. Species-level detectability was influenced by a range of external factors such as location, season, or sampling method, suggesting that raw species counts may sometimes be strongly biased.

4. Synthesis and applications. Due to generally high species-specific detection probabilities, Neotropical aerial insectivorous bats proved to be well suited for monitoring using AS. However, for species with low detectability, such as most gleaning animalivores or nectarivores, count data obtained in bat monitoring surveys must be corrected for detection bias. Our results indicate that species-averaged detection probabilities will rarely approach 1 unless many surveys are conducted. Consequently, long-term bat monitoring programmes need to adopt an estimation scheme that corrects for variation in detectability when comparing species richness over time and when making regional comparisons. Similar corrections will be needed for other species-rich tropical taxa.

[Meyer, Christoph F. J.; Fahr, Jakob; Hodgkinson, Robert; Jung, Kirsten G.; Sampaio, Erica M.; von Staden, Dietrich; Kalko, Elisabeth K. V.] Univ Ulm, Inst Expt Ecol, D-89069 Ulm, Germany. [Meyer, Christoph F. J.] Univ Lisbon, Fac Ciencias, Ctr Biol Ambiental, P-1749016 Lisbon, Portugal. [Aguiar, Ludmilla M. S.] Univ Brasilia, Dept Zool, BR-70910900 Brasilia, DF, Brazil. [Aguirre, Luis F.] Univ Mayor San Simon, Ctr Biodiversidad & Genet, Cochabamba, Bolivia. [Aguirre, Luis F.; Moya, Isabel] Ctr Estudios Biol Teor & Aplicada, Programa Para Conservac Murcielagos Bolivia, La Paz, Bolivia. [Baumgarten, Julio; Faria, Deborah] Univ Estadual Santa Cruz, Dept Ciencias Biol, BR-45650000 Ilheus, Bahia, Brazil. [Clarke, Frank M.; Furey, Neil; Jenkins, Richard K. B.; MacSwiney, Maria Cristina] Univ Aberdeen, Inst Biol & Environm Sci, Aberdeen AB24 2TZ, Scotland. [Cosson, Jean-Francois] INRA, UMR CBGP, F-34988 Montferrier Sur Lez, France. [Villegas, Sergio Estrada] McGill Univ, Dept Biol, Montreal, PQ H3A 1B1, Canada. [Henry, Mickael] INRA, UMR 406 Abeilles & Environm, F-84914 Avignon, France. [Jenkins, Richard K. B.] Madagasikara Voakajy, Antananarivo, Madagascar. [Jenkins, Richard K. B.] Univ Kent, Sch Anthropol & Conservat, DICE, Canterbury CT2 7NR, Kent, England. [Jenkins, Richard K. B.] Bangor Univ, Sch Environm Nat Resources & Geog, Bangor LL57 2UW, Gwynedd, Wales. [Kingston, Tigga] Texas Tech Univ, Dept Biol Sci, Lubbock, TX 79409 USA. [Kunz, Thomas H.] Boston Univ, Ctr Ecol & Conservat Biol, Dept Biol, Boston, MA 02215 USA. [MacSwiney, Maria Cristina] Univ Veracruzana, Ctr Invest Trop, Veracruz 91019, Mexico. [Patterson, Bruce D.] Field Museum Nat Hist, Dept Zool, Chicago, IL 60605 USA. [Pons, Jean-Marc] Museum Natl Hist Nat, Dept Systemat & Evolut, UMR 7205, F-75005 Paris, France. [Racey, Paul A.] Univ Exeter Cornwall, Ctr Ecol & Conservat, Penryn TR10 9EZ, England. [Rex, Katja; Voigt, Christian C.] Leibniz Inst Zoo & Wildlife Res, D-10315 Berlin, Germany. [So(TRUNCATED)].

NIEUWLAND, J., DE GRAAF, B.H.J., CHEUNG, A.Y. and BOSCH, M., 2011. **Plant reproduction: does size matter?** *New Phytologist*, 190(4), pp. 812-815.

Plant development takes place almost entirely after embryogenesis in contrast to most animals in which the final body plan is laid out during embryogenesis. Plants therefore are able to respond to changes in biotic and abiotic conditions by adapting their body plan. This requires not only a high level of plasticity on both the cellular and molecular level but also a tight regulation of cell division and growth. These aspects indicate differences in the integration of growth and cell division between animals and plants and would predict the existence of plant-unique factors (Dewitte & Murray, 2003; De Veylder *et al.*, 2007). Although the core cell cycle machinery is in essence the same in all eukaryotes, it has become clear that such plant-specific factors are pivotal for plant development (Nieuwland *et al.*, 2009b). In this issue of *New Phytologist*, DePaoli *et al.* (pp. 882–895) describe a novel protein, SCI1 (stigma/style cell cycle inhibitor 1), which may well serve the role of specific cell cycle regulator for pistil development in *Nicotiana tabacum* (tobacco). The pistil, typically consisting of stigma, style and ovary (see Fig. 1), is the female reproductive organ of the flower in angiosperms. Its proper development is essential for successful plant reproduction. The stigma captures the pollen containing the sperm cells. The pollen forms a tube which grows a considerable distance through stigma and style to reach an ovule in the ovary, after which sperm cells are released for fertilization followed by seed development. Results described in DePaoli *et al.* suggest that SCI1 acts as an inhibitor of cell division and is specifically involved in the development of tobacco pistils. [Bosch, Maurice] Aberystwyth Univ, Inst Biol Environm & Rural Sci IBERS, Aberystwyth SY23 3EB, Dyfed, Wales. [Nieuwland, Jeroen; de Graaf, Barend H. J.] Cardiff Univ, Cardiff Sch Biosci, Cardiff CF10 3AX, S Glam, Wales. [Cheung, Alice Y.] Univ Massachusetts, Dept Biochem & Mol Biol, Amherst, MA 01003 USA. [Cheung, Alice Y.] Univ Massachusetts, Mol Cell Biol Program, Amherst, MA 01003 USA. [Cheung, Alice Y.] Univ Massachusetts, Plant Biol Grad Program, Amherst, MA 01003 USA.; Bosch, M, Aberystwyth Univ, Inst Biol Environm & Rural Sci IBERS, Aberystwyth SY23 3EB, Dyfed, Wales.; degtraafb@cardiff.ac.uk mub@aber.ac.uk.

OLIVER, P.G. and LOTZEN, J., 2011. **An Anatomically Bizarre, Fluid-Feeding, Galeommatoidean Bivalve: *Draculamya Porobranchiata* Gen. Et Sp. Nov. (Mollusca: Bivalvia).** *Journal of Conchology*, 40, pp. 365-392.

For the first time we propose ectoparasitism, by piercing and fluid-feeding in the Bivalvia. *Draculamya porobranchiata* a gen. et sp. nov is described and the anatomy reveals a number of functional adaptations related to the feeding mode. Primary among these is a puncturing organ situated at the anterior end of the byssus groove. The ctenidia are reduced to a series of ciliated pores set ventrally within a suspensory membrane and the labial palps are not present, indicating that suspension feeding cannot take place. The alimentary tract is highly modified; the oesophageal musculature is in the form of a suction pump. The fore stomach is greatly expanded, lacking sorting ridges and is presumed to store large volumes of ingested fluid. The central cavity of the stomach is poorly defined with a small gastric shield and style sac while the openings to the digestive diverticula are wide. The ovary is situated in the mantle and foreign sperm are stored in paired ctenidial seminal receptacles;. No males were found. There are left and right pericardia and their failure to fuse as in other bivalves prevent the development of a heart. Oxygenation of the blood probably occurs across the thin walls separating the mantle cavity and the proportionally very large blood sinuses. Comparisons

are made with *Kurtiella tumidula* (= *Mysella verrilli*) the only other described galeommatoid with a suctorial habit. [Oliver, P. Graham] *Natl Museum Wales, Dept Biodivers & Systemat Biol, Cardiff CF10 3NP, S Glam, Wales.* [Lotzen, Jorgen] *Univ Copenhagen, Dept Biol, DK-2100 Copenhagen O, Denmark.;* Oliver, PG, *Natl Museum Wales, Dept Biodivers & Systemat Biol, Cathays Pk, Cardiff CF10 3NP, S Glam, Wales.;* graham.oliver@museumwales.ac.uk.

PARRY, G.S., BURTON, S., COX, B. and FORMAN, D.W., 2011. **Diet of coastal foraging Eurasian otters (*Lutra lutra* L.) in Pembrokeshire south-west Wales.** *European Journal of Wildlife Research*, 57(3), pp. 485-494.

The importance of the marine environment to Eurasian otters is currently poorly understood. Wales is one of the few countries where coastal activity has been recorded and an increase in marine otter sightings could indicate remarkable developments within Welsh populations. The trophic niche of coastal otter populations around Pembrokeshire was investigated over a 12-month period. Marine activity was more widespread than previously thought and marine prey formed the largest component of otter diet, although, otters also consumed freshwater and terrestrial prey throughout the year. Otter diet was very diverse compared to other European coastal populations and a spring contraction in trophic niche width coincided with the estimated timing of breeding activity. Seasonal variation in prey composition was predominantly due to differences in the consumption of alternate prey types. In areas where wetlands are fragmented and populations of freshwater fish are declining, the marine environment may become an increasingly important habitat for otters. It is necessary to define the historical importance of coastal populations to otter conservation. Coastal areas are often subject to pressure from human activities, so the impact of disturbance needs to be assessed. Importantly, there is no verified otter survey method for coastal areas, so the use of marine habitat is likely to be underestimated. [Parry, Gareth S.; Forman, Dan W.] *Swansea Univ, Sch Environm & Soc, Conservat Ecol Res Team, Dept Pure & Appl Ecol, Swansea SA2 8PP, W Glam, Wales.* [Burton, Sue] *Pembrokeshire Marine SAC, Old Sail Loft, Milford Docks, Milford Haven SA73 3AF, Pembroke, Wales.* [Cox, Bethan] *Pembrokeshire Cty Council, Haverfordwest SA61 1TP, Pembro, Wales.;* Forman, DW, *Swansea Univ, Sch Environm & Soc, Conservat Ecol Res Team, Dept Pure & Appl Ecol, Singleton Pk, Swansea SA2 8PP, W Glam, Wales.;* d.w.forman@swansea.ac.uk.

PLANT, A., 2011. **The Hemerodromiinae (Diptera: Empididae) of New Zealand III. *Antipodromia* new genus.** *New Zealand Entomologist*, 34, pp. 52-55.

Antipodromia new genus (Diptera: Empididae: Hemerodromiinae) is described. The genus is monotypic with *Hemerodromia radialis* Collin, 1928 its type species and is endemic to New Zealand. Systematic relationships with *Hemerodromia* Meigen and other Hemerodromiinae are discussed. *Natl Museum Wales, Dept Biodivers & Systemat Biol, Cardiff CF10 3NP, S Glam, Wales.;* Plant, A, *Natl Museum Wales, Dept Biodivers & Systemat Biol, Cathays Pk, Cardiff CF10 3NP, S Glam, Wales.;* adrian.plant@museumwales.ac.uk.

REIMER, J.D., HIROSE, M., IREI, Y., OBUCHI, M. and SINNIGER, F., 2011. **The sands of time: rediscovery of the genus *Neozoanthus* (Cnidaria: Hexacorallia) and evolutionary aspects of sand incrustation in brachycnemic zoanthids.** *Marine Biology*, 158(5), pp. 983-993.

The zoanthid family Neozoanthidae (Anthozoa: Hexacorallia: Zoantharia) was described in 1973 from Madagascar as a monogeneric and monotypic taxon, and never reported again in literature. In 2008-2010, numerous zoanthid specimens fitting the morphological description of Neozoanthus were collected in the Ryukyu Islands, Okinawa, Japan, and the Great Barrier Reef (GBR), Australia. Utilizing these specimens, this study re-examines the phylogenetic position of Neozoanthidae and analyzes the evolutionary history of sand incrustation in zoanthids through phylogenetic and ancestral state reconstruction analyses. Specimens were colonial, partially incrustated with large, irregular sand and debris, zooxanthellate, and found from the intertidal zone to depths of approximately 30 m. Phylogenetic results utilizing mitochondrial 16S ribosomal DNA and cytochrome oxidase subunit I sequences show the presence of two Neozoanthus species groups, one each from Japan and the GBR. Unexpectedly, the molecular results also show Neozoanthus to be very closely related to the genus Isaurus, which as a member of the family Zoanthidae, is not sand incrustated. These results suggest that during evolution zoanthids can acquire and lose the ability to incrust sand with relative rapidity. [Reimer, James Davis] Japan Agcy Marine Earth Sci & Technol JAMSTEC, Marine Biodivers Res Program, Inst Biogeosci, Yokosuka, Kanagawa 2370061, Japan. [Reimer, James Davis; Hirose, Mamiko; Obuchi, Masami; Sinniger, Frederic] Univ Ryukyus, Mol Invertebrate Systemat & Ecol Lab, Rising Star Program, Transdisciplinary Org Subtrop Isl Studies, Okinawa 9030213, Japan. [Irei, Yuka] Univ Ryukyus, Mol Invertebrate Systemat & Ecol Lab, Grad Sch Engr & Sci, Okinawa 9030213, Japan. [Sinniger, Frederic] Bangor Univ, Mol Ecol & Fisheries Genet Lab, Environm Ctr, Sch Biol Sci, Bangor LL57 2UW, Gwynedd, Wales.; Reimer, JD, Japan Agcy Marine Earth Sci & Technol JAMSTEC, Marine Biodivers Res Program, Inst Biogeosci, 2-15 Natsushima, Yokosuka, Kanagawa 2370061, Japan.; jreimer@sci.u-ryukyu.ac.jp.

RIDGWAY, I.D., RICHARDSON, C.A., ENOS, E., UNGVARI, Z., AUSTAD, S.N., PHILIPP, E.E.R. and CSISZAR, A., 2011. **New Species Longevity Record for the Northern Quahog (=Hard Clam), Mercenaria Mercenaria.** *Journal of Shellfish Research*, 30(1), pp. 35-38.

Twenty-two large shells (> 90 mm shell height) from a sample of live collected hard shell clams, *Mercenaria mercenaria*, from Buzzards Bay, Woods Hole, Cape Cod, MA, were subjected to sclerochronological analysis. Annually resolved growth lines in the hinge region and margin of the shell were identified and counted; the age of the oldest clam shell was determined to be at least 106 y. This age represents a considerable increase in the known maximum life span for *M. mercenaria*, more than doubling the maximum recorded life span of the species (46 y). More than 85% of the clam shells aged had more than 46 annual increments, the previous known maximum life span for the species. In this article we present growth rate and growth performance indicators (the overall growth performance and phi prime) for this record-breaking population of *M. mercenaria*. Recently discovered models of aging require accurate age records and growth parameters for bivalve populations if they are to be utilized to their full potential. [Ridgway, Iain D.; Richardson, C. A.] Bangor Univ, Coll Nat Sci, Sch Ocean Sci, Menai Bridge, Anglesey, Wales. [Ungvari, Z.; Csiszar, Anna] Univ Oklahoma, Hlth Sci Ctr, Donald W Reynolds Dept Geriatr Med, Reynolds Oklahoma Ctr Aging, Oklahoma City, OK 73104 USA. [Enos, E.] Marine Biol Lab, Aquat Resources Div, Woods Hole, MA 02543 USA. [Austad, S. N.] Univ Texas

Hlth Sci Ctr San Antonio, Sam & Ann Barshop Inst Longev & Aging Studies, San Antonio, TX 78245 USA. [Philipp, E. E. R.] Univ Kiel, Inst Clin Mol Biol, D-24105 Kiel, Germany.; Ridgway, ID, Bangor Univ, Coll Nat Sci, Sch Ocean Sci, Menai Bridge, Anglesey, Wales.; ain.ridgway@bangor.ac.uk.

RODRIGUES, C.F., HILARIO, A., CUNHA, M.R., WEIGHTMAN, A.J. and WEBSTER, G., 2011. **Microbial diversity in Frenulata (Siboglinidae, Polychaeta) species from mud volcanoes in the Gulf of Cadiz (NE Atlantic).** *Antonie Van Leeuwenhoek International Journal of General and Molecular Microbiology*, 100(1), pp. 83-98.

Frenulates are a group of gutless marine annelids belonging to the Siboglinidae that are nutritionally dependent upon endosymbiotic bacteria. We have characterized the bacteria associated with several frenulate species from mud volcanoes in the Gulf of Cadiz by PCR-DGGE of bacterial 16S rRNA genes, coupled with analysis of 16S rRNA gene libraries. In addition to the primary symbiont, bacterial consortia (microflora) were found in all species analysed. Phylogenetic analyses indicate that the primary symbiont in most cases belongs to the Gammaproteobacteria and were related to thiotrophic and methanotrophic symbionts from other marine invertebrates, whereas members of the microflora were related to multiple bacterial phyla. This is the first molecular evidence of methanotrophic bacteria in at least one frenulate species. In addition, the occurrence of the same bacterial phylotype in different Frenulata species, from different depths and mud volcanoes suggests that there is no selection for specific symbionts and corroborates environmental acquisition as previously proposed for this group of siboglinids. [Rodrigues, Clara F.; Hilario, Ana; Cunha, Marina R.] Univ Aveiro, CESAM, P-3810193 Aveiro, Portugal. [Rodrigues, Clara F.; Hilario, Ana; Cunha, Marina R.] Univ Aveiro, Dept Biol, P-3810193 Aveiro, Portugal. [Weightman, Andrew J.; Webster, Gordon] Cardiff Univ, Cardiff Sch Biosci, Cardiff CF10 3AT, S Glam, Wales. [Webster, Gordon] Cardiff Univ, Sch Earth & Ocean Sci, Cardiff CF10 3AT, S Glam, Wales.; Rodrigues, CF, Univ Aveiro, CESAM, Campus Santiago, P-3810193 Aveiro, Portugal.; clara.rodrigues@ua.pt.

RYLAND, J.S., BISHOP, J.D.D., DE BLAUWE, H., EL NAGAR, A., MINCHIN, D., WOOD, C.A. and YUNNIE, A.L.E., 2011. **Alien species of Bugula (Bryozoa) along the Atlantic coasts of Europe.** *Aquatic Invasions*, 6(1), pp. 17-31.

Three apparently non-native species of Bugula occur in marinas and harbours in Atlantic Europe. The most common, *B. neritina*, was known from a few sites in southern Britain and northern France during the 20(th) century, following its discovery at Plymouth by 1911. During the 1950-60s it was abundant in a dock heated by power station effluent at Swansea, south Wales, where it flourished until the late 1960s, while water temperatures were 7-10 degrees C above ambient. It disappeared after power generation ceased, when summer temperatures probably became insufficient to support breeding. Details of disappearances have not been recorded but *B. neritina* was not seen in Britain between c1970 and 1999. Since 2000, it has been recorded along the south coast of England, and subsequently in marinas in the southern North Sea, Ireland and southern Scotland, well to the north of its former range, as well as along the Atlantic coast from Spain to The Netherlands. It has also been introduced to outlying localities such as the Azores and Tristan da Cunha. We report that this rapidly spreading form has the same COI haplotype as *B. neritina* currently invasive elsewhere in the world. *B. simplex*

has been reported less, with 1950s records from settlement panels in some Welsh docks. It has not been targeted in most recent marina surveys but has been observed in southwest England, Belgium and The Netherlands. There are almost no recent records of *B. stolonifera*, though it was probably introduced to a few British and Irish ports prior to the 1950s. Its current status in most of western Europe is unknown but it has been reported as expanding throughout most of the world during the last 60 years. Having poorly known distributions, *B. simplex* and *B. stolonifera* should be recorded during future monitoring of alien species in Atlantic Europe. Illustrations to aid identification are included for all three species. [Ryland, John S.] Swansea Univ, Dept Pure & Appl Ecol, Swansea SA2 8PP, W Glam, Wales. [Bishop, John D. D.; El Nagar, Aliya; Wood, Christine A.; Yunnie, Anna L. E.] Marine Biol Assoc United Kingdom Lab, Plymouth PL1 2PB, Devon, England. [Minchin, Dan] Marine Organism Invest, Killaloe, Co Clare, Ireland.; Ryland, JS, Swansea Univ, Dept Pure & Appl Ecol, Swansea SA2 8PP, W Glam, Wales.; j.s.ryland@swan.ac.uk jbis@mba.ac.uk deblauwehans@hotmail.com plxae6@exmail.nottingham.ac.uk moiireland@yahoo.ie cwo@mba.ac.uk ayunnie@sb-roscoff.fr.

SANZ, L., DEWITTE, W., FORZANI, C., PATELL, F., NIEUWLAND, J., WEN, B., QUELHAS, P., DE JAGER, S., TITMUS, C., CAMPILHO, A., REN, H., ESTELLE, M., WANG, H. and MURRAY, J.A.H., 2011. **The Arabidopsis D-Type Cyclin CYCD2;1 and the Inhibitor ICK2/KRP2 Modulate Auxin-Induced Lateral Root Formation.** *Plant Cell*, 23(2), pp. 641-660.

The integration of cell division in root growth and development requires mediation of developmental and physiological signals through regulation of cyclin-dependent kinase activity. Cells within the pericycle form de novo lateral root meristems, and D-type cyclins (CYCD), as regulators of the G(1)-to-S phase cell cycle transition, are anticipated to play a role. Here, we show that the D-type cyclin protein CYCD2;1 is nuclear in *Arabidopsis thaliana* root cells, with the highest concentration in apical and lateral meristems. Loss of CYCD2;1 has a marginal effect on unstimulated lateral root density, but CYCD2;1 is rate-limiting for the response to low levels of exogenous auxin. However, while CYCD2;1 expression requires sucrose, it does not respond to auxin. The protein Inhibitor-Interactor of CDK/Kip Related Protein2 (ICK2/KRP2), which interacts with CYCD2;1, inhibits lateral root formation, and *ick2/krp2* mutants show increased lateral root density. ICK2/KRP2 can modulate the nuclear levels of CYCD2;1, and since auxin reduces ICK2/KRP2 protein levels, it affects both activity and cellular distribution of CYCD2;1. Hence, as ICK2/KRP2 levels decrease, the increase in lateral root density depends on CYCD2;1, irrespective of ICK2/CYCD2;1 nuclear localization. We propose that ICK2/KRP2 restrains root ramification by maintaining CYCD2;1 inactive and that this modulates pericycle responses to auxin fluctuations. [Sanz, Luis; Dewitte, Walter; Forzani, Celine; Patell, Farah; Nieuwland, Jeroen; Wen, Bo; Titmus, Craig; Murray, James A. H.] Cardiff Univ, Cardiff Sch Biosci, Cardiff CF10 3AX, S Glam, Wales. [Sanz, Luis] Univ Salamanca, Ctr Hispano Luso Invest Agr, Salamanca 37185, Spain. [Quelhas, Pedro; Campilho, Aurelio] Inst Biomed Engr, Div Sinal & Imagem, P-4200465 Oporto, Portugal. [De Jager, Sarah] Univ Cambridge, Dept Physiol Dev & Neurosci, Cambridge CB2 3DY, England. [Campilho, Aurelio] Univ Porto, Fac Engr, P-4200465 Oporto, Portugal. [Ren, Hong; Estelle, Mark] Univ Calif San Diego, Div Biol Sci, La Jolla, CA 92093 USA. [Wang, Hong] Univ Saskatchewan, Dept Biochem, Saskatoon, SK S7N 5E5,

Canada.; Murray, JAH, Cardiff Univ, Cardiff Sch Biosci, Cardiff CF10 3AX, S Glam, Wales.; murrayja1@cardiff.ac.uk.

TORRES, G., GIMENEZ, L. and ANGER, K., 2011. **Growth, tolerance to low salinity, and osmoregulation in decapod crustacean larvae.** *Aquatic Biology*, 12(3), pp. 249-260.

Marine invertebrate larvae suffer high mortality due to abiotic and biotic stress. In planktotrophic larvae, mortality may be minimised if growth rates are maximised. In estuaries and coastal habitats however, larval growth may be limited by salinity stress, which is a key factor selecting for particular physiological adaptations such as osmoregulation. These mechanisms may be energetically costly, leading to reductions in growth. Alternatively, the metabolic costs of osmoregulation may be offset by the capacity maintaining high growth at low salinities. Here we attempted identify general response patterns in larval growth at reduced salinities by comparing 12 species of decapod crustaceans with differing levels of tolerance to low salinity and differing osmoregulatory capability, from osmoconformers to strong osmoregulators. Larvae possessing tolerance to a wider range in salinity were only weakly affected by low salinity levels. Larvae with a narrower tolerance range, by contrast, generally showed reductions in growth at low salinity. The negative effect of low salinity on growth decreased with increasing osmoregulatory capacity. Therefore, the ability to osmoregulate allows for stable growth. In euryhaline larval decapods, the capacity to maintain high growth rates in physically variable environments such as estuaries appears thus to be largely unaffected by the energetic costs of osmoregulation. [Torres, Gabriela; Gimenez, Luis] Bangor Univ, Sch Ocean Sci, Menai Bridge LL59 5AB, Gwynedd, Wales. [Torres, Gabriela; Anger, Klaus] Fdn Alfred Wegener Inst Polar & Marine Res, D-27498 Helgoland, Germany.; Torres, G, Bangor Univ, Sch Ocean Sci, Menai Bridge LL59 5AB, Gwynedd, Wales.; g.torres@bangor.ac.uk.

WHITELEY, N.M., RASTRICK, S.P.S., LUNT, D.H. and ROCK, J., 2011. **Latitudinal variations in the physiology of marine gammarid amphipods.** *Journal of experimental marine biology and ecology*, 400(1-2), pp. 70-77.

In order to examine the physiological capabilities of marine invertebrates in their natural environment, a series of physiological measurements were conducted on congeneric amphipod species (Genus Gammarus) distributed along a natural thermal gradient in the NE Atlantic and Arctic Oceans. This synoptic paper summarises our most recent findings by describing physiological differences within and between Gammarus species collected from the intertidal between Portugal at 38 degrees N and Svalbard at 79 degrees N. Two physiological variables were examined to include temperature-adaptive responses at two different levels of biological organisation: (1) whole animal responses by measuring oxygen uptake rates as a measure of metabolic rates or costs of living; and (2) molecular responses by examining sequence variation in two functional regions of the myosin heavy chain gene (loops 1 and 2) which influence muscle contractibility. Our initial observations on Gammarus species showed that physiological variation as a function of latitude was species-specific. For instance, the sub-arctic/boreal species Gammarus oceanicus did not compensate its metabolism at polar latitudes. Instead, metabolic rates declined with latitudinal changes in temperature resulting in relatively low rates of metabolism in the sub-arctic population. In contrast, the boreal and temperate species G. locusta and G. duebeni duebeni

conserved metabolic rate across latitudes indicating a capacity for physiological compensation. A similar response was observed at the molecular level as sequence diversity in the loop 2 region of the myosin heavy chain gene remained unchanged with latitude in *G. oceanicus* but increased with latitude in *G. d. duebeni* which was attributed to differences in thermal habitat. Further work is required to establish whether these physiological differences involve local adaptation or are dependent on phenotypic plasticity. These findings provide valuable information on the ability of each species to adjust their physiology to maintain function despite increases in temperature due to global warming. (C) 2011 Elsevier B.V. All rights reserved. [Whiteley, N. M.; Rastrick, S. P. S.; Rock, J.] Bangor Univ, Sch Biol Sci, Coll Nat Sci, Bangor LL57 2UW, Gwynedd, Wales. [Lunt, D. H.] Univ Hull, Dept Biol Sci, Kingston Upon Hull HU6 7RX, N Humberside, England.; Whiteley, NM, Bangor Univ, Sch Biol Sci, Coll Nat Sci, Bangor LL57 2UW, Gwynedd, Wales.; n.m.whiteley@bangor.ac.uk.

Energy

ROWE, D.M., SMITH, J., THOMAS, G. and MIN, G., 2011. **Weight Penalty Incurred in Thermoelectric Recovery of Automobile Exhaust Heat.** *Journal of Electronic Materials*, 40(5), pp. 784-788.

Thermoelectric recovery of automobile waste exhaust heat has been identified as having potential for reducing fuel consumption and environmentally unfriendly emissions. Around 35% of combustion energy is discharged as heat through the exhaust system, at temperatures which depend upon the engine's operation and range from 800A degrees C to 900A degrees C at the outlet port to less than 50A degrees C at the tail-pipe. Beneficial reduction in fuel consumption of 5% to 10% is widely quoted in the literature. However, comparison between claims is difficult due to nonuniformity of driving conditions. In this paper the available waste exhaust heat energy produced by a 1.5 L family car when undergoing the new European drive cycle was measured and the potential thermoelectric output estimated. The work required to power the vehicle through the drive cycle was also determined and used to evaluate key parameters. This enabled an estimate to be made of the engine efficiency and additional work required by the engine to meet the load of a thermoelectric generating system. It is concluded that incorporating a thermoelectric generator would attract a penalty of around 12 W/kg. Employing thermoelectric modules fabricated from low-density material such as magnesium silicide would considerably reduce the generator weight penalty. [Smith, J.; Thomas, G.] Calson Kansai Plc, Llanelli, Wales. [Rowe, D. M.] Cardiff Univ, Cardiff, S Glam, Wales.; roweDM1@cardiff.ac.uk.

Fisheries

RAMSAY, A.L., MILNER, N.J., HUGHES, R.N. and MCCARTHY, I.D., 2011. **Comparison of the performance of scale and otolith microchemistry as fisheries research tools in a small upland catchment.** *Canadian Journal of Fisheries and Aquatic Sciences*, 68(5), pp. 823-833.

Laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) analysis of recently formed *Salmo trutta* scale hydroxyapatite and otolith aragonite

provided biogeochemical tags of *S. trutta* at six sites (>7.5 km apart) in a small upland catchment (drainage area: similar to 1800 km²). 87% and 89% of fish were correctly classified to their site of capture based on Sr, Mn, Ba, and Mg concentrations in scales and otoliths, respectively. Sr, Mn, and Ba were highly significantly correlated between structures of the same fish ($P < 0.001$). Ba and Mn in both structures were significantly correlated with stream water chemistries at each site ($P < 0.05$). Significant differences among sites were found in 11 element concentrations in scales and six element concentrations in otoliths ($P < 0.05$). Broadening the suite of elements improved the classification to 90% when using otoliths and 92% when using scales. Although there appears to be some degree of postdepositional change in scale hydroxyapatite in sea-run *S. trutta*, it was not sufficient to completely overprint the freshwater signature. Scales offer a nonlethal sampling alternative to otoliths and appear to provide a biogeochemical tag comparable in performance, but further work needs to examine the degree of postdepositional change in scale hydroxyapatite. [Ramsay, Alice L.; McCarthy, Ian D.] Bangor Univ, Sch Ocean Sci, Menai Bridge LL59 5AB, Anglesey, Wales. [Milner, Nigel J.] APEM Manchester Lab, Stockport SK4 3GN, Lancs, England. [Hughes, Roger N.] Bangor Univ, Sch Biol Sci, Bangor LL57 2UW, Gwynedd, Wales.; Ramsay, AL, Bangor Univ, Sch Ocean Sci, Askew St, Menai Bridge LL59 5AB, Anglesey, Wales.; ramsayalice@yahoo.co.uk.

Land Quality

CLARK, J.M., VAN DER HEIJDEN, G.M.F., PALMER, S.M., CHAPMAN, P.J. and BOTTRELL, S.H., 2011. **Variation in the sensitivity of DOC release between different organic soils following H₂SO₄ and sea-salt additions.** *European Journal of Soil Science*, 62(2), pp. 267-284.

Long-term monitoring data from eastern North America and Europe indicate a link between increased dissolved organic carbon (DOC) concentrations in surface waters over the last two decades and decreased atmospheric pollutant and marine sulphur (S) deposition. The hypothesis is that decreased acidity and ionic strength associated with declining S deposition has increased the solubility of DOC. However, the sign and magnitude of DOC trends have varied between sites, and in some cases at sites where S deposition has declined, no significant increase in DOC has been observed, creating uncertainty about the causal mechanisms driving the observed trends. In this paper, we demonstrate chemical regulation of DOC release from organic soils in batch experiments caused by changes in acidity and conductivity (measured as a proxy for ionic strength) associated with controlled SO₄²⁻ additions. DOC release from the top 10 cm of the O-horizon of organo-mineral soils and peats decreased by 21-60% in response to additions of 0-437 μeq SO₄²⁻ l⁻¹ sulphuric acid (H₂SO₄) and neutral sea-salt solutions (containing Na⁺, Mg²⁺, Cl⁻, SO₄²⁻) over a 20-hour extraction period. A significant decrease in the proportion of the acid-sensitive coloured aromatic humic acids (measured by specific ultra-violet absorbance (SUVA) at 254 nm) was also found with increasing acidity ($P < 0.05$) in most, but not all, soils, confirming that DOC quality, as well as quantity, changed with SO₄²⁻ additions. DOC release appeared to be more sensitive to increased acidity than to increased conductivity. By comparing the change in DOC release with bulk soil properties, we found that DOC release from the O-horizon of organo-mineral soils and semi-

confined peats, which contained greater exchangeable aluminium (Al) and had lower base saturation (BS), were more sensitive to SO_4^{2-} additions than DOC release from blanket peats with low concentrations of exchangeable Al and greater BS. Therefore, variation in soil type and acid/base status between sites may partly explain the difference in the magnitude of DOC changes seen at different sites where declines in S deposition have been similar. [Clark, J. M.; van der Heijden, G. M. F.; Palmer, S. M.; Chapman, P. J.; Bottrell, S. H.] *Univ Leeds, Sch Earth & Environm, Leeds LS2 9JT, W Yorkshire, England.* [Clark, J. M.; van der Heijden, G. M. F.; Palmer, S. M.; Chapman, P. J.; Bottrell, S. H.] *Univ Leeds, Sch Geog, Leeds LS2 9JT, W Yorkshire, England.* [Clark, J. M.] *Bangor Univ, Sch Biol Sci, Wolfson Carbon Capture Lab, Bangor LL57 2UW, Gwynedd, Wales.* [Clark, J. M.] *Univ London Imperial Coll Sci Technol & Med, Grantham Inst Climate Change Fellow Civil & Envir, London SW7 2AZ, England.* [Clark, J. M.] *Univ Reading, Sch Human & Environm Sci, Dept Geog & Environm Sci, Soils Res Ctr, Reading RG6 6DW, Berks, England.* [van der Heijden, G. M. F.] *Univ Sheffield, Dept Anim & Plant Sci, Sheffield S10 2TN, S Yorkshire, England.*; Clark, JM, *Univ Leeds, Sch Earth & Environm, Woodhouse Lane, Leeds LS2 9JT, W Yorkshire, England.*; j.m.clark@reading.ac.uk.

OBURGER, E., JONES, D.L. and WENZEL, W.W., 2011. **Phosphorus saturation and pH differentially regulate the efficiency of organic acid anion-mediated P solubilization mechanisms in soil.** *Plant and Soil*, 341(1-2), pp. 363-382.

Exudation of organic acid anions by plants as well as root-induced changes in rhizosphere pH can potentially improve phosphate (P-i) availability in the rhizosphere and are frequently found to occur simultaneously. In non-calcareous soils, a major proportion of P-i is strongly sorbed to metal oxo(hydr)oxides of mainly iron (Fe) and aluminium (Al) and organic anions are known to compete with P-i for the same sorption sites (ligand exchange) or solubilize P-i via ligand-promoted mineral dissolution. Root-induced co-acidification may also further promote P-i release from soil. The relative efficiency of these different solubilization mechanisms, however, is poorly understood. The aims of this study were to gain a better mechanistic understanding of the solubilizing mechanisms of four carboxylates (citrate, malate, oxalate, malonate) in five soils with high and low P surface site saturation. Results indicate that at a lower P saturation of solid phase sorption sites, ligand-promoted mineral dissolution was the main P-i solubilization mechanism, while ligand exchange became more important at higher soil P concentrations. Co-acidification generally increased P-i solubility in the presence of carboxylates; however the relative solubilizing effect of carboxylates compared to the background electrolyte (KCl) control decreased by 20-50%. In soils with high amounts of exchangeable calcium (Ca), the proton-induced Ca solubilization reduced soluble P-i, presumably due to ionic-strength-driven changes in the electric surface potential favoring a higher P-i retention. Across a wider soil pH range (pH 3-8), P-i solubility increased with increasing alkalinity, as a result of both, more negatively charged sorption sites, as well as DOC-driven changes in Fe and Al solubility, which were further enhanced by the presence of citrate. Overall, the relative efficiency of carboxylates in solubilizing P-i was greatest in soils with medium to high amounts of anionic binding sites (mainly Fe- and Al-oxo(hydr)oxides) and a medium P sorption site coverage, with citrate being most effective in solubilizing P-i. [Oburger, Eva; Wenzel, Walter W.] *BOKU Univ Nat Resources & Life Sci, Dept Forest & Soil Sci, A-1190 Vienna, Austria.* [Jones,

David L.] Bangor Univ, Sch Environm & Nat Resources, Bangor LL57 2UW, Gwynedd, Wales.; Oburger, E, BOKU Univ Nat Resources & Life Sci, Dept Forest & Soil Sci, A-1190 Vienna, Austria.; eva.oburger@boku.ac.at.

OWEN, G., MORETTI, M. and ALFARO, P., 2011. **Recognising triggers for soft-sediment deformation: Current understanding and future directions.** *Sedimentary Geology*, 235(3-4), pp. 133-140.

Most of the 16 papers in this special issue were presented at a session entitled "The recognition of trigger mechanisms for soft-sediment deformation" at the 27th IAS Meeting of Sedimentology in Alghero, Sardinia, Italy, which took place from 20th-23rd September 2009. They describe soft-sediment deformation structures that range widely in morphology, age, depositional environment and tectonic setting. In their interpretations, the authors have been asked to focus on identifying the agent that triggered deformation. Our aims in this introductory overview are to: (1) review the definition and scope of soft-sediment deformation; (2) clarify the significance and role of the trigger; (3) set the contributions in context and summarise their findings; and (4) discuss strategies for reliably identifying triggers and make recommendations for future study of this widespread and significant category of sedimentary structures. We recommend a three-stage approach to trigger recognition, combining the assessment of facies, potential triggers, and available criteria. This focus on the trigger for deformation distinguishes this collection of papers on soft-sediment deformation from other important collections, notably those edited by Jones and Preston (1987), Maltman (1994), Maltman et al. (2000), Shiki et al. (2000), Etensohn et al. (2002b), Van Rensbergen et al. (2003) and Storti and Vannucchi (2007). (C) 2011 Elsevier B.V. All rights reserved. [Moretti, Massimo] Univ Bari, Dipartimento Geol & Geofis, I-70125 Bari, Italy. [Owen, Geraint] Swansea Univ, Dept Geog, Swansea SA2 8PP, W Glam, Wales. [Alfaro, Pedro] Univ Alicante, Fac Ciencias, Dept Ciencias Tierra & Medio Ambiente, E-03080 Alicante, Spain.; Moretti, M, Univ Bari, Dipartimento Geol & Geofis, Via Orabona 4, I-70125 Bari, Italy.; g.owen@swansea.ac.uk m.moretti@geo.uniba.it pedro.alfaro@ua.es.

OWEN, G. and MORETTI, M., 2011. **Identifying triggers for liquefaction-induced soft-sediment deformation in sands.** *Sedimentary Geology*, 235(3-4), pp. 141-147.

Triggers for liquefaction-induced soft-sediment deformation structures in sands include seismic shaking, effects of water waves, rapid sediment accumulation and groundwater movements. Many soft-sediment deformation structures are attributed to a seismic trigger, but the evidence is often variable and inconclusive. Liquefaction and its effects are reviewed in the context of earthquakes, other triggers and experiments. The interpretation of liquefaction-induced soft-sediment deformation structures comprises two key stages: recognising liquefaction as the deformation mechanism, and determining the trigger for liquefaction. The characteristics of sediment that has undergone liquefaction include the pervasive, ductile character of deformation, preservation of stratification, a gradual upward increase in the extent or complexity of deformation, possible water-escape structures in the upper parts of a liquefied horizon, a horizontal upper surface, and a distinctive grain fabric. Approaches to determining the trigger for liquefaction include those based on criteria and those based on the sedimentological and palaeoenvironmental context. Few of the criteria applied to seismic triggers are

diagnostic and several are not applicable on the scale of single outcrops. Criteria are poorly developed for non-seismic triggers. A methodology is proposed for analysing soft-sediment deformation structures within their overall sedimentological and palaeoenvironmental context in order to refine and improve criteria for distinguishing the action of 'external' (allogenic) triggers, including earthquakes, from 'internal' (autogenic) triggers. (C) 2010 Elsevier B.V. All rights reserved. [Owen, Geraint] Swansea Univ, Dept Geog, Swansea SA2 8PP, W Glam, Wales. [Moretti, Massimo] Univ Bari, Dipartimento Geol & Geofis, I-70125 Bari, Italy.; Owen, G, Swansea Univ, Dept Geog, Singleton Pk, Swansea SA2 8PP, W Glam, Wales.; g.owen@swansea.ac.uk.

PLYTYCZ, B., CYGAL, M., LIS-MOLENDA, U., KLIMEK, M., MAZUR, A.I., DUCHNOWSKI, M. and MORGAN, A.J., 2011. **Characteristics of immune-competent amoebocytes non-invasively retrieved from populations of the sentinel earthworm *Lumbricus rubellus* (Annelida; Oligochaeta; Lumbricidae) inhabiting metal polluted field soils.** *Ecotoxicology and environmental safety*, 74(4), pp. 719-726.

Lumbricus rubellus is a cosmopolitan earthworm devoid of riboflavin-storing eleocytes; its immune competent coelomocytes are predominantly amoebocytes. Our aim was to determine whether amoebocyte cytometrics in *L. rubellus* are robust biomarkers for innate immunological responses to environmental pollutants. Investigations were conducted on populations inhabiting three unpolluted and five metalliferous (mainly Pb+Zn+Cd) habitats in the UK and Poland. Inter-population differences in worm mass and amoebocyte numbers did not consistently reflect soil or tissue metal concentrations. Flow cytometry indicated that autofluorescence of the amoebocytes differs between cells from the unpolluted and metal-polluted worms, and pinocytosis of neutral red by amoebocytes was lower (especially at 15 versus 60 min incubation) in worms from the polluted Poland site compared with the reference population. To conclude, amoebocyte cytometrics and functionality are potentially useful for environmental diagnostics; deployment is contingent on better understanding potential confounders. (C) 2010 Elsevier Inc. All rights reserved. [Plytycz, Barbara; Cygal, Malgorzata; Lis-Molenda, Urszula; Klimek, Malgorzata; Mazur, Agnieszka Irena] Jagiellonian Univ, Inst Zool, PL-30060 Krakow, Poland. [Duchnowski, Michal] Jagiellonian Univ, Inst Environm Sci, PL-30060 Krakow, Poland. [Morgan, A. John] Cardiff Univ, Cardiff Sch Biosci, Cardiff CF10 3US, S Glam, Wales.; Plytycz, B, Jagiellonian Univ, Inst Zool, Ingardena 6, PL-30060 Krakow, Poland.; barbara.plytycz@uj.edu.pl.

ROUSK, J., BROOKES, P.C., GLANVILLE, H.C. and JONES, D.L., 2011. **Lack of Correlation between Turnover of Low-Molecular-Weight Dissolved Organic Carbon and Differences in Microbial Community Composition or Growth across a Soil pH Gradient.** *Applied and Environmental Microbiology*, 77(8), pp. 2791-2795.

We studied how soil pH (pHs 4 to 8) influenced the mineralization of low-molecular-weight (LMW)-dissolved organic carbon (DOC) compounds, and how this compared with differences in microbial community structure. The mineralization of LMW-DOC compounds was not systematically connected to differences in soil pH, consistent with soil respiration. In contrast, the microbial community compositions differed dramatically. This suggests that microbial community composition data will be of limited use in improving the predictive

power of soil C models. [Rousk, Johannes; Glanville, Helen C.; Jones, David L.] Bangor Univ, Environm Ctr Wales, Bangor LL57 2UW, Gwynedd, Wales. [Rousk, Johannes] Lund Univ, Dept Biol, SE-22362 Lund, Sweden. [Brookes, Philip C.] Rothamsted Res, Dept Soil Sci, Harpenden AL5 2JQ, Herts, England.; Rousk, J, Bangor Univ, Environm Ctr Wales, Bangor LL57 2UW, Gwynedd, Wales.; j.rous@bangor.ac.uk.

Marine

SPENCER, M., BIRCHENOUGH, S.N.R., MIESZKOWSKA, N., ROBINSON, L.A., SIMPSON, S.D., BURROWS, M.T., CAPASSO, E., CLEALL-HARDING, P., CRUMMY, J., DUCK, C., ELOIRE, D., FROST, M., HALL, A.J., HAWKINS, S.J., JOHNS, D.G., SIMS, D.W., SMYTH, T.J. and FRID, C.L.J., 2011. **Temporal change in UK marine communities: trends or regime shifts?** *Marine Ecology- an Evolutionary Perspective*, 32, pp. 10-24.

A regime shift is a large, sudden, and long-lasting change in the dynamics of an ecosystem, affecting multiple trophic levels. There are a growing number of papers that report regime shifts in marine ecosystems. However, the evidence for regime shifts is equivocal, because the methods used to detect them are not yet well developed. We have collated over 300 biological time series from seven marine regions around the UK, covering the ecosystem from phytoplankton to marine mammals. Each time series consists of annual measures of abundance for a single group of organisms over several decades. We summarised the data for each region using the first principal component, weighting either each time series or each biological component (e. g. plankton, fish, benthos) equally. We then searched for regime shifts using Rodionov's regime shift detection (RSD) method, which found regime shifts in the first principal component for all seven marine regions. However, there are consistent temporal trends in the data for six of the seven regions. Such trends violate the assumptions of RSD. Thus, the regime shifts detected by RSD in six of the seven regions are likely to be artefacts caused by temporal trends. We are therefore developing more appropriate time series models for both single populations and whole communities that will explicitly model temporal trends and should increase our ability to detect true regime shift events. [Spencer, M.; Robinson, L. A.; Frid, C. L. J.] Univ Liverpool, Sch Environm Sci, Liverpool L69 7ZB, Merseyside, England. [Birchenough, S. N. R.] Cefas Lab, Lowestoft, Suffolk, England. [Mieszkowska, N.; Capasso, E.; Frost, M.; Hawkins, S. J.; Sims, D. W.] Marine Biol Assoc United Kingdom Lab, Plymouth PL1 2PB, Devon, England. [Simpson, S. D.] Univ Bristol, Sch Biol Sci, Bristol, Avon, England. [Burrows, M. T.] Dunstaffnage Marine Lab, Scottish Assoc Marine Sci, Oban, Argyll, Scotland. [Capasso, E.; Cleall-Harding, P.; Hawkins, S. J.] Bangor Univ, Sch Ocean Sci, Menai Bridge, Ynys Mon, Wales. [Crummy, J.] British Geol Survey, Edinburgh, Midlothian, Scotland. [Duck, C.; Hall, A. J.] Univ St Andrews, Sea Mammal Res Unit, Scottish Oceans Inst, St Andrews, Fife, Scotland. [Eloire, D.; Smyth, T. J.] Plymouth Marine Lab, Plymouth, Devon, England. [Eloire, D.] Univ Montpellier 2, Lab Ecosyst Lagunaire, UMR 5119, CNRS, IRD, IFREMER, CC093, Montpellier, France. [Johns, D. G.] Sir Alister Hardy Fdn Ocean Sci, Plymouth, Devon, England. [Sims, D. W.] Univ Plymouth, Marine Biol & Ecol Res Ctr, Inst Marine, Sch Marine Sci & Engr, Plymouth PL4 8AA, Devon,

England.; Spencer, M, Univ Liverpool, Sch Environm Sci, Liverpool L69 7ZB, Merseyside, England.; m.spencer@liverpool.ac.uk.

CLARK, I.R. and CARTWRIGHT, J.A., 2011. **Key controls on submarine channel development in structurally active settings.** *Marine and Petroleum Geology*, 28(7), pp. 1333-1349.

Submarine channel-levee systems commonly develop in structurally active deepwater settings. Despite their widespread development in such settings, only recently have researchers begun to address the response of channel-levee system evolution to deformation. Key factors which govern channel evolution and morphological development are relative rates of deformation and channel deposition and erosion, and also the number and scale of deformational structures, relative to the scale of the submarine channel. Submarine channel-structure interactions can be split into four end-members: deflection, blocking, diversion and confinement. Where deformation is coeval with channel development, an increase in the relative rate of uplift versus deposition and erosion causes a transition from channel deflection to blocking. Diversion and confinement are linked by the number, scale and orientation of structures relative to the channel flow path. Increasing the number of structures and their scale typically results in channel confinement. Underlying all of these individual controls is the distribution of local accommodation, which is determined by specific structural style. This distribution of accommodation over relatively small (<10 km) length scales strongly affects local channel development in order to attain the equilibrium profile. Knowledge of these controls on submarine channel development can increase our understanding of how these deepwater sedimentary systems evolve and distribute sediment across deforming submarine slopes. Understanding the factors governing spatial variations in channel morphology may also be applied when exploring for hydrocarbon reservoirs in structurally active deepwater settings. (C) 2011 Elsevier Ltd. All rights reserved. [Clark, Ian R.; Cartwright, Joseph A.] Cardiff Univ, 3DLab, Cardiff CF10 3YE, S Glam, Wales.; Clark, IR, Cardiff Univ, 3DLab, Main Bldg, Pk Pl, Cardiff CF10 3YE, S Glam, Wales.; clarki@cf.ac.uk.

Renewable energy

BAGDANAVICIUS, A., SHELIL, N., BOWEN, P.J., SYRED, N. and CRAYFORD, A.P., 2010. **Investigations of Gaseous Alternative Fuels at Atmospheric and Elevated Temperature and Pressure Conditions.** pp1004. PT: B; CT: ASME Turbo Expo 2010; CY: JUN 14-18, 2010; CL: Glasgow, SCOTLAND. 978-0-7918-4397-0

Increasing interest in alternative fuels for gas turbines stimulates research in gaseous fuels other than natural gas. Various gas mixtures, based on methane as the main component, are considered as possible fuels in the future. In particular, methane enrichment with hydrogen or dilution with carbon dioxide is of considerable interest. Some experiments and numerical calculations have been undertaken to investigate methane-hydrogen and methane-carbon dioxide gas flames, however most of these investigations are limited by particular pressure or temperature conditions. This paper presents the investigation of the combustion of methane - carbon dioxide mixtures at atmospheric and elevated temperature and

pressure conditions. Two experimental rigs were used, a Bunsen burner and swirl burner. Bunsen burner experiments were performed in the High Pressure Optical Chamber, which is located within the Gas Turbine Research Centre of Cardiff University - at 3 bara and 7 bara pressure, and 473 K, 573 K and 673 K temperature conditions for lean and rich mixtures. Planar Laser Tomography (PLT) was applied to investigate turbulent burning velocity. Burning velocity of the gas mixture was calculated using two different image processing techniques and the difference in the results obtained using these two techniques is presented and discussed. Laser Doppler anemometry (LDA) was utilised to define turbulence characteristics such as turbulence intensity and integral length scale. Due to the variability of the velocity flow field and turbulence intensity across Bunsen burners, the importance of measuring position and conditions is discussed. The sensitivity of this variance on the flame regime as defined in the Borghi diagram is evaluated. In the second part of the study, a generic swirl burner was used to define the flame flashback limits for methane - carbon dioxide mixtures at atmospheric conditions. The gas mixture stability graphs are plotted, and the effect of CO₂ addition are discussed. [Bagdanavicius, Audrius; Shelil, Nasser; Bowen, Philip J.; Syred, Nick; Crayford, Andrew P.] Cardiff Univ, Inst Energy, Cardiff Sch Engn, Cardiff CF24 3AA, S Glam, Wales.; Bagdanavicius, A, Cardiff Univ, Inst Energy, Cardiff Sch Engn, Queens Bldg, Cardiff CF24 3AA, S Glam, Wales.; bagdanaviciusa@cardiff.ac.uk shelilnm@cardiff.ac.uk bowenpj@cardiff.ac.uk syredn@cardiff.ac.uk crayfordap1@cardiff.ac.uk.

CRAYFORD, A.P., BOWEN, P.J., KAY, P.J. and LAGET, H., 2010. **Comparison of Gas-Oil and Bio-Oil Spray Performance for use in a Gas Turbine.** pp667. PT: B; CT: ASME Turbo Expo 2010; CY: JUN 14-18, 2010; CL: Glasgow, SCOTLAND. 978-0-7918-4396-3

This study forms part of an ongoing program to investigate the feasibility of substituting a bio-oil for gas-oil in gas turbine applications. In this paper, the influence of the change of fluid properties on spray characteristics is presented and analyzed. It was not feasible to characterize the spray at full-scale operating conditions, and so a scaling methodology was adopted using published correlations. The study was conducted in three stages; a scaled nozzle was selected utilizing a published correlation to ensure the spray characteristics match the critical characteristics of the full-scale nozzle. The scaled nozzle was then characterized with a gas-oil as a benchmark for comparison with the bio-oil tests. Finally bio-oil tests were conducted at elevated fuel preheat temperatures and the spray characteristics compared to the benchmark case. The objective of the program was to provide an insight into the effect of fuel preheat on spray characteristics. The results of this program helped determine scaled operating conditions for a subsequent atmospheric combustion program, not presented in this paper. The spray characterization was conducted in the atmospheric spray rig (ASR) located at Cardiff University's GTRC, at Port Talbot, UK. The experiments presented were conducted using bio-oil at elevated fuel preheat temperatures. The spray structure and mean droplet sizes are measured for a bio-oil at various initial pre-heat temperatures and compared with the benchmark gas-oil case. Operating conditions were chosen to maintain an equivalent thermal load of approximately 1.5 MW. Good quality PDA data were recorded for all cases and demonstrated that primary spray characteristics for bio-oil could be optimized and matched to those of gas-oil utilizing the same fuel delivery system. This was achieved by

implementing a fuel pre-heat of 80 degrees C, thereby changing the delivery conditions of the bio-oil. [Crayford, Andrew P.; Bowen, Philip J.; Kay, Peter J.] Cardiff Univ, Cardiff Sch Engr, GTRC, Cardiff CF24 3AA, S Glam, Wales.; Crayford, AP, Cardiff Univ, Cardiff Sch Engr, GTRC, Cardiff CF24 3AA, S Glam, Wales.

Technology and IT

BURBIDGE, R., WALKER, J.H. and WILSON, M.S., 2009. **Grammatical Evolution of a Robot Controller**. pp362. PT: B; CT: IEEE RSJ International Conference on Intelligent Robots and Systems; CY: OCT 10-15, 2009; CL: St. Louis, MO. 978-1-4244-3803-7

An autonomous mobile robot requires an onboard controller that allows it to perform its tasks for long periods in isolation. One possibility is for the robot to adapt to its environment using some form of artificial intelligence. Evolutionary techniques such as genetic programming (GP) offer the possibility of automatically programming the controller based on the robot's experience of the world. Grammatical evolution (GE) is a recent evolutionary algorithm that has been successfully applied to various problems, particularly those for which GP has been successful. We present a method for applying GE to autonomous robot control and evaluate it in simulation for the Khepera robot. [Burbidge, Robert; Walker, Joanne H.; Wilson, Myra S.] Aberystwyth Univ, Dept Comp Sci, Aberystwyth SY23 3DB, Dyfed, Wales.; Walker, JH, Aberystwyth Univ, Dept Comp Sci, Aberystwyth SY23 3DB, Dyfed, Wales.; rvb@aber.ac.uk jnw@aber.ac.uk mxw@aber.ac.uk.

CLEWLEY, D., LUCAS, R.M., MOGHADDAM, M., BUNTING, P., DWYER, J. and CARREIRAS, J., 2010. **Forest Parameter Retrieval from Sar Data using an Estimation Algorithm Applied to Regrowing Forest Stands in Queensland, Australia**. 2010 IEEE International Geoscience and Remote Sensing Symposium, , pp. 1238-1241.

The use of a non-linear estimation algorithm for retrieving the biomass and structure of vegetation from polarimetric Synthetic Aperture Radar (SAR) data is demonstrated for woody regrowth in Queensland, Australia dominated by *Acacia harpophylla* (Brigalow). By varying the size and density of trees and associated woody components (branches and trunks), multiple simulations of the backscattering coefficient ($\sigma(0)$) were performed based on the SAR simulation model of [1]. Functions relating $\sigma(0)$ to these variables were subsequently used to generate spatial estimates from NASA JPL airborne SAR (AIRSAR) data. Above ground biomass was estimated from stem density and size measurements using available allometric relationships. The study demonstrates potential for retrieval of regrowth structure and biomass through non-linear estimation. [Clewley, D.; Lucas, R. M.; Bunting, Pete] Aberystwyth Univ, Inst Geog & Earth Sci, Aberystwyth SY23 3DB, Dyfed, Wales.; Clewley, D, Aberystwyth Univ, Inst Geog & Earth Sci, Aberystwyth SY23 3DB, Dyfed, Wales.

DAVIES, A.J. and GUINOTTE, J.M., 2011. **Global Habitat Suitability for Framework-Forming Cold-Water Corals**. *Plos One*, 6(4), pp. e18483.

Predictive habitat models are increasingly being used by conservationists, researchers and governmental bodies to identify vulnerable ecosystems and

species' distributions in areas that have not been sampled. However, in the deep sea, several limitations have restricted the widespread utilisation of this approach. These range from issues with the accuracy of species presences, the lack of reliable absence data and the limited spatial resolution of environmental factors known or thought to control deep-sea species' distributions. To address these problems, global habitat suitability models have been generated for five species of framework-forming scleractinian corals by taking the best available data and using a novel approach to generate high resolution maps of seafloor conditions. High-resolution global bathymetry was used to resample gridded data from sources such as World Ocean Atlas to produce continuous 30-arc second (similar to 1 km(2)) global grids for environmental, chemical and physical data of the world's oceans. The increased area and resolution of the environmental variables resulted in a greater number of coral presence records being incorporated into habitat models and higher accuracy of model predictions. The most important factors in determining cold-water coral habitat suitability were depth, temperature, aragonite saturation state and salinity. Model outputs indicated the majority of suitable coral habitat is likely to occur on the continental shelves and slopes of the Atlantic, South Pacific and Indian Oceans. The North Pacific has very little suitable scleractinian coral habitat. Numerous small scale features (i.e., seamounts), which have not been sampled or identified as having a high probability of supporting cold-water coral habitat were identified in all ocean basins. Field validation of newly identified areas is needed to determine the accuracy of model results, assess the utility of modelling efforts to identify vulnerable marine ecosystems for inclusion in future marine protected areas and reduce coral bycatch by commercial fisheries. [Davies, Andrew J.] Bangor Univ, Sch Ocean Sci, Menai Bridge, Anglesey, Wales. [Guinotte, John M.] Marine Conservat Biol Inst, Bellevue, WA USA.; Davies, AJ, Bangor Univ, Sch Ocean Sci, Menai Bridge, Anglesey, Wales.; andrew.j.davies@bangor.ac.uk.

EL-GORASHI, T.E.H., PRANGGONO, B. and ELMIRGHANI, J.M.H., 2006. **WDM Metropolitan Sectioned Ring for Storage Area Networks Extension with Symmetrical and Asymmetrical Traffic.** *2006 IEEE International Conference on Communications, Vols 1-12*, , pp. 2669-2674.

As storage area networks (SANs) are increasingly replacing traditional direct-attached storage (DAS) in many large data centers, many studies are considering extending SANs over large distances. SANs in a metropolitan wavelength-division multiplexing (WDM) scenario create asymmetrical traffic and hot-node scenarios. This paper proposes a sectioned WDM metropolitan ring network as a suitable extension for SANs. Two node architectures are considered, one uses two fixed transmitters and the other uses a tuneable transmitter. A tuneable receiver is used with both architectures. For the two fixed-transmitters node architecture, two versions of medium access control (MAC) protocol are introduced. Simulation is carried out under both symmetrical and asymmetrical traffic sources. Performance of the sectioned ring is compared with that of the SAN ring network architecture proposed in [1]. [El-Gorashi, Taisir E. H.; Pranggono, Bernardi; Elmighani, Jaafar M. H.] Univ Wales Swansea, Inst Adv Telecommun, Swansea SA2 8PP, W Glam, Wales.; El-Gorashi, TEH, Univ Wales Swansea, Inst Adv Telecommun, Swansea SA2 8PP, W Glam, Wales.

FADZLI, S.A. and SETCHI, R., 2010. **Semantic Approach to Image Retrieval Using Statistical Models Based on a Lexical Ontology.** *Knowledge-Based and Intelligent Information and Engineering Systems, Pt Iv*, 6279, pp. 240-250.

The increasing amount of digital images available on the Internet has made searching, browsing, and organizing such resources a major challenge. This paper proposes a semantic approach to text-based image retrieval of manually annotated digital images. The approach uses statistical models based on Semantic DNA (SDNA) extracted from the structure of a lexical ontology called OntoRo. The approach involves three main techniques: (a) SDNA extraction, (b) word sense disambiguation using statistical models based on the extracted SDNA, and (c) applying semantic similarity measures using SDNA. The experiments performed show that the proposed approach retrieves images based on their conceptual meaning rather than the use of specific keywords in their annotations. [Fadzli, Syed Abdullah; Setchi, Rossitza] Cardiff Univ, Knowledge Engr Syst Grp, Cardiff, S Glam, Wales.; Fadzli, SA, Cardiff Univ, Knowledge Engr Syst Grp, Cardiff, S Glam, Wales.; scesa@cf.ac.uk setchi@cardiff.ac.uk.

KUWADEKAR, A. and AL-BEGAIN, K., 2009. **User Centric Quality of Experience Testing for Video on Demand over IMS.** pp504. PT: B; CT: 1st International Conference on Computational Intelligence, Communication Systems and Networks; CY: JUL 23-25, 2009; CL: Indore, INDIA. 978-1-4244-4937-8 Video call capabilities in 3G mobile handsets and higher data rate in 3G UMTS networks are fuelling resurgence in video telephony. This enables the delivery of exciting video applications to subscribers. The addition of Interactive Voice and Video Response (IVVR) opens up a wide stream of interactive video applications. In this paper we present a comparative study on the encoding tools and the techniques used to store and stream video on demand to subscribers. The paper presents the performance results obtained on a IP Multimedia Subsystem (IMS) based Next Generation Network test-setup connected to a live operator network. These results are based on the Quality of Experience (QoE) that end user perceive. These results can help service operators to deliver content rich applications to the end users as per their expectations. [Kuwadekar, Alhad; Al-Begain, Khalid] Univ Glamorgan, Integrated Commun Res Ctr, Pontypridd CF37 1DL, M Glam, Wales.; Kuwadekar, A, Univ Glamorgan, Integrated Commun Res Ctr, Pontypridd CF37 1DL, M Glam, Wales.; akuwadek@glam.ac.uk kbegain@glam.ac.uk.

LUCAS, R.M., ARMSTON, J., CARREIRAS, J., NUGROHO, N., CLEWLEY, D. and DE GRANDI, F., 2010. **Advances in the Integration of Alos Palsar and Landsat Sensor Data for Forest Characterisation, Mapping and Monitoring.** *2010 IEEE International Geoscience and Remote Sensing Symposium*, , pp. 1851-1854.

Based on case studies undertaken in tropical forests in Brazil and Indonesia and subtropical woodlands in Australia, the paper highlights how data acquired by the Advanced Land Observing Satellite (ALOS) Phased Arrayed L-band Synthetic Aperture Radar (SAR) and Landsat sensors can be integrated to better quantify the extent, biophysical characteristics and/or dynamics of undisturbed, degraded and regenerating forests. The benefits of using time-series of Landsat sensor data to support the interpretation of ALOS PALSAR data and to identify areas with greatest potential for ecosystem recovery are conveyed. [Lucas, R. M.; Clewley,

D.] Aberystwyth Univ, Inst Geog & Earth Sci, Aberystwyth SY23 3DB, Ceredigion, Wales.; Lucas, RM, Aberystwyth Univ, Inst Geog & Earth Sci, Aberystwyth SY23 3DB, Ceredigion, Wales.; rml@aber.ac.uk frank.de-grandi@jrc.ec.europa.eu.

TRENTACOSTE, M., MANTIUK, R. and HEIDRICH, W., 2011. **Blur-Aware Image Downsampling**. *Computer Graphics Forum*, 30(2), pp. 573-582.

Resizing to a lower resolution can alter the appearance of an image. In particular, downsampling an image causes blurred regions to appear sharper. It is useful at times to create a downsampled version of the image that gives the same impression as the original, such as for digital camera viewfinders. To understand the effect of blur on image appearance at different image sizes, we conduct a perceptual study examining how much blur must be present in a downsampled image to be perceived the same as the original. We find a complex, but mostly image-independent relationship between matching blur levels in images at different resolutions. The relationship can be explained by a model of the blur magnitude analyzed as a function of spatial frequency. We incorporate this model in a new appearance-preserving downsampling algorithm, which alters blur magnitude locally to create a smaller image that gives the best reproduction of the original image appearance. [Trentacoste, Matthew; Heidrich, Wolfgang] Univ British Columbia, Vancouver, BC V5Z 1M9, Canada. [Mantiuk, Rafal] Bangor Univ, Bangor, Gwynedd, Wales.; Trentacoste, M, Univ British Columbia, Vancouver, BC V5Z 1M9, Canada.

YEGANEH-BAKHTIARY, A., KAZEMINEZHAD, M.H., ETEMAD-SHAHIDI, A., BAAS, J.H. and CHENG, L., 2011. **Euler-Euler two-phase flow simulation of tunnel erosion beneath marine pipelines**. *Applied Ocean Research*, 33(2), pp. 137-146.

In this study an Euler-Euler two-phase model was developed to investigate the tunnel erosion beneath a submarine pipeline exposed to unidirectional flow. Both of the fluid and sediment phases were described via the Navier-Stokes equations, i.e. the model was implemented using time-averaged continuity and momentum equations for the fluid and sediment phases and a modified k - epsilon turbulence closure for the fluid phase. The fluid and sediment phases were coupled by considering the drag and lift interaction forces. The model was employed to simulate the tunnel erosion around the pipeline laid on an erodible bed. Comparison between the numerical result and experimental measurement confirms that the numerical model successfully predicts the bed profile and velocity field during the tunnel erosion. It is evident that the sediments are transported as the sheet-flow mode in the tunnel erosion stage. Also the transport rate under the pipe increases rapidly at the early stage and then reduces gradually at the end of the tunnel erosion beneath pipelines. (C) 2011 Elsevier Ltd. All rights reserved. [Yeganeh-Bakhtiary, Abbas; Etemad-Shahidi, Amir] Iran Univ Sci & Technol, Sch Civil Engn, Envirohydroinformat COE, Tehran 16844, Iran. [Baas, Jaco H.] Bangor Univ, Sch Ocean Sci, Menai Bridge LL59 5AB, Anglesey, Wales. [Cheng, Liang] Univ Western Australia, Sch Civil & Resource Engn, Crawley, WA 6009, Australia.; Yeganeh-Bakhtiary, A, Iran Univ Sci & Technol, Sch Civil Engn, Envirohydroinformat COE, Tehran 16844, Iran.; yeganeh@iust.ac.ir mkazeminezhad@iust.ac.ir etemad@iust.ac.ir j.baas@bangor.ac.uk cheng@civil.uwa.edu.au.

Water

BIALOWIEC, A., JANCZUKOWICZ, W. and RANDERSON, P.F., 2011. **Nitrogen removal from wastewater in vertical flow constructed wetlands containing LWA/gravel layers and reed vegetation.** *Ecological Engineering*, 37(6), pp. 897-902.

The influence of light weight aggregates made of fly ash from sewage sludge thermal treatment (FASSTT-LWA) on the nitrogen removal efficiency from artificial wastewater in constructed wetlands (CW) with vertical flow reed bed was investigated. Thirty lysimeters with six different double-layer bed constructions (upper layer of FASSTT LWA with thicknesses of: 0 cm, 12cm, 25cm, 50 cm, and 100 cm of the total depth of the lysimeter, above a lower gravel layer), either with or without reed plants were operated with wastewater hydraulic loading rate of 4.67 mm/d. During a six-month experiment, high efficiency of ammonia removal was observed. The influence of FASSTT LWA as a bed material and the presence of reed on CW treatment efficiency was determined. The highest total nitrogen removal efficiency, 59.5%, was obtained in the CW with double-layer lysimeters consisting of 25% FASSTT LWA (upper layer), and 75% gravel (lower layer), and planted with reed. (C) 2011 Elsevier B.V. All rights reserved. [Bialowiec, Andrzej] Univ Warmia & Mazury Olsztyn, Dept Environm Biotechnol, PL-10900 Olsztyn, Poland. [Janczukowicz, Wojciech] Univ Warmia & Mazury Olsztyn, Dept Environm Protect Engn, PL-10900 Olsztyn, Poland. [Randerson, Peter F.] Cardiff Univ, Sch Biosci, Cardiff CF10 3AX, S Glam, Wales.; Bialowiec, A, Univ Warmia & Mazury Olsztyn, Dept Environm Biotechnol, Ul Sloneczna 45 G, PL-10900 Olsztyn, Poland.; andrzej.bialowiec@uwm.edu.pl jawoj@uwm.edu.pl randerson@ck.ac.uk.

MOORE, S., GAUCI, V., EVANS, C.D. and PAGE, S.E., 2011. **Fluvial organic carbon losses from a Bornean blackwater river.** *Biogeosciences*, 8(4), pp. 901-909.

Concentrations of dissolved organic carbon (DOC) and particulate organic carbon (POC) were analysed from the source to the mouth of the River Sebangau in Central Kalimantan, Indonesia during the dry and wet seasons in 2008/2009 and an annual total organic carbon (TOC) flux estimated. DOC concentrations were higher and POC concentrations lower in the wet season compared to the dry season. As seen in other tropical blackwater rivers, DOC concentration is consistently around 10 times greater than POC concentration. We estimate the annual TOC flux discharged to the Java Sea to be 0.46 Tg year⁻¹ comprising of 93% (0.43 Tg) DOC and 7% (0.03 Tg) POC. This equates to a fluvial TOC loss flux per unit area over the entire Sebangau catchment of 88 g Cm⁻² yr⁻¹. When extrapolating the River Sebangau DOC loss flux (83 g Cm⁻² yr⁻¹) to the peat covered area of Indonesia (206 950 km²), we estimate a DOC loss of 17.2 Tg C yr⁻¹ or similar to 10% of current estimates of the global annual riverine DOC discharge into the ocean. [Moore, S.; Gauci, V.] Open Univ, Dept Earth & Environm Sci, CEPSAR, Milton Keynes MK7 6AA, Bucks, England. [Evans, C. D.] Environm Ctr Wales, Ctr Ecol & Hydrol, Bangor LL57 2UW, Gwynedd, Wales. [Page, S. E.] Univ Leicester, Dept Geog, Leicester LE1 7RH, Leics, England.; Moore, S, Open Univ, Dept Earth & Environm Sci, CEPSAR, Walton Hall, Milton Keynes MK7 6AA, Bucks, England.; s.moore@open.ac.uk.

REED, J.P., DEVLIN, D., ESTEVES, S.R.R., DINSDALE, R. and GUWY, A.J., 2011. **Performance parameter prediction for sewage sludge digesters using reflectance FT-NIR spectroscopy.** *Water research*, 45(8), pp. 2463-2472.

This study investigates the use of Fourier transform near infrared (FT-NIR) spectroscopy combined with principle components analysis (PCA) and partial least squares regression (PLS-R) as part of a possible process monitoring system for sewage sludge anaerobic digesters. The ability of FT-NIR with PCA to distinguish between different stages of the AD process was investigated, it was found that waste activated sludge (WAS), primary, feed (Primary:WAS 70:30) and digested sludge were distinguishable from each other using this technique. PLS-R was used successfully to track differing proportions of primary: WAS in feedstocks of 5% total solids (Coefficient of Efficiency (CE) = 0.93). The study also looked at the ability of reflectance mode NIR spectroscopy to track process parameters important for stability. Temperature and organic loading rate variations were employed to stress the digesters. Predictive models were produced for volatile fatty acids (VFA), bicarbonate alkalinity (BA) and total and volatile solids (TS and VS) and independently validated for each digester. The models were able to track the relevant process parameters: IS (CE = 0.75), VS (CE = 0.75), BA (CE = 0.71), and VFA (CE = 0.69). This technique could be used to improve the performance of sewage sludge anaerobic digesters. (C) 2011 Elsevier Ltd. All rights reserved.[Reed, J. P.; Devlin, D.; Esteves, S. R. R.; Dinsdale, R.; Guwy, A. J.] *Univ Glamorgan, Fac Hlth Sport & Sci, Sustainable Environm Res Ctr, Pontypridd CF37 1DL, M Glam, Wales.; Reed, JP, Univ Glamorgan, Fac Hlth Sport & Sci, Sustainable Environm Res Ctr, Pontypridd CF37 1DL, M Glam, Wales.;* jpreed@glam.ac.uk.

WARRENDER, R., PEARCE, N.J.G., PERKINS, W.T., FLORENCE, K.M., BROWN, A.R., SAPSFORD, D.J., BOWELL, R.J. and DEY, M., 2011. **Field Trials of Low-cost Reactive Media for the Passive Treatment of Circum-neutral Metal Mine Drainage in Mid-Wales, UK.** *Mine Water and the Environment*, 30(2), pp. 82-89.

This paper addresses the ability of five low-cost reactive materials to remove Zn, Pb, and Cd from Fe-poor, circum-neutral pH metal mine water in Mid-Wales, UK. Compost, fly ash, waste shell material, iron ochre, and a mixture of blast furnace slag (BFS) and basic oxygen furnace slag (BOS) were used in a series of small-scale passive treatment cells to assess metal removal from mine drainage initially containing, on average, 23.5 mg/L Zn, 0.5 mg/L Pb, and 0.05 mg/L Cd. Trial treatment cells contained between 1.5 and 12 kg of reactive media, had a 15 min residence time, and treated a discharge of up to 1 L per minute. Fly ash from a peat-fired power station was found to be the most effective material for metal removal, with concentrations reduced to 0.02 mg/L Zn, 0.0069 mg/L Pb, and 0.0001 mg/L Cd from over 1,000 L of water (between 98.6 and 99.9% removal). The other materials initially achieved high levels of metal removal (between 75 and 99.9% Zn, Pb, and Cd removed); however, all of the materials were saturated with Zn after less than 200 L of water had been treated. Metal sorption ranged from 21.4 mg/g Zn for the peat fly ash to 0.0015 mg/g Cd for the compost and BOS/BFS slag. The results of the pilot-scale field trials can be scaled to demonstrate that a modest-sized fly ash treatment cell (2.6 x 2.6 x 1 m) in size would be sufficient to remove 90% of the total metal load (Pb, Zn, and Cd) from this 10 L/min mine water discharge for a 1 year period. Importantly this research

demonstrates that passive treatment for metal mine drainage can comply with water quality directives but cannot be considered a 'walk-away' solution; it requires modest (potentially annual) maintenance. [Warrender, R.; Bowell, R. J.; Dey, M.] SRK Consulting UK Ltd, Cardiff CF10 2HH, S Glam, Wales. [Pearce, N. J. G.; Perkins, W. T.; Florence, K. M.; Brown, A. R.] Aberystwyth Univ, Inst Geog & Earth Sci, Aberystwyth SY23 3DB, Dyfed, Wales. [Florence, K. M.; Sapsford, D. J.] Cardiff Univ, Cardiff Sch Engn, Cardiff CF24 3AA, S Glam, Wales.; Warrender, R, SRK Consulting UK Ltd, 5th Floor Churchill House, Churchill Way, Cardiff CF10 2HH, S Glam, Wales.; rwarrender@srk.co.uk.

Social Science

Behaviour

EVANS, L. and BUEHNER, M.J., 2011. **Small Samples Do Not Cause Greater Accuracy-But Clear Data May Cause Small Samples: Comment on Fiedler and Kareev (2006)**. *Journal of Experimental Psychology-Learning Memory and Cognition*, 37(3), pp. 792-799.

Fiedler and Kareev (2006) have claimed that taking a small sample of information (as opposed to a large one) can, in certain specific situations, lead to greater accuracy-beyond that gained by avoiding fatigue or overload. Specifically, they have argued that the propensity of small samples to provide more extreme evidence is sufficient to create an accuracy advantage in situations of high caution and uncertainty. However, a close examination of Fiedler and Kareev's experimental results does not reveal any strong reason to conclude that small samples can cause greater accuracy. We argue that the negative correlation between sample size and accuracy that they reported (found only for the second half of Experiment 1) is also consistent with mental fatigue and that their data in general are consistent with the causal structure opposite to the one they suggest: Rather than small samples causing clear data, early clear data may cause participants to stop sampling. More importantly, Experiment 2 provides unequivocal evidence that large samples result in greater accuracy; Fiedler and Kareev only found a small sample advantage here when they artificially reduced the data set. Finally, we examine the model that Fiedler and Kareev used; they surmised that decision makers operate with a fixed threshold independent of sample size. We discuss evidence for an alternative (better performing) model that incorporates a dynamic threshold that lowers with sample size. We conclude that there is no evidence currently to suggest that humans benefit from taking a small sample, other than as a tactic for avoiding fatigue, overload, and/or opportunity cost-that is, there is no accuracy advantage inherent to small samples. [Evans, Laurel; Buehner, Marc J.] Cardiff Univ, Sch Psychol, Cardiff CF10 3AT, S Glam, Wales.; Evans, L, Cardiff Univ, Sch Psychol, Pk Pl, Cardiff CF10 3AT, S Glam, Wales.; evansL19@cardiff.ac.uk.

STANLEY, D.J., ALLEN, N.J., WILLIAMS, H.M. and ROSS, S.J., 2011. **Examining workgroup diversity effects: does playing by the (group-retention) rules help or hinder?** *Behavior Research Methods*, 43(2), pp. 508-521.

Group diversity researchers are often faced with the problem of calculating diversity indices for groups that are incomplete due to participant nonresponse. Because participant nonresponse may attenuate the correlations that are observed between group diversity scores and outcome variables, some researchers use group-retention rules based on within-group response rates. With this approach, only those groups that have a within-group response rate at, or higher than, the rate prescribed by the group-retention rule are retained for subsequent analyses. We conducted two sets of experiments using computer simulations to determine the usefulness of group-retention rules. We found that group-retention rules are not a substitute for a high response rate and may decrease the accuracy of observed relations, and consequently, we advise against their use in diversity research. [Stanley, David J.] Univ Guelph, Dept Psychol, Guelph, ON N1G 2W1, Canada. [Allen, Natalie J.; Ross, Sarah J.] Univ Western Ontario, Dept Psychol, London, ON, Canada. [Williams, Helen M.] Swansea Univ, Sch Business & Econ, Swansea, W Glam, Wales.; Stanley, DJ, Univ Guelph, Dept Psychol, Guelph, ON N1G 2W1, Canada.; dstanley@uoguelph.ca.

Communication

EDWARDS, A., EVANS, R., WHITE, P. and ELWYN, G., 2011. **Experiencing patient-experience surveys: a qualitative study of the accounts of GPs.** *British Journal of General Practice*, 61(585), pp. 263-264.

Background Despite policy and financial support for patient-experience surveys as feedback to modify clinical practice, their benefits and other effects remain unclear.

Aim This study aimed to examine the perspective of GPs who have engaged with such tools.

Method Qualitative semi-structured interviews with 30 GPs across south Wales, UK. The transcripts were analysed using a constant comparative method.

Results The participants regarded patient feedback as highly important but felt that patient-experience surveys, as currently implemented, were hard to interpret. Reflecting on the doctor-patient interaction, participants perceived ambiguity about whether results were evaluating the individual or the GP practice, and whether they were directed towards the 'practitioner-as-person' or towards specific behaviours. A potential threat was posed in both interpretations, with the risk of damaging consequences for the practitioner and the nature of general practice. The tension between satisfying patients and performing good health care was a clearly voiced dilemma. Doctors did not feel confident in their ability to change in response to feedback, particularly outside a formal training environment.

Conclusion Patient evaluation is seen as a key part of multisource feedback for practising doctors. Clarity is needed about the purpose of evaluation - whether for organisational or personal 'feedback', and whether formative or summative - and there is a need for attention to the process, with trained facilitators, to ensure that doctors gain from structured reflection, and can minimise the potential negative effects of evaluation. [Edwards, Adrian] Cardiff Univ, Sch Med, Dept Primary Care & Publ Hlth, Cardiff CF14 4YS, S Glam, Wales.; Edwards, A, Cardiff Univ, Sch Med, Dept Primary Care & Publ Hlth, Heath Pk, Cardiff CF14 4YS, S Glam, Wales.; edwardsaq@cf.ac.uk.

Socio-economic

AARTS, J.W.M., VAN EMPEL, I.W.H., BOIVIN, J., NELEN, W.L., KREMER, J.A.M. and VERHAAK, C.M., 2011. **Relationship between quality of life and distress in infertility: a validation study of the Dutch FertiQoL.** *Human Reproduction*, 26(5), pp. 1112-1118.

BACKGROUND: This study examined the relationship between emotional distress as measured by the Hospital Anxiety and Depression Scale (HADS) and the Fertility Quality of Life (FertiQoL) questionnaire. METHODS: The FertiQoL and HADS were distributed to a random sample of 785 patients attending 29 Dutch clinics for medically assisted reproduction. FertiQoL was psychometrically tested for reliability. Pearson's correlations were calculated between subscales of FertiQoL and HADS. Using an independent t-test, differences between patient subgroups were computed for both instruments. The threshold for clinically meaningful depression/anxiety on the HADS subscales was used to ascertain the critical threshold for high distress on the FertiQoL scales. RESULTS: FertiQoL and HADS were completed by 583 patients (response 74%). Reliability of FertiQoL scales was high (reliability coefficient between 0.72 and 0.91). Significant negative correlations were found between FertiQoL subscales and HADS scores for anxiety and depression, ranging from -0.29 to -0.71. Means on FertiQoL scales and HADS scales of couples undergoing an assisted reproductive technology (ART) treatment and a non-ART treatment did not differ significantly. Patients scoring above the HADS threshold for pathology on anxiety had an average FertiQoL score of 58.8, whereas patients exceeding the HADS depression threshold had a FertiQoL total score of 51.9 (range 0-100). CONCLUSIONS: Our study confirms the expected negative relation between quality of life as measured by FertiQoL and anxiety and depression. The data support that FertiQoL reliably measures QoL in women facing infertility. FertiQoL enables clinicians to tailor care more specifically to the patient in a comprehensive way. [Aarts, J. W. M.; van Empel, I. W. H.; Nelen, W. L.; Kremer, J. A. M.] Radboud Univ Nijmegen, Med Ctr, Dept Obstet & Gynaecol, NL-6500 HB Nijmegen, Netherlands. [Boivin, J.] Cardiff Univ, Sch Psychol, Cardiff Fertil Studies Res Grp, Cardiff, S Glam, Wales. [Verhaak, C. M.] Radboud Univ Nijmegen, Med Ctr, Dept Med Psychol, NL-6500 HB Nijmegen, Netherlands.; Aarts, JWM, Radboud Univ Nijmegen, Med Ctr, Dept Obstet & Gynaecol, POB 9101, NL-6500 HB Nijmegen, Netherlands.; a.aarts@obgyn.umcn.nl.

BUSHBY, A.J., P'NG, K.M.Y., YOUNG, R.D., PINALI, C., KNUPP, C. and QUANTOCK, A.J., 2011. **Imaging three-dimensional tissue architectures by focused ion beam scanning electron microscopy.** *Nature Protocols*, 6(6), pp. 845-858.

In this protocol, we describe a 3D imaging technique known as 'volume electron microscopy' or 'focused ion beam scanning electron microscopy (FIB/SEM)' applied to biological tissues. A scanning electron microscope equipped with a focused gallium ion beam, used to sequentially mill away the sample surface, and a backscattered electron (BSE) detector, used to image the milled surfaces, generates a large series of images that can be combined into a 3D rendered image of stained and embedded biological tissue. Structural information over volumes of tens of thousands of cubic micrometers is possible, revealing complex

microanatomy with subcellular resolution. Methods are presented for tissue processing, for the enhancement of contrast with osmium tetroxide/potassium ferricyanide, for BSE imaging, for the preparation and platinum deposition over a selected site in the embedded tissue block, and for sequential data collection with ion beam milling; all this takes similar to 90 h. The imaging conditions, procedures for alternate milling and data acquisition and techniques for processing and partitioning the 3D data set are also described; these processes take similar to 30 h. The protocol is illustrated by application to developing chick cornea, in which cells organize collagen fibril bundles into complex, multilamellar structures essential for transparency in the mature connective tissue matrix. The techniques described could have wide application in a range of fields, including pathology, developmental biology, microstructural anatomy and regenerative medicine. [Bushby, Andrew J.; P'ng, Kenneth M. Y.] Univ London, Sch Engr & Mat Sci, NanoVis Ctr, London, England. [Young, Robert D.; Pinali, Christian; Knupp, Carlo; Quantock, Andrew J.] Cardiff Univ, Sch Optometry & Vis Sci, Struct Biophys Grp, Cardiff, Wales.; Bushby, AJ, Univ London, Sch Engr & Mat Sci, NanoVis Ctr, London, England.; a.j.bushby@qmul.ac.uk.

DAVEY, M.S., LIN, C., ROBERTS, G.W., HEUSTON, S., BROWN, A.C., CHESS, J.A., TOLEMAN, M.A., GAHAN, C.G.M., HILL, C., PARISH, T., WILLIAMS, J.D., DAVIES, S.J., JOHNSON, D.W., TOPLEY, N., MOSER, B. and EBERL, M., 2011. **Human Neutrophil Clearance of Bacterial Pathogens Triggers Anti-Microbial gamma delta T Cell Responses in Early Infection.** *Plos Pathogens*, 7(5), pp. e1002040.

Human blood V gamma 9/V delta 2 T cells, monocytes and neutrophils share a responsiveness toward inflammatory chemokines and are rapidly recruited to sites of infection. Studying their interaction in vitro and relating these findings to in vivo observations in patients may therefore provide crucial insight into inflammatory events. Our present data demonstrate that V gamma 9/V delta 2 T cells provide potent survival signals resulting in neutrophil activation and the release of the neutrophil chemoattractant CXCL8 (IL-8). In turn, V gamma 9/V delta 2 T cells readily respond to neutrophils harboring phagocytosed bacteria, as evidenced by expression of CD69, interferon (IFN)-gamma and tumor necrosis factor (TNF)-alpha. This response is dependent on the ability of these bacteria to produce the microbial metabolite (E)-4-hydroxy-3-methyl-but-2-enyl pyrophosphate (HMB-PP), requires cell-cell contact of V gamma 9/V delta 2 T cells with accessory monocytes through lymphocyte function-associated antigen-1 (LFA-1), and results in a TNF-alpha dependent proliferation of V gamma 9/V delta 2 T cells. The antibiotic fosmidomycin, which targets the HMB-PP biosynthesis pathway, not only has a direct antibacterial effect on most HMB-PP producing bacteria but also possesses rapid anti-inflammatory properties by inhibiting gamma delta T cell responses in vitro. Patients with acute peritoneal-dialysis (PD)-associated bacterial peritonitis - characterized by an excessive influx of neutrophils and monocytes into the peritoneal cavity - show a selective activation of local V gamma 9/V delta 2 T cells by HMB-PP producing but not by HMB-PP deficient bacterial pathogens. The gamma delta T cell-driven perpetuation of inflammatory responses during acute peritonitis is associated with elevated peritoneal levels of gamma delta T cells and TNF-alpha and detrimental clinical outcomes in infections caused by HMB-PP positive microorganisms. Taken together, our findings indicate a direct link between invading pathogens, neutrophils, monocytes and microbe-responsive

gamma delta T cells in early infection and suggest novel diagnostic and therapeutic approaches. [Davey, Martin S.; Lin, Chan-Yu; Toleman, Mark A.; Topley, Nicholas; Moser, Bernhard; Eberl, Matthias] Cardiff Univ, Sch Med, Dept Infect Immun & Biochem, Cardiff, S Glam, Wales. [Lin, Chan-Yu] Chang Gung Mem Hosp, Dept Nephrol, Tao Yuan, Taiwan. [Roberts, Gareth W.; Williams, John D.] Cardiff Univ, Sch Med, Inst Nephrol, Cardiff, S Glam, Wales. [Heuston, Sinead; Gahan, Cormac G. M.; Hill, Colin] Natl Univ Ireland Univ Coll Cork, Alimentary Pharmabiot Ctr, Cork, Ireland. [Heuston, Sinead; Gahan, Cormac G. M.; Hill, Colin] Natl Univ Ireland Univ Coll Cork, Dept Microbiol, Cork, Ireland. [Brown, Amanda C.; Parish, Tanya] Queen Mary Univ London, Barts & London Sch Med & Dent, London, England. [Chess, James A.] Morriston Hosp, Dept Nephrol, Swansea, W Glam, Wales. [Davies, Simon J.] Keele Univ, Univ Hosp N Staffordshire, Dept Nephrol, Stoke On Trent, Staffs, England. [Johnson, David W.] Univ Queensland, Princess Alexandra Hosp, Dept Nephrol, Brisbane, Qld, Australia. [Johnson, David W.] Univ Adelaide, Australia & New Zealand Dialysis Transplant Regis, Adelaide, SA, Australia.; Eberl, M, Cardiff Univ, Sch Med, Dept Infect Immun & Biochem, Cardiff, S Glam, Wales.; eberlm@cf.ac.uk.

JARCHI, D., SANEI, S., MOHSENI, H.R. and LORIST, M.M., 2011. **Coupled particle filtering: A new approach for P300-based analysis of mental fatigue.** *Biomedical Signal Processing and Control*, 6(2), pp. 175-185.

A new method for investigating mental fatigue based on P300 variability is presented here. In this approach a new coupled particle filtering for tracking variability of P300 subcomponents, i.e., P3a and P3b, across trials is developed. The latency, amplitude, and width of each subcomponent, as the main varying parameters, are modelled using state space system. In this model the observation is modelled as a linear function of amplitude and a nonlinear function of latency and width. Two Rao-blackwellised particle filters are then coupled and employed for recursive estimation of the state of the system across trials. By including some physiological based constraints, the proposed technique prevents generation of invalid particles during estimation of the state of the system. The main advantage of the algorithm compared with other single trial based methods is its robustness in the low signal-to-noise ratio situations. The method is applied to both simulated data and real mental fatigue data. The results demonstrate potential use of the method in event-related potential (ERP) based applications. (C) 2010 Elsevier Ltd. All rights reserved. [Jarchi, Delaram; Sanei, Saeid; Mohseni, Hamid R.] Cardiff Univ, Sch English, Ctr Digital Signal Proc, Cardiff, S Glam, Wales. [Lorist, Monicque M.] Univ Groningen, Dept Expt Psychol, NL-9700 AB Groningen, Netherlands.; Jarchi, D, Cardiff Univ, Sch English, Ctr Digital Signal Proc, Cardiff, S Glam, Wales.; delaram.jarchi@gmail.com.

JEBBARI, H., SIMMS, I., CONTI, S., MARONGIU, A., HUGHES, G., WARD, H., POWERS, C., THOMAS, D.R. and EVANS, B., 2011. **Variations in the epidemiology of primary, secondary and early latent syphilis, England and Wales: 1999 to 2008.** *Sexually transmitted infections*, 87(3), pp. 191-198.

Objective To investigate factors associated with variations in diagnoses of primary, secondary and early latent syphilis in England and Wales. Methods Data were derived from two sources: diagnoses made in genitourinary medicine clinics reported on form KC60, and information collected through National Enhanced Syphilis Surveillance (NESS). Multinomial regression modelling was used for data

analysis. Results Between 1999 and 2008, 12 021 NESS reports were received, 54% of KC60 reports. The dominant profile of the epidemic was one of white men who have sex with men aged 35-44, often co-infected with HIV, centred in larger cities. During this period, the proportion of primary cases increased over time, while the proportion of secondary cases fell. Primary cases exceeded secondary cases by 2004. The proportion of early latent cases remained relatively stable over time and tended to be lower than that of primary and secondary infection. Patients who attended because they had symptoms of infection, had been identified through partner notification, were HIV positive, and were UK born were more likely to present with primary or secondary infection than with early latent infection. A higher proportion of early latent cases were seen among patients who were Asian, had contacted sexual partners through saunas, bars and the internet, had untraceable partners, and had acquired infection in Manchester. Conclusions The continuing syphilis epidemic indicates that control has only been partially effective, with ongoing transmission being sustained. Intensive and targeted efforts delivered locally are required to interrupt further transmission. [Jebbari, Heather; Simms, Ian; Marongiu, Andrea; Hughes, Gwenda; Ward, Helen; Powers, Cassandra; Evans, Barry] Hlth Protect Agcy, Hlth Protect Serv, HIV & STI Dept, London NW9 5EQ, England. [Conti, Stefano] Hlth Protect Agcy, Ctr Infect, Stat Modelling & Bioinformat Unit, London NW9 5EQ, England. [Thomas, Daniel Rh] NPHS Communicable Dis Surveillance Ctr, Cardiff, S Glam, Wales.; Simms, I, Hlth Protect Agcy, Hlth Protect Serv, HIV & STI Dept, 61 Colindale Ave, London NW9 5EQ, England.; ian.simms@hpa.org.uk.

LAUDER, S.N., TAYLOR, P.R., CLARK, S.R., EVANS, R.L., HINDLEY, J.P., SMART, K., LEACH, H., KIDD, E.J., BROADLEY, K.J., JONES, S.A., WISE, M.P., GODKIN, A.J., O'DONNELL, V. and GALLIMORE, A.M., 2011. **Paracetamol reduces influenza-induced immunopathology in a mouse model of infection without compromising virus clearance or the generation of protective immunity.** *Thorax*, 66(5), pp. 368-374.

Background Seasonal influenza A infection affects a significant cohort of the global population annually, resulting in considerable morbidity and mortality. Therapeutic strategies are of limited efficacy, and during a pandemic outbreak would only be available to a minority of the global population. Over-the-counter medicines are routinely taken by individuals suffering from influenza, but few studies have been conducted to determine their effectiveness in reducing pulmonary immunopathology or the influence they exert upon the generation of protective immunity. Methods A mouse model of influenza infection was utilised to assess the efficacy of paracetamol (acetaminophen) in reducing influenza-induced pathology and to examine whether paracetamol affects generation of protective immunity. Results Administration (intraperitoneal) of paracetamol significantly decreased the infiltration of inflammatory cells into the airway spaces, reduced pulmonary immunopathology associated with acute infection and improved the overall lung function of mice, without adversely affecting the induction of virus-specific adaptive responses. Mice treated with paracetamol exhibited an ability to resist a second infection with heterologous virus comparable with that of untreated mice. Conclusions Our results demonstrate that paracetamol dramatically reduces the morbidity associated with influenza but does not compromise the development of adaptive immune responses. Overall, these data support the utility of paracetamol for reducing the clinical symptoms associated with influenza virus

infection. [Lauder, Sarah N.] Cardiff Univ, Sch Med, Dept Infect Immun & Biochem, Cardiff CF14 4XN, S Glam, Wales. [Evans, Rhys L.; Kidd, Emma J.; Broadley, Kenneth J.] Cardiff Univ, Div Pharmacol, Cardiff CF14 4XN, S Glam, Wales. [Wise, Matt P.] Univ Wales Hosp, Cardiff CF4 4XW, S Glam, Wales.; Lauder, SN, Cardiff Univ, Sch Med, Dept Infect Immun & Biochem, Heath Pk, Cardiff CF14 4XN, S Glam, Wales.; laudersn@cardiff.ac.uk.

LEPPING, P., DELIEU, J., MELLOR, R., WILLIAMS, J.H.H., HUDSON, P.R. and HUNTER-LAVIN, C., 2011. **Antipsychotic Medication and Oxidative Cell Stress: A Systematic Review.** *Journal of Clinical Psychiatry*, 72(3), pp. 273-285. Objective: To look at (1) the association between antipsychotics and cell stress, (2) whether first-generation antipsychotics may show different effects than second-generation antipsychotics, and (3) whether recommendations can be made regarding medication. Data Sources: We conducted a systematic review of 5 databases for all articles published until December 31, 2007: Pub Med, Ovid MEDLINE, EMBASE, PsycINFO, and EBM Reviews. Under specific headings (eg, "heat shock proteins" and "oxidative stress"), a systematic search of these databases included such terms as HSP70 and homocysteine, and specific search strings were constructed. No limits were placed on the year or language of publication. References from pertinent articles or books were retrieved. Study Selection: We included 42 articles of human studies from 2,387 references originally retrieved. We included only articles that (1) were quantitative; (2) referred only to human tissue, in vivo, or in vitro; (3) stated what tissue was examined; (4) identified what metabolites were measured; and (5) had references. Data Extraction: All articles were assessed by 2 authors, which ensured that the inclusion criteria were met. The selected studies were too heterogeneous to be combined for any useful meta-analysis. Three authors, therefore, independently interpreted the data, using specified criteria to judge whether each study showed a beneficial, detrimental, or no effect on the markers measured. Data Synthesis: The analysis revealed no conclusive association with direct or indirect markers of oxidative cell stress and antipsychotics. For every reviewed antipsychotic, we revealed differing research results showing a beneficial, detrimental, or no effect. This was true for in vivo as well as in vitro studies. Conclusions: It remains unclear whether antipsychotics increase or reduce cell stress. Claims of neuroprotective properties of antipsychotics seem premature. *J Clin Psychiatry* 2011;72(3):273-285 (C) Copyright 2010 Physicians Postgraduate Press, Inc. [Lepping, Peter] Glyndwr Univ, Wrexham, Wales. [Lepping, Peter; Mellor, Richard] Betsi Cadwaladr Univ Hlth Board, Dept Psychiat, Bangor, Gwynedd, Wales. [Hudson, Peter R.] Betsi Cadwaladr Univ Hlth Board, Dept Clin Biochem, Bangor, Gwynedd, Wales. [Delieu, John] Bangor Univ, Sch Med Sci, Bangor, Gwynedd, Wales. [Williams, John H. H.] Univ Chester, Chester Ctr Stress Res, Chester, Cheshire, England.; Lepping, P, Wrexham Acad Unit, Croesnewydd Rd, Wrexham LL13 7TY, Wales.; peter.lepping@wales.nhs.uk.

MANDAL, S., BRADSHAW, L., ANDERSON, L.F., BROWN, T., EVANS, J.T., DROBNIOWSKI, F., SMITH, G., MAGEE, J.G., BARRETT, A., BLATCHFORD, O., LAURENSEN, I.F., SEAGAR, A., RUDDY, M., WHITE, P.L., MYERS, R., HAWKEY, P. and ABUBAKAR, I., 2011. **Investigating Transmission of Mycobacterium bovis in the United Kingdom in 2005 to 2008.** *Journal of clinical microbiology*, 49(5), pp. 1943-1950.

Due to an increase in bovine tuberculosis in cattle in the United Kingdom, we investigated the characteristics of Mycobacterium bovis infection in humans and assessed whether extensive transmission of M. bovis between humans has occurred. A cross-sectional study linking demographic, clinical, and DNA fingerprinting (using 15-locus mycobacterial interspersed repetitive-unit-variable-number tandem-repeat [MIRU-VNTR] typing) data on cases reported between 2005 and 2008 was undertaken. A total of 129 cases of M. bovis infection in humans were reported over the period, with a decrease in annual incidence from 0.065 to 0.047 cases per 100,000 persons. Most patients were born pre-1960, before widespread pasteurization was introduced (73%), were of white ethnicity (83%), and were born in the United Kingdom (76%). A total of 102 patients (79%) had MIRU-VNTR typing data. A total of 31 of 69 complete MIRU-VNTR profiles formed eight distinct clusters. The overall clustering proportion determined using the n - 1 method was 33%. The largest cluster, comprising 12 cases, was indistinguishable from a previously reported West Midlands outbreak strain cluster and included those cases. This cluster was heterogeneous, having characteristics supporting recent zoonotic and human-to-human transmission as well as reactivation of latent disease. Seven other, smaller clusters identified had demographics supporting recrudescence rather than recent infection. A total of 33 patients had incomplete MIRU-VNTR profiles, of which 11 may have yielded 2 to 6 further small clusters if typed to completion. The incidence of M. bovis in humans in the United Kingdom remains low, and the epidemiology is predominantly that of reactivated disease. [Abubakar, Ibrahim] Hlth Protect Agcy Ctr Infect, Dept Resp Dis, TB Sect, London NW9 5EQ, England. [Brown, Tim; Drobniewski, Francis] Hlth Protect Agcy Ctr Infect, Natl Mycobacterium Reference Lab, London NW9 5EQ, England. [Evans, Jason T.; Smith, Grace; Hawkey, Peter] Hlth Protect Agcy, Reg Ctr Mycobacteriol, Birmingham, W Midlands, England. [Magee, John G.; Barrett, Anne] Hlth Protect Agcy, Reg Ctr Mycobacteriol, Newcastle Upon Tyne, Tyne & Wear, England. [Blatchford, Oliver] Hlth Protect Scotland, Glasgow, Lanark, Scotland. [Laurenson, Ian F.; Seagar, Amie-Louise] Scottish Mycobacteria Reference Lab, Edinburgh, Midlothian, Scotland. [Ruddy, Michael; White, P. Lewis] Wales Ctr Mycobacteria, Cardiff, S Glam, Wales. [Myers, Richard] Hlth Protect Agcy Ctr Infect, Bioinformat Unit, London NW9 5EQ, England. [Hawkey, Peter] Univ Birmingham, Birmingham, W Midlands, England.; Abubakar, I, Hlth Protect Agcy Ctr Infect, Dept Resp Dis, TB Sect, 61 Colindale Ave, London NW9 5EQ, England.; i.abubakar@uea.ac.uk.

MORRIS-STIFF, G., OGUNBIYI, S., REES, J., DAVIES, C.J., HICKS, E. and LEWIS, M.H., 2011. **Variations in the anatomical distribution of peripheral vascular disease according to gender.** *Annals of the Royal College of Surgeons of England*, 93(4), pp. 306-309.

BACKGROUND While large epidemiological studies have suggested that the male gender is more frequently afflicted with intermittent claudication, there is little data whether there are gender differences in the distribution of peripheral vascular disease (PVD). The aim of this study was to clarify this issue on the basis of angiographic findings in patients presenting with claudication. **PATIENTS AND METHODS** The radiology department computerised database was used to identify all lower limb angiograms performed for investigation of PVD. Patients undergoing incomplete assessment and those with normal angiograms were excluded.

Demographic details for each patient were collected together with details of uni- or

bilaterality of disease, the number of lesions present and their anatomical distribution according to the major named vessels. Only lesions reported as radiologically significant were included in the analysis. RESULTS Five hundred consecutive angiograms fitting the defined study criteria were assessed. There were 310 males and 190 females giving a male to female ratio of 1.6:1. The most common distribution for both genders was multiple bilateral lesions. There were no significant differences in the number of stenoses in terms of ratio of bilateral to unilateral (2.39 vs 2.77) or ratio of multiple to single lesions (1.5 vs 1.7) between the female and male groups. Disease was more common in males at all anatomical locations, the most significant differences being for lesions of the common femoral and profunda femoris arteries. CONCLUSIONS PVD is more commonly diagnosed in males than females. The disease process is more commonly bilateral in both genders and PVD affects more numerous sites in the male claudicant than in the female claudicant. Nevertheless, there does not appear to be any difference in the anatomical distribution of disease between genders. [Morris-Stiff, Gareth; Ogunbiyi, Samuel; Rees, Jonathan; Lewis, Michael H.] Royal Glamorgan Hosp, Dept Surg, Pontyclun CF72 8XR, Llantrisant, Wales. [Davies, Colin J.; Hicks, Eryl] Royal Glamorgan Hosp, Dept Radiol, Pontyclun CF72 8XR, Llantrisant, Wales.; Lewis, MH, Royal Glamorgan Hosp, Dept Surg, Pontyclun CF72 8XR, Llantrisant, Wales.; mike.lewis@pr-tr.wales.nhs.uk.

TSATSOU, P., 2011. **Digital divides revisited: what is new about divides and their research?** *Media Culture & Society*, 33(2), pp. 317-331.

A worldwide debate has taken place in the last two decades about the digital divide and its constituents, as well as its dimensions and variations in the different contexts in which it emerges. In this article, I refer to 'digital divides' throughout the text, since I argue that many different aspects and forms of divides co-exist today, leading the concept to be defined and approached in various ways by contemporary research: 'this is, in fact, a whole series of interlocking "divides" - the gaps that separate segments of society as well as whole nations into those who are able to take advantage of the new ICT opportunities and those who are not' (OECD, 2003: 3). Swansea Univ, Swansea, W Glam, Wales.; Tsatsou, P, Swansea Univ, Swansea, W Glam, Wales.; p.tsatsou@swansea.ac.uk.

WADHAWAN, A., SMITH, C., NICHOLSON, R.I., BARRETT-LEE, P. and HISCOX, S., 2011. **Src-mediated regulation of homotypic cell adhesion: implications for cancer progression and opportunities for therapeutic intervention.** *Cancer treatment reviews*, 37(3), pp. 234-241.

Homotypic cell adhesion is fundamental to the maintenance of cell and tissue structure and function and is predominantly mediated by cadherin-containing adherens junction complexes. The integrity of these adhesion sites can be modulated by Src, a non-receptor tyrosine kinase implicated in the development and progression of a number of tumour types. Changes in homotypic cell adhesion have been shown to be central to cell migration and invasion, characteristics central to tumour metastasis and irrevocably leading to patient death. Targeting of Src may thus be an effective means to suppress migration and invasion of cancer cells and suggests the use of Src inhibitors clinically as a mechanism to delay or limit tumour spread. In this article, we review the role of Src in cell-cell adhesion and discuss data that suggests its usefulness as a therapeutic target in anti-invasive therapy. (C) 2010 Elsevier Ltd. All rights reserved. [Wadhawan, Anshu;

Smith, Chris; Barrett-Lee, Peter] Velindre Canc Ctr, Cardiff CF14 2TL, S Glam, Wales. [Nicholson, Robert I.; Hiscox, Stephen] Cardiff Univ, Welsh Sch Pharm, Cardiff CF10 3XF, S Glam, Wales.; Wadhawan, A, Velindre Canc Ctr, Velindre Rd, Cardiff CF14 2TL, S Glam, Wales.; anshudol@aol.com smithc1@Cardiff.ac.uk
NicholsonRI@cardiff.ac.uk Peter.Barrett-Lee@velindre-tr.wales.nhs.uk
HiscoxSE1@cardiff.ac.uk.

Glossary of terms

Index term	Scope
Agriculture and food	Farming Crops GM Nitrate Vulnerable Zones Pastoral Agri-food Horticulture
Air	Ambient air pollution Atmospheric air pollution Emissions from stationary sources Emissions from mobile sources Ground-level pollution (eg ozone) Air quality Air pollution substances (typically: SO _x ; NO _x ; particulates – PM ₁₀) Acid rain
Biotechnology	Bioremediation Industrial microbiology
Chemicals	Nanotechnology Pesticides Chemicals and their properties Endocrine disruption
Climate	Global warming Climate change Ozone depletion Carbon sinks Carbon emissions (include CO ₂) Carbon sequestration Carbon cycle Ice sheet instability Melting ice sheets
Conservation and Biodiversity	Species Habitats Invasive species Ecology Healthland Wetlands Biomass Grassland
Energy	Fossil fuel Electricity supply
Engineering and Construction	Building
Environmental Management	Environmental management systems (EMAS, ISO 14000) Environmental accounting Statistics Risk Hazard management
Fisheries	Shellfish

	Freshwater fishing Marine fishing
Flood	Sustainable drainage Flooding events Flood management
Forestry	Rain forests Logging Canopies
Human Health	Disease Chemical pollution
Land Quality	Contaminated land Remediation Brownfield development Soil Soil erosion
Marine	Bathing water quality Coastal zone management
Noise	Noise pollution
Nuclear	Radioactive substances Nuclear energy
Process industry regulation	Permitting, Compliance and Enforcement IPPC LAPC (Local Authority)
Planning	Town and country planning Planning consents Developmental control Regeneration Infrastructure
Pollution prevention and control	MCERTS
Products	Life cycle assessment Green product design
Renewable energy	Biofuels/biogas/biomass Wind Solar Geothermal Tidal Alternative fuels – hydrogen production
Technology and IT	GIS Data logging Satellite imagery Biosensors GPS Digital evaluation models Modelling Remote sensing Tracking
Sustainable Development	Population Environmental justice
Waste	Waste types, eg domestic, commercial, industrial, WEEE
Waste Management	Treatment options: landfill, incineration, pyrolysis, recycling, reuse, land spreading, composting
Water	Glacial water/glaciers Drinking water

	Groundwater Sewage treatment Wastewater (industrial including mine wastewater) Effluent
Water Quality	Focus on surface water quality Water Framework Directive Diffuse pollution
Water Resources	Drought Catchment areas

Social Science

Behaviour	Changing behaviours Influencing Incentives Motivation Culture
Communication	Best practice Getting the message across Debates Controversy Discourse Reaction Perception
Governance	Politics Standards Modernisation Reform Devolution
Industry & Commerce	SMEs Industry Business Corporate Social Responsibility Ethical investment Environmental performance Environmental impact Products Greening supply chain Innovation Green design
Socio-economic	Health Inequalities Deprivation

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