

**CURRICULUM VITAE**  
**OLEG V. ZABORONSKI**

October 2012

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**Date of Birth:** June 25, 1968

**Nationality:** British

**Family Status:** Married

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**Chronology of Education**

M. S.                    Theoretical physics, MEPHI, 1993  
Moscow Engineering Physics Institute, Russia.

Ph. D.                   Mathematics, U. C. Davis, USA.  
September 1997.

Advisor:                Professor Albert S. Schwarz.

Thesis Title:          “Supergeometry and localization”

**Current Position:** Associate Professor (Reader) at the Department of Mathematics, University of Warwick.

**Chronology of Employment**

Associate member at the Department of Mathematics, U. C. Davis.	July 1996
Research Assistant at the Department of Physics, U. C. Davis.	July-August 1994
Research Assistant at the Department of Physics, U. C. Davis.	July-August 1995
Research Assistant at the Department of Physics, U. C. Davis.	August-September 1996
Postdoctoral member of the Institute for Advanced Study, Princeton, NJ.	1997-1998
Lecturer at the Department Mathematics, University of Warwick.	1998-2003
Senior lecturer at the Department of Mathematics, University of Warwick.	1998-2007
Reader (Associate Professor) at the Department of Mathematics, University of Warwick.	2007-present
Consulting scientist at Arithmatica Ltd, Redwood City, USA - Warwick, UK.	2000-March 2008
Consulting scientist and president Siglead Europe, Kenilworth, UK.	March 2008-September 2012

## **Research Areas**

-Information theory, error-correcting codes, public key cryptography, advanced detection and coding technology for data storage.

-Statistical mechanics (equilibrium and non equilibrium), quantum field theory, fluid mechanics and turbulence;

-Stochastic analysis, integrable systems, partial differential equations, the theory of large deviations with applications to information theory.

## **Honors, Awards and Fellowships**

1985. First Place in the all Russian Physics Olympiad dedicated to the memory of I. V. Kurchatov.

1993. Honorary diploma from Moscow Engineering Physics Institute.

2004-2008. Royal Society Industrial Fellowship.

October 2009 - September 2012. Siglead Inc. Research Fellow.

## **Service**

Organizer of the conference on Random Matrices and Integrable Systems, University of Warwick, November 1998.

Organizer of the Departmental Applied Mathematics Seminar, Spring 2000.

Coordinator of Applied Mathematics Projects, 1998-1999.

First Year Examination Secretary, 2001.

First Year Coordinator, 2001-2002.

Postgraduate Examination Secretary, 2002-present.

Organizer of MIRAW day 'New trends in non-equilibrium statistical mechanics', 2002.

Organizer of the inter-Departmental Quantum Theory Seminar, 2001-present.

Organizer of Departmental Colloquium, 2003-2005.

Co-organiser of Warwick Turbulence Symposium, 2005-2006.

Executive committee member for the UK Data Storage Network, 2007-present.

Executive committee member for the ProTeM (Probe-based Terabit Memory) consortium, 2006-present.

Co-organiser of Warwick Symposium on Complex Systems and Systems Biology, 2009-2010.

### **Research supervision**

**1999-2000 academic year.** Supervised Gareth Rowlands working on the applied mathematics project "Burgers Equation".

**2000-2001 academic year.** Supervised Thomas Morris who worked on the final year project "Solitons in Legoland".

**2001-2002 academic year.** Supervised MSc student Steven Thomas. Project title: "The Number of Pulsars in the Galaxy".

**2000-2003.** Jointly with Dr. S. Nazarenko I supervised a PhD student (Robert West) who worked on the project "Intermittency of Navier-Stokes turbulence in the framework of rapid distortion theory".

**2002-2006.** Supervised a PhD student Ranjiva Munasinghe. Title of the thesis: "Large fluctuation effects in reaction-diffusion systems".

**2003-2009 academic year.** Supervised a PhD student Robert Jackson. Title of the thesis: "Signal detection for perpendicular magnetic storage".

**2009-20011 academic year.** Supervised a PhD student Tom Parnell. Title of the thesis: "Digital signal processing and coding for nano-scale probe storage".

**Current PhD students:** (i) Oliver Hambrey (project: Probabilistic error correction schemes and statistical mechanics); (ii) Jonathan Yip (jointly with Roger Tribe. Project: exactly solvable interacting particle systems). (iii) Barnaby Garrod (jointly with Roger Tribe. Project: pfaffian structures for interacting particle systems).

## Publications

### *Published Papers*

- [1] M. Schepkin, O. Zaboronsky, H. Clement, *Estimate of  $d'$  production in proton-proton collisions*, Z. Physik **A 345** (4) , 407 (1993).(O. Z.'s contribution: 33 per cent.)
- [2] H. Clement, M. Schepkin, G. Wagner, O. Zaboronsky, *On the production of a narrow  $\pi NN$  resonance in low energy pionic DCX on He isotopes*, Phys. Lett **B 337** (1-2) , 43 (1994). (O. Z.'s contribution: 25 per cent.)
- [3] R. Bilger, H. Clement, K. Fohl, G. Wagner, M. Schepkin, O. Zaboronsky, *Search for NN-decoupled resonance in the  $\pi NN$ -system*, Proceedings of the international conference on mesons and nuclei at intermediate energies, Dubna, Russia, 3-7 May 1994. Edited by M. Khankhasayev, Zh. Kurmonov; Singapore: World Scientific, 1995, p. 199. (O. Z.'s contribution: 16 per cent.)
- [4] R. Bilger, H. Clement, K. Fohl, G. Wagner, M. Schepkin, O. Zaboronsky, *NN-decoupled resonances in the  $\pi NN$  system*, Proceedings of the international conference on physics with GeV-particle beams, Forschungszentrum Julich, Germany, 22-24 August 1994. Edited by H. Machner, K. Sistemich; Singapore: World Scientific, 1995, p. 324. (O. Z.'s contribution: 16 per cent.)
- [5] M. Alexandrov, M. Kontsevich, A. Schwarz, O. Zaboronsky, *The geometry of master equation and topological quantum field theory*, hep-th/9502010, published in Int. Jour. Mod. Phys. **A12**, No. 7, p. 1429 (1997). (29 pages, O. Z.'s contribution: 25 per cent.) Math. Review No. 98a:81235 .
- [6] A. Schwarz, O. Zaboronsky, *Supersymmetry and localization*, hep - th/9511112, published in Comm. Math. Phys. **183**, p. 463 (1997). Math. Review No. 98g:58016. (16 pages, O. Z.'s contribution: 50 per cent.)
- [7] L. -L. Chau, O. Zaboronsky, *Normal Matrix Model, Toda lattice hierarchy, and the two-dimensional electron gas in a strong magnetic field*, Proceedings in memory of Professor Wolfgang Kroll (1906-1992), ed. J. P. Hsu, et. al. , World Scientific, 1997. (7 pages, O. Z.'s contribution: 50 per cent.)
- [8] L. -L. Chau, O. Zaboronsky, *On the structure of Normal Matrix Model*, hep-th/9711091, published in Comm. Math. Phys. **196**, p. 203 (1998). Math Review No. 99g:58062. (43 pages, O. Z.'s contribution: 50 per cent.)
- [9] R. Tribe and O. Zaboronski, *On the large time asymptotics of decaying Burgers turbulence*, Comm. Math. Phys. **212**, p. 415 (2000). (25 pages, O. Z.'s contribution: 50 per cent.)
- [10] O. Zaboronski, *Stochastic aggregation of diffusive particles revisited*, Physics Letters **A 281**, p. 119 (2001). (9 pages, O. Z.'s contribution: 100 per cent.)
- [11] O. Zaboronski, *On Dimensional Reduction in Supersymmetric Field Theories*, J. Phys. **A: Math. Gen.** **35** No. 26 (5 July 2002) 5511-5519. (11 pages, O. Z.'s contribution: 100 per cent.)
- [12] S. Krishnamurthy, R. Ravindran and O. Zaboronski, *Kang-Redner Anomaly in Stochastic Aggregation*, cond-mat/0209174, Phys. Rev. E, Vol 66, 066118 (2002).(11 pages, O. Z.'s contribution: 33 per cent.)
- [13] S. Krishnamurthy, R. Ravindran and O. Zaboronski, *Persistence properties of a system of coagulating*

- and annihilating random walkers, cond-mat/0209174, Physical Review E Vol 68, 046103 (2003). (12 pages, O. Z.'s contribution: 33 per cent.)
- [14] S. Nazarenko, R.J. West, O. Zaboronski, *Fourier space intermittency of the small-scale turbulent dynamo*, Phys. Rev. E Vol 68, 026311 (2003). (19 pages, O. Z.'s contribution: 33 per cent.)
- [15] Colm Connaughton, R. Rajesh and O. Zaboronski, *Stationary Kolmogorov solutions of the Smoluchowski aggregation equation with a source term*, cond-mat/0310063, Phys. Rev. E 69, 061114 (2004); (7 pages, O. Z.'s contribution: 33 per cent.)
- [16] B. Dubrulle, J.-P. Laval, S. Nazarenko, O. Zaboronski, *A model for rapid stochastic distortions of small-scale turbulence*, physics/0304035, Journal of Fluid Mechanics, vol. 520, pp. 1 - 21 (2004) ; (19 pages, O. Z.'s contribution: 25 per cent.)
- [17] R. Rajesh and O. Zaboronski, *Survival probability of a diffusing test particle in a system of coagulating and annihilating random walkers*, cond-mat/0404025, Phys. Rev. E 70, 036111 (2004); (8 pages, O. Z.'s contribution: 50 per cent.)
- [18] C. Connaughton, R. Rajesh and O. Zaboronski, *Breakdown of Kolmogorov Scaling in Models of Cluster Aggregation*, Phys. Rev. Lett. 94, 194503 (2005); (5 pages, O. Z.'s contribution: 33 per cent.)
- [19] C. Connaughton, R. Rajesh and O. Zaboronski, *Cluster-Cluster Aggregation as an Analogue of a Turbulent Cascade : Kolmogorov Phenomenology, Scaling Laws and the Breakdown of self-similarity* , cond-mat/0510389, Physica D, **Vol 222**, 97 (2006) ; (28 pages, O. Z.'s contribution: 33 per cent.)
- [20] R. Munasinghe, R. Rajesh and O. Zaboronski, *Multi-Scaling of Correlation Functions in Single Species Reaction-Diffusion Systems*, cond-mat/0506398, Phys. Rev. **E 73**, 051103 (2006) (10 pages, O.Z.'s contribution: 33 per cent);
- [21] R. Munasinghe, R. Rajesh, R. Tribe and O. Zaboronski, *Multi-Scaling of the n-point density function for coalescing Brownian motions*, math.PR/0512179, CMP **Vol. 268**, Number 3, pp. 717-725 (2006); (8 pages, O. Z.'s contribution: 25 per cent.)
- [22] C. Connaughton, R. Rajesh and O. Zaboronski, *Constant Flux Relation for Driven Dissipative Systems*, cond-mat/0607656, PRL, **Vol 98**, 080601 (2007) ; (4 pages, O. Z.'s contribution: 33 per cent.)
- [23] C. Connaughton, R. Rajesh and O. Zaboronski , *Constant Flux Relation for models with desorption and fragmentation*, Physica A, **Vol. 384**, Issue 1, p. 108-114 (2007). preprint arXiv:condmat.statmech/0708.2139, (2007); (7 page, O. Z.'s contribution: 33 per cent.)
- [24] C. Connaughton, R. Rajesh and O. Zaboronski, *Constant Flux Relation for diffusion limited cluster-cluster aggregation*, Phys. Rev **E 78**, 041403 (2008); preprint arXiv:0806.3344v1 [cond-mat.stat-mech] (2008); (7 pages, O.Z's contribution: 33 per cent.)
- [25] C. Gratrix, R. Jackson, T. Parnell and O. Zaboronski, *Viterbi Detector for Non-Markov Recording Channels*, IEEE Transactions on Magnetism, **Vol 44**, Issue 1 (Part 2), p. 198-206 (2008) ; (9 pages, O. Z.'s contribution: 25 per cent.)
- [26] T. Parnell, H. Pozidis and O. Zaboronski, *Forward message passing detector for probe storage*, proceedings of ICC'08 (2008) ; (5 pages, O. Z.'s contribution: 33 per cent.)

- [27] T. Parnell, H. Pozidis and O. Zaboronski, *Performance evaluation of the probe storage channel*, proceedings of GLOBECOM'09 (2009) ; (6 pages, O. Z.'s contribution: 33 per cent.)
- [28] C. Connaughton, R. Rajesh and O. Zaboronski, *On the Non-equilibrium Phase Transition in Evaporation-Deposition Models*, J. Stat. Mech. P09016 (2010); preprint arXiv:1006.37201 [cond-mat.stat-mech] (2010); (8 pages, O.Z's contribution: 33 per cent.)
- [29] R. Jackson, D. Rumynin and O. Zaboronski, *An approach to RAID-6 based on cyclic groups of prime order*, preprint arXiv:cs/0611109, Journal of Applied Mathematics & Information Sciences, Vol. **5** No. 3 (2011). (14 pages, O.Z's contribution: 33 per cent.)
- [30] R. Ball, C. Connaughton, T. Stein and O. Zaboronski, *Instantaneous Gelation in Smoluchowski's Coagulation Equation Revisited*, Phys.Rev.E, **84**, p. 011111 (2011); preprint arXiv:1012.4431 [cond-mat.stat-mech]; (8 pages, O.Z's contribution: 25 per cent.)
- [31] Joost W. van Honschoten, Henri W. de Jong, Wabe W. Koelmans,, T. Parnell and O. Zaboronski, *Information Storage and Retrieval for Probe Storage using Optical Diffraction Patterns*, Journal of Applied Physics, **110**, p. 104309 (2011); preprint arXiv:1104.0871 [cs.IT, cs.IR]; (14 pages, O.Z's contribution: 20 per cent.)
- [\*32] R. Tribe and O. Zaboronski, *Pfaffian formulae for one dimensional coalescing and annihilating systems*, Electronic Journal of Probability, 16, p. 2080-2103 (2011); preprint arXiv:1009.4565 [probability]; (24 pages, O.Z's contribution: 50 per cent.)
- [\*33] R. Tribe, J. Yip and O. Zaboronski, *One dimensional annihilating and coalescing particle systems as extended Pfaffian point processes*, Electronic Communications in Probability, 17, No. 40, p. 1-7 (2012); preprint arXiv:1207.0929 [probability]; (7 pages, O.Z's contribution: 33 per cent.)
- [34] R. Ball, C. Connaughton, P. Jones, R. Rajesh and O. Zaboronski, *Collective Oscillations in Irreversible Coagulation Driven by Monomer Inputs and Large-Cluster Outputs*, Phys. Rev. Lett. **109**, p. 168304 (2012); preprint arXiv:1205.4445 [cond-mat.stat-mech] (2012); (7 pages, O.Z's contribution: 20 per cent.)
- [35] Colm Connaughton, Roger Tribe, R. Rajesh and O. Zaboronski, *Non-equilibrium phase diagram for a model with coalescence, evaporation and deposition*, Submitted to Journal of Statistical Physics; preprint arXiv:1211.3576 [probability]; (26 pages, O.Z's contribution: 25 per cent.)
- [36] Roger Tribe and Oleg Zaboronski, *The Ginibre Evolution in the large-N limit*, submitted to Electronic Journal of Probability, 17; preprint arXiv:1212.6949 [probability]; (31 pages, O.Z's contribution: 50 per cent.)

### *Book Chapters*

- [1] C. Connaughton, R. Rajesh and O. Zaboronski *Reaction-diffusion Systems and Turbulence*. Published in: *Turbulence and Non-equilibrium Statistical Mechanics*, Eds. S. Nazarenko and O. Zaboronski, Cambridge University Press (2008);
- [2] C. Connaughton, R. Rajesh and O. Zaboronski *Kinetics of Cluster-Cluster Aggregation*. Published in: K. Sattler (Ed.), *Handbook of Nanophysics*, CRC Press (2010);
- [3] Marcellino Gemelli, Leon Abelmann, Johan B. C. Engelen, Mohammed G. Khatib, Wabe W. Koelmans

and Oleg Zaboronski, *Probe Storage*. Published in: Campardo, Giovanni; Tiziani, Federico; Iaculo, Massimo (Eds.), *Memory Mass Storage*, Springer (2011).

## Patents.

- [1] P. Meulemans and O. Zaboronski, *Logic circuits for performing modular multiplication and exponentiation*, UK No. 0130255.3, USA No. 10/02/27237 (2001). (O. Z.'s contribution: 50 per cent.)
- [2] O. Zaboronski, *Loop-erase maximal likelihood decoding algorithm*. U.S. application No. 10/867,216. (2003) (O. Z.'s contribution: 100 per cent.)
- [3] N. Atkinson, R. Jackson and O. Zaboronski, *Method and apparatus for an effective path metric computation in maximal likelihood decoding*. U.S. application No. 10/867,179. U.S. Publication No. 2005-0094748-A1. (2004) (O. Z.'s contribution: 33 per cent.)
- [4] S. Gratrix, R. Jackson and O. Zaboronski, *Maximum likelihood detector for data-dependent correlated noise*, U. S. application No. 60/669,429. (2005) (O. Z.'s contribution: 33 per cent. )
- [5] S. Gratrix, R. Jackson and O. Zaboronski, *Feedback-Free maximum likelihood detector for data-dependent correlated noise*, Provisional U. S. application No. 60/805,376. (2006) (O. Z.'s contribution: 33 per cent.)
- [6] T. Parnell, H. Pozidis, Oleg Zaboronski, *A Method and Apparatus for Producing the Reliability Estimates for Signals Transmitted Over a Noisy Channel*. , Provisional U. S. application No. 60975524. (2007) (O.Z.'s contribution: 33 per cent.)
- [7] T. Parnell, Oleg Zaboronski, *An Encoding and Decoding Method*, Japanese application No. No. 2009-196037 (2009) (O.Z.'s contribution: 50 per cent.)

## Industrial projects carried out at Siglead Europe: 2009 – 2012

### 1. *Information storage at nano-scales using micro-mechanical probes (In collaboration with IBM Zurich, Switzerland)*

In collaboration with IBM Zurich we developed a set of digital signal processing (DSP) algorithms for retrieving information recorded as nanometer-size indentations in polymer media using micro-mechanical probes. This work spanned 4 years and required experimental channel characterization for the noise model extraction, development of appropriate channel coding and modulation schemes and experimental validation of the complete system, see pp. 25 – 26 of the final ProTeM report for more details, <http://www.protem-fp6.org/>.

**Impact:** The stored information density of 8 Tb/in<sup>2</sup> has been achieved in a large scale write-read experiment - the current world record for any type of two-dimensional storage. The paper describing DSP algorithms, the experimental set-up and the details of the recording experiment is currently being prepared for publication.

### 2. *System level analysis of probe-based storage devices (In collaboration with IBM Zurich, Switzerland)*

Using basic Information Theory we proved that a probe-based storage device consisting of a large array of probes reading and writing information in parallel will suffer prohibitively-large probability of data recovery failure due to global positioning errors. The central part of the argument is the proof that this effect does not depend on the structure of the error correction code used, see [33] for details.

**Impact:** Owing to our theoretical results together with experimental studies of the limitations of available nano-precise positioning systems, the trust of the current research into ultra-high density probe-based storage systems has shifted in the direction of immobile readers fixed over the storage media.

### 3. *Information storage and retrieval using diffraction patterns (In collaboration with the University of Twente, Netherlands)*

During the project we developed an idea that information can be stored in purposefully engineered nano-scale irregularities of the storage media and retrieved by analyzing diffraction patterns resulting from the illumination of the media by laser light. This required a development of novel modulation, detection and coding algorithms based on basic principles of Information Theory, see [31] and pp. 6 – 8 of the final ProTeM report for more details, <http://www.protem-fp6.org/>. In particular, data detection algorithm is a non-trivial adaptation of the two-dimensional genetic sequence matching algorithm by Smith and Waterman.

**Impact:** The developed optical readout scheme has been implemented in hardware at the University of Twente and validated experimentally. Paper [31] published in the Journal of Applied Physics which gives the details of theoretical and experimental study of the algorithms has been rated as 'outstanding' by the anonymous referees. The idea of extracting the information about the nano-scale features of surfaces from the diffraction pattern has applications beyond data storage. Examples include tribology and microbiology, see p. 9 of the final ProTeM report for more details, <http://www.protem-fp6.org/>.

### 4. *Universal channel quality estimation algorithms for mass production quality control (In collaboration with Siglead Inc., Japan, Unnamed OE manufacturer, Hong-Kong, Unnamed OE Manufacturer, South Korea)*

Today's manufacturers of components for magnetic hard drives and solid state drives face a serious problem of estimating the quality of the components when inserted into a data storage channel containing Low-Density-Parity Check Error Correction Codes (LDPC's). Unlike the previous generation of Reed-Solomon-based error correction codes (ECC), there was up to now no known easily-measurable channel characteristic which is well correlated with post-LDPC probability of error. This probability is of the order of  $10^{-12}$  and is impossible



to measure directly. The application of rough quality indicators, such as pre-ECC bit error rate, has a detrimental effect on the production yield.

Generalizing the work of Shannon, Gallager, Kolmogorov and Bernstein we built a suite of fast channel estimation algorithms for post-LDPC performance estimation given only a partial knowledge of the LDPC structure.

**Impact:** These algorithms have been implemented in hardware by Siglead Japan and currently undergo a large scale evaluation by the world's largest manufacturer of magnetic read heads. Patent pending.

#### *5. Error correction codes for non-volatile storage (In collaboration with Siglead Inc., Japan)*

Modern controllers of NAND flash memory (used to store data in mobile phones, music players, laptops, ebook readers, automobile computers) traditionally use powerful Bose-Chauhuri-Hocquenghem (BCH) codes to correct errors in retrieved binary data. However, the newest samples of NAND flash memory manufactured using 20 nanometers (nm) transistor libraries prove to be too 'noisy' for even the most powerful BCH codes: under the standard operation conditions the probability of error turns out to be around  $10^{-6}$  instead of  $10^{-12}$  required by memory users.

During the project we carried out an experimental characterization of the 20 nm NAND flash memory, designed low complexity iterative error correction codes which target error events typical for this memory and verified (using a combination of experimental and theoretical methods) that these new codes achieve the target probability of error of  $10^{-12}$ .

**Impact:** These codes have been implemented in the new Siglead's flash memory controller to be taped out in June 2012. Patent pending.

## Invited Scholarly Presentations

### 1996

#### *Seminars.*

Berkeley-Davis-Stanford symplectic geometry seminar, Berkeley, January 1996. Title: *On localization of integrals over supermanifolds.* (1 hr)

### 1997

#### *Seminars*

New Members' Seminar at the IAS, Princeton, October 1997. Title: *Supersymmetry and localization.* (1 hr)

Statistical Physics Seminar at the IAS, November 1997. Title: *Asymptotic analysis of random matrix models.* (Two separate 1 hr lectures)

Analysis/PDEs Seminar at the IAS, December 1997. Title: *Normal matrix model and a multidimensional extension of KP hierarchy.* (1 hr)

### 1998

#### *Conference Lectures*

*Warwick Seminar on Random Matrices and Integrable Systems*, organized by D. Elworthy, B. Mouzikantski and O. Zeitouni. The Institute of Mathematical Sciences, Warwick, UK, November 13-17, 1998. Title: *Universality of correlations in the Normal Matrix Model.* (1 hr)

*Meeting of the European Intermittency Network*, organized by P. Tabeling. ENS, Paris, December 15-17, 1998. Title: *On singularities and intermittency in Burgers turbulence.* (20 min)

#### *Seminars*

Department of Complex Systems, Weizmann Institute of Science, Aug. 1998. Title: *On the decay of Burgers turbulence.* (1 hr)

### 1999

#### *Extended Research Programs*

*Turbulence*, program at the Isaac Newton Institute for Mathematical Sciences, Cambridge, UK, January-July 1999. Dates of participation: June 20-June 30. Title of lecture: *On the large time asymptotics of the decaying Burgers turbulence.* (1 hr)

#### *Conference Lectures*

*Conference on Random Matrices* organized by A. Its, P. Sarnak, C. Tracy, Berkeley, CA, Feb. 21-28, 1999. Title: *The universality theorems in the model of random normal matrices.* (45 min)

*Adriatico Research Conference on Non-Hermiticity and Disorder*, workshop organized by Ian Fyodorov. ITCP, Trieste, August 14-17, 1999. Title: *On the statistics of eigenvalues in the normal matrix model*. (45 min)

#### *Seminars*

Department of Mathematics, Herriot-Watt University, Edinburgh, May 1999. Topic: *On the decay of Burgers turbulence*. (1 hr)

Department of Mathematics, University of Swansea, October 1999. Title: *Intermittency of the decaying Burgers turbulence*. (1 hr)

Department of physics, University of Birmingham, November 1999. Title: *On the large time asymptotics of the decaying Burgers turbulence*. (1 hr)

### **2000**

#### *Extended Research Programs*

*Physics of Hydrodynamic Turbulence*, program at the Institute for Theoretical Physics, Santa Barbara, CA, January-June 2000. Dates of participation: April 4-May 1. Title of lecture: *Turbulence in stochastic aggregation*.

#### *Conference Lectures*

*Integrable Days at Loughborough*, conference organised by A. Veselov. Loughborough University, Jan. 2000. Title: *Integrability of normal matrix model* (1 hr).

*Meeting of the European Intermittency Network*, organized by P. Tabeling. University of Torino, Turin, Feb. 2000. Title: *Renormalisation group analysis of diffusion-limited aggregation*. (30 min)

*XIII International Congress of Mathematical Physics*, 17-22 July, Imperial College, London. Title: *On intermittency in the decaying Burgers Turbulence*. (15 min)

#### *Seminars*

Dept. of Theoretical Physics, University of Oxford, Nov. 2000. Title: *Statistical field theory of stochastic aggregation*. (1.5 hr)

### **2001**

#### *Conference Lectures*

*Warwick Symposium on Stochastic Processes and Applications*, conference organised by R. Tribe and D. Elworthy. Warwick University, July 2000. Title: *On large fluctuations in stochastic coalescence*. (1 hr).

*International Conference on Stochastic Processes*, organized by J. Norris. University of Cambridge, Cambridge, July 2001. Title: *Renormalisation group analysis of stochastic aggregation*. (30 min)

## 2002

### *Conference Lectures*

*Progress in Statistical Hydrodynamics*, conference organised by R. Chertkov and G. Eyink. Los Alamos, April 2002. Title: *Weak and not so weak turbulence in stochastic aggregation*. (20 min).

*Probabilistic Methods in Fluids*, organized by I. Davies. University of Swansea, Swansea, April 2002. Title: *Kang Redner Anomaly and intermittency of stochastic aggregation*. (40 min)

### *Extended Research Programs*

*Statistical Hydrodynamics*, program at Los Alamos National Laboratory, New Mexico, USA. July-September 2002. Dates of participation: August 15-September 15. Title of lecture course: *Statistical Field Theory of Cluster-Cluster Aggregation*. (3 hr)

## 2003

### *Seminars*

Statistical Laboratory, Cambridge University, Jan. 2003. Title: *Lee-Cardy equations an reaction-diffusion systems*. (1 hr)

Department of Mathematics, Oxford University, Feb. 2003. Title: *On the distribution of particle masses in cluster-cluster aggregation*. (1 hr)

Department of Physics, Oxford University, May 2003. Title: *Persistence properties of reaction-diffusion systems*. (1 hr)

Department of Mathematics, Warwick University, October 2003. Title: *Turbulence in cluster-cluster aggregation*. (2 hr)

### *Extended Research Programs*

*Interaction and growth in complex stochastic systems*, program at Isaac Newton Institute, Cambridge, UK. July-December 2003. Dates of participation: July 7-July 15, August 1 - August 31, November 24 - December 12. Title of the talk: *Survival probability of a test particle in a random viscous environment*. (1 hr)

## 2004

### *Seminars*

Department of Mathematics, Brunel University, Jan. 2004. Title: *Intermittency and Kolmogorov scaling in Takayasu model*. (1 hr)

### *Extended Research Programs*

*Non-equilibrium statistical mechanics and turbulence*, program at CNLS, Los-Alamos, USA. August 2004. Title of the talk: *Reaction-diffusion systems and turbulence*. (2 hrs)

## 2005

### *Invited Conference Lectures*

*DSNET UK DSP meeting*, conference organised by D. Wright. Manchester, July 2005. Title: *Read channel technology in the presence of data-dependent noise* (40 min).

### *Seminars.*

*Major Semiconductor Manufacturer, Yokohama, Japan*. March, August, November 2005. Lecture course: *'New MLD algorithms for perpendicular magnetic read channel'* (approx 30 hours).

## 2007

### *Seminars.*

*Department of Engineering, Manchester University*, March 2007. Talk: *Turbulence in cluster-cluster aggregation* (50 minutes).

### *Invited Conference Lectures*

*TMRC 2007*. Talk: *Viterbi detectors for non-Markov recording channels* (30 minutes).

*IMST 2007*. Tutorial talk: *Detection and decoding techniques for modern magnetic recording channels* (1 hour).

## 2010

### *Seminars*

International Digital Laboratory, Warwick University, March 2010. Title: *Mathematics of digital signal processing for data storage*. (1 hr)

Department of Mathematics, Brunel University, Nov. 2010. Title: *Pfaffians structures for coalescing/annihilating Brownian motions*. (1 hr)

Department of Computer Science, Warwick University, Nov. 2010. Title: *Information theory of massively parallel probe storage channels*. (1 hr)

### *Extended Research Programs*

*Stochastic Partial Differential Equations*, program at Isaac Newton Institute, Cambridge, UK. January-June 2010. Dates of participation: March 20 - April 20. August 1 - August 31, November 24 - December 12.

### **Track record of research funding.**

1. Principal Investigator: Grant No. 1117MAA from research and teaching development fund of the University of Warwick for the project "Intermittency in Burgers turbulence" (2500 GBP).
  
2. Principal Investigator: Collaborative small grant from London Mathematical Society to support the sabbatical term at the University of Oxford, 2000 (500 GBP).
  
3. Principal investigator: A contract from Royal Commission for the Exhibition of 1851 for training a PhD student, Robert Jackson, 2002 (University fees for three years plus 10,000 GBP paid to Department of Mathematics of Warwick University on completion of training.)
  
4. Principal Investigator: Collaborative small grant from London Mathematical Society to support the visit of a collaborator to Warwick, 2004 (500 GBP).
  
5. Royal Society/EPSRC Industrial Fellowship, October 2004 - September 2008. (100,000 GBP)
  
6. Co-investigator: EPSRC standard research grant GR/T05950/1 to fund 2005-2006 Warwick Turbulence Symposium. Jointly with S. Nazarenko (PI), B. Kerr and D. Barkley. (GBP 115,404)
  
7. Principal Investigator: A contract from Royal Commission for the Exhibition of 1851 for training a PhD student, Tom Parnell, 2006 (University fees for three years paid plus 10,000 GBP payable to Department of Mathematics of Warwick University on completion of training.)
  
8. Co-investigator: European FP6 network grant 'Multi-Terabit Probe Storage'. (As the leader of Siglead Europe Ltd probe storage team.) Network coordinator: Pr. David Wright (University of Exeter). Network partners: CEA (France), IBM Zurich (Switzerland), ST Microelectronics (Italy), University of Twente (Holland), Fraunhofer Institute (Germany), University of Aachen (Germany). ( EUR 5,500,000 from European Union complemented by EUR 4,000,000 from industrial partners.)
  
9. Co-investigator: EPSRC standard research grant to fund 2010-2011 Warwick Symposium on the Mathematics of Complexity Science and Systems Biology. Symposium. Jointly with R. Mackay (PI) and eight other co-investigators. (GBP 252,853)
  
10. Siglead Inc. Industry Fellowship, October 2009 - September 2012. (50% of O. Z.'s academic salary at full economic cost.)
  
11. Principal Investigator: A contract from Royal Commission for the Exhibition of 1851 for training a PhD student, Oliver Hambrey, 2010 (University fees for three years paid plus 10,000 GBP payable to Department of Mathematics of Warwick University on completion of training.)
  
12. Co-Investigator: EPSRC grant to investigate pfaffian structures in interacting particle systems (Principle investigator - Dr. Roger Tribe)