# Conference Programme

## New Directions in Numerical Computation: In Celebration of Nick Trefethen's 60th Birthday

**25-28 August, 2015**

**Mathematical Institute**
**Oxford University**

## Monday 24th September

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| 14:00 - | | Rooms at Balliol available for check-in (checkout: 10:00am on day of departure) |
| 17:00 - | 19:00 | Registration and drinks reception in the Old Common Room at Balliol College |

## Tuesday 25th September

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| 7.15 - | 8.15 | Breakfast in the hall at Balliol for resident delegates |
| 8:00 - | 9:00 | Coffee and registration, Mathematical Insitute, Andrew Wiles Building, mezzanine floor |
| 9:00 - | 9:45 | Plenary talk 1: **Nick Higham**, U. of Manchester, "*Recent progress on the nearest correlation matrix problem*" |
| 9:45 - | 10:30 | Plenary talk 2: **Volker Mehrmann**, TU Berlin, "*Stability radii and pseudospectra of (structured) dynamical systems"* |
| 10.30 - | 11:00 | Coffee |
| 11:00 - | 11:45 | Plenary talk 3: **Alan Edelman**, MIT<br>*"The Julia computing language"* |
| 11:45 - | 12:30 | Plenary talk 4: **Marsha Berger**, New York University<br>"*Can embedded boundary grids compute high Reynolds number flow?"* |
| 12:30 - | 2:00 | Lunch |
| 2:00 - | 2:45 | Plenary talk 5: **André Weideman**, Stellenbosch University<br>*"The shortest path: Complex detours in real computation"* |
| 2:45 - | 3:30 | Plenary talk 6: **Bengt Fornberg,** University of Colorado Boulder<br>"*Radial basis function generated finite differences (RBF-FD): New computational opportunities for solving PDEs"* |
| 3.30 - | 4:00 | Coffee |
| Room C1 | 4:00 - 4:20 | 1.1: **Joerg Liesen** "*Zeros of rational harmonic functions and their applications"* |
| | 4:25 - 4.45 | 2.1: **Ken'ichiro Tanaka** "*Potential theoretic approach to design an optimal formula for function approximation in a weighted Hardy space"* |
| | 4:50 - 5:10 | 3.1 **Marc Van Barel** *"Rational filter functions for solving eigenvalue problems by contour integration"* |
| | 5:15 - 5:35 | 4.1 **Walter Gautschi** *"Bimodal polynomials"* |
| | 5:40 - 6:00 | 5.1 **Huijun Li** *"Removing of the Cauchy singularity in Hilbert transform over unit circle and its high accuracy quadrature"* |
| Room L2 | 4:00 - 4:20 | 1.2: **Sheehan Olver** "*A practical framework for infinite-dimensional linear algebra"* |
| | 4:25 - 4.45 | 2.2: **Thorsten Dahmen** "*A new type system for automatic computing with operator objects"* |
| | 4:50 - 5:10 | 3.2 **Zdenek Strakos** *"On operator and matrix view to (preconditioned) iterative methods"* |
| | 5:15 - 5:35 | 4.2 **Stefan Guettel** *"The RKFIT algorithm for nonlinear rational approximation and RKFUNs"* |
| | 5:40 - 6:00 | 5.2 **Nick Hale** *"Legendre polynomials in scientific computing"* |
| Room L3 | 4:00 - 4:20 | 1.3 **Hadrien Montanelli** "*Computing choreographies"* |
| | 4:25 - 4.45 | 2.3 **Mario Chater** *"Convergence of the least squares shadowing method for computing the derivative of ergodic averages"* |
| | 4:50 - 5:10 | 3.3 **Qiqi Wang** *"Adjoining Chaos"* |
| | 5:15 - 5:35 | 4.3 **Manfred Trummer** *"Spectral methods for singularly perturbed two-point boundary value problems"* |
| | 5:40 - 6:00 | 5.3 **Marcelo Trindade** *"An iterative implementation of the Tau method based on Schur complements"* |
| Room L4 | 4:00 - 4:20 | 1.4 **Cong Sun** "*Methods for special structured optimization problems"* |
| | 4:25 - 4.45 | 2.4 **Natasa Strabic** *Cholesky-factor based implementation for doubling algorithms with permuted Langrangian graph bases"* |
| | 4:50 - 5:10 | 3.4 **Jack Spencer** *"Shape prior segmentation with intensity inhomogeneity"* |
| | 5:15 - 5:35 | 4.4 **Heinz-Joachim Rack** *"Extremal problems for polynomials initiated by* |

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| | | *numerical computations"* |
| | 5:40 - 6:00 | 5.4 **Paul Constantine** *"Active Subspaces: Emerging ideas for dimension reduction in functions of several variables"* |
| Room C4 | 4:00 - 4:20 | 1.5 **Stefan Kunis** "*Low-ranks in computational Fourier analysis"* |
| | 4:25 - 4.45 | 2.5 **Venera Khoromskaia** *"3D lattice summation of long range potentials by assembled tensor method"* |
| | 4:50 - 5:10 | 3.5 **Guo He** *"The fast implementation of higher order Hermite-Fejer interpolation"* |
| | 5:15 - 5:35 | 4.5 **Michael Floater** *"Lagrange interpolation in convex polytopes"* |
| | 5:40 - 6:00 | 5.5 **Shuhuang Xiang** *"On interpolation approximation: Convergence rates on interpolation for functions of limited regularity"* |

**Wednesday 26 August**

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| 7:30 - 8:30 | Breakfast in the hall at Balliol for resident delegates |
| 8:30 - 9:00 | Coffee, Andrew Wiles Building |
| 9:00 - 9:45 | Plenary talk 7: **Michael Overton**, New York University<br>*"Investigation of Crouziex's Conjecture via nonsmooth optimization* |
| 9:45 - 10:30 | Plenary talk 8: **Andy Wathen**, University of Oxford<br>*"Optimal iterative solution of nonsymmetric Toeplitz systems"* |
| 10:30 - 11:00 | Coffee |
| 11:00 - 11:45 | Plenary talk 9: **Ian Sloan**, University of New South Wales<br>*"The high dimensional frontier"* |
| 11:45 - 12:30 | Plenary talk 10: **Anne Greenbaum**, University of Washington<br>*"Near normal dilations of nonnormal matrices and linear operators"* |
| 12:30 - 1:00 | **Group Photograph!** – Please assemble at front of building (Penrose Paving) if fine, or under South Crystal if wet. |
| 1:00 - 2:30 | Lunch |
| 2:30 - 5:30 | Outing to Blenheim Palace: Please assemble at rear of building (by revolving doors).<br>Coaches will leave the Mathematical Institute at 2:45pm.<br>Coaches will board at Blenheim at 5:45pm and return to the Mathematical Institute. |

**Thursday 27 August**

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| 7:30 - 8:30 | | Breakfast in the hall at Balliol for resident delegates |
| 8:30 - 9:00 | | Coffee, Andrew Wiles Building |
| Room L2 | 9:00 - 9:20 | 6.1 **Haiyong Wang** *"On the optimal estimates and comparison of Gegenbauer expansion coefficients"* |
| | 9:25 - 9:45 | 7.1 **Kim-Chuan Toh** *"A two-phase augmented Langrangian method for convex composite quadratic programming"* |
| | 9:50 - 10:10 | 8.1 **Yuji Nakatsukasa** *"Stable polefinding and rational least-squares fitting via eigenvalues"* |
| | 10:15- 10:35 | 9.1 **Walter Gautschi** *"Freud and sub-range Freud polynomials and their zeros"* |
| Room L3 | 9:00 - 9:20 | 6.2 **Daan Huybrechs** *"Beyond machine precision: high-accuracy computation of Chebyshev coefficients in floating point arithmetic"* |
| | 9:25 - 9:45 | 7.2 **Grady Wright** *"An extension of Chebfun to spheres and disks"* |
| | 9:50 - 10:10 | 8.2 **Rodrigo Platte** *"A windowed Fourier method for computations on the sphere"* |
| | 10:15- 10:35 | 9.2 **Roel Matthysen** "*Fast algorithms for Fourier extensions"* |
| Room C1 | 9:00 - 9:20 | 6.3 **Alison Ramage** "*A multilevel preconditioner for data assimilation with 4D-Var"* |
| | 9:25 - 9:45 | 7.3 **Cécile Piret** *"A fast radial basis functions method for solving partial differential equations on arbitrary surfaces"* |

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| | 9:50 - 10:10 | 8.3 **Jessica Bosch** "*A fractional inpainting model based on the vector-valued Cahn-Hilliard equation"* |
| | 10:15- 10:35 | 9.3 **Stephen Langdon** *"Hybrid numerical-asymptotic methods for wave scattering problems"* |
| Room C4 | 9:00 - 9:20 | 6.4 **Christopher Paige** *"Equivalence of Lanczos tridiagonalization, Golub-Kahan bidiagonalization, and some solution of equations algorithms, for skew symmetric matrices"* |
| | 9:25 - 9:45 | 7.4 **Thomas Trogdon** "*The conjugate gradient algorithm in finite-precision arithmetic and the condition number of random matrices"* |
| | 9:50 - 10:10 | 8.4 **Samuel Relton** *"Componentwise and mixed condition numbers for matrix functions"* |
| | 10:15- 10:35 | 9.4 **Raymundo Navarette** *"Accuracy and stability of inversion of power series"* |
| Room L4 | 9:00 - 9:20 | 6.5 **Dave Hewett** *"Mathematics of the Faraday cage"* |
| | 9:25 - 9:45 | 7.5 **Laurette Tuckerman** "*Binary fluid convection as a two-by-two matrix"* |
| | 9:50 - 10:10 | 8.5 **Silvio Gama** *"Sign changes in the eddy viscosity of two-dimensional incompressible flow"* |
| | 10:15- 10:35 | 9.5 **Ludvig af Klinteberg** *"A fast and accurate integral equation method for particles in viscous flow using QBX"* |
| 10.35 - 11:00 | Coffee | |
| 11:00 - 11:45 | Plenary talk 11: **Jean-Paul Berrut**, University of Fribourg<br>*"Linear barycentric rational interpolation with guaranteed degree of precision in two dimensions"* | |
| 11:45 - 12:30 | Plenary talk 12: **Mark Embree**, Virginia Tech<br>*"Approximation theory for model reduction"* | |
| 12:30 - 2:00 | Lunch | |
| 2:00 - 2:45 | Plenary talk 13: **Penny Anderson**, MathWorks<br>"*From a vibrating membrane to tricorders: The inextricably intertwined story of algorithms, MATLAB, and Nick Trefethen"* | |
| 2:45 - 3:30 | Plenary talk 14: **Randy LeVeque**, University of Washington<br>*"How to fit a square peg in a round hole"* | |
| 3.30 - 4:00 | Coffee | |
| 4:00 - 4:45 | Plenary talk 15 **Folkmar Bornemann**, TU München<br>*"The SIAM 100-Digit Challenge – O(10) years later"* | |
| Room C1 | 4:50 - 5:10 | 10.1 **Evren Yarman** *"A new way to calculate the sine integral function"* |
| | 5:15 - 5:35 | 11.1 **Raffaello Seri** *"Computing weighted chi-squared distributions and related quantities"* |
| | 5:40 - 6:00 | 12.1 **Roberto Garrappa** *"On the computation of the Mittag-Leffler function"* |
| Room L2 | 4:50 - 5:10 | 10.2 **Silviu Filip** *"The Parks-McClellan algorithm: a robust and scalable approach for designing digital filters"* |
| | 5:15 - 5:35 | 11.2 **Boris Khoromskij** *"Toward integration of high-frequency oscillators at logarithmic cost: QTT tensor approximation of discretized functions"* |
| | 5:40 - 6:00 | 12.2 **Ricardo Pachon** *"A Chebyshev-based methodology for pricing European options with arbitrary payoffs"* |
| Room C4 | 4:50 - 5:10 | 10.3 **Andrea Moiola** *"Trefftz methods for the Helmholtz equation and best approximation estimates for plane and circular waves"* |
| | 5:15 - 5:35 | 11.3 **Kristoffer van der Zee** *"Optimal discretization in Banach spaces: Residual minimization, nonlinear Petrov-Galerkin, and monotone mixed methods"* |
| | 5:40 - 6:00 | 12.3 **Matthias Maischak** *"Exact quadrature in n-dim Galerkin-BEM"* |
| Room L3 | 4:50 - 5:10 | 10.4 **Ramis Movassagh** *"Eigenvalue attraction"* |
| | 5:15 - 5:35 | 11.4 **Emre Mengi** *"Large scale computation of extreme pseudospectral functions"* |
| | 5:40 - 6:00 | 12.4 **Petar Sirkovic** *"A reduced basis approach to large-scale pseudospectra computation"* |
| Room L4 | 4:50 - 5:10 | 10.5 **Clemens Heitzinger** *"Advances in numerical methods for stochastic partial differential equations and stochastic homogenization"* |

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| | 5:15 - 5:35 | 11.5 **Lehel Banjai** *"A positivity preservation property of Runge-Kutta based convolution quadratures"* |
| | 5:40 - 6:00 | 12.5 **Peter Kandolf** *"The Leja method for the matrix exponential: backward error analysis and implementation"* |
| Room C2 | 5:15 - 5:35 | 11.6 **Lothar Reichel** *"Rational Krylov methods for the approximation of matrix functions"* |
| | 5:40 - 6:00 | 12.6 **Ya-Xiang Yuan** *"A note on the worst-case complexity of nonlinear stepsize control algorithms for unconstrained optimization"* |

7:00- Banquet at Balliol College. There will be a drinks reception from 7pm in the Old Common Room, followed by dinner in the hall at 8pm.

**Friday 28 August**

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|---|---|---|
| 7.30 - | 8:30 | Breakfast in the hall at Balliol for resident delegates |
| 8:30 - | 9:00 | Coffee, Andrew Wiles Building |
| 9:00 - | 9:45 | Plenary talk 16: **Gilbert Strang**, MIT<br>*"Stability of interpolation: Lagrange, Shannon, Hermite"* |
| 9:45 - | 10:30 | Plenary talk 17: **Leslie Greengard,** New York University<br>"*Layered medium Green's functions for wave scattering problems"* |
| 10:30 - | 11:00 | Coffee |
| 11:00 - | 11:45 | Plenary talk 18: **Jon Chapman**, University of Oxford<br>"*Conformal maps, Escher, and my Dad's Christmas present"* |
| 11:45 - | 12:30 | Plenary talk 19: **Des Higham**, University of Strathclyde<br>*"Keeping the noise down"* |
| 12-30 - | | Lunch |