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(1) BRIEF CV

CURRENT POSITION

June 2013 – present Professor of Biological Physics, Department of Physics, Univ. of Oxford, Oxford, UK (tenured to retirement). Leading a group of ~15 biological and physical scientists (the “Gene Machines” group) who develop advanced single-molecule fluorescence imaging methods and instruments, and apply them to study mechanisms of bacterial and viral gene expression, replication, and DNA repair, and to perform rapid detection of pathogenic viruses and bacteria. Group relocated to the Kavli Institute for Nanoscience Discovery in July 2021.

EDUCATION

1999 PhD in Biological Chemistry, Rutgers University, New Brunswick, New Jersey, USA (GPA: 3.92/4.0)
1993 MSc in Food Chemistry, Rutgers University, New Brunswick, New Jersey, USA (GPA: 4.0/4.0)
1991 BSc in Chemistry, Aristotelian University, Thessaloniki, Greece (GPA: 8.75/10; highest honours)
1986 5th Lyceum of Thessaloniki, Thessaloniki, Greece (highest honours).

PROFESSIONAL EXPERIENCE

Dec 2004-May 2013 *University Lecturer in Biological Physics, Department of Physics and Fellow of St. Cross College, University of Oxford, Oxford, UK*

- Group leader of a team of 15 postdoctoral fellows and PhD students working on:
 - Studies of gene transcription and DNA replication using single-molecule fluorescence methods.
 - Development of single-molecule FRET and super-resolution imaging methods.
 - Development of single-molecule biosensing assays for detecting pathogenic viruses and antibiotic resistance
- The group is part of the Biological Physics Research Group (5 groups in total)

July 2001-Nov 2004 *Senior Research Scientist (Advisor: Prof. Shimon Weiss), Department of Chemistry and Biochemistry, University of California, Los Angeles (UCLA), USA*

- Addressed gene transcription mechanisms using single-molecule fluorescence spectroscopy.
- Developed assays for monitoring protein movements and interactions within nucleoprotein complexes.
- Co-developed and patented alternating-laser excitation of single molecules

August 2000-June 2001 *Post-doctoral Fellow (Advisor: Prof. Shimon Weiss), Department of Material Sciences and Physical Biosciences, Lawrence Berkeley National Lab, Berkeley, California, USA*

- Developed novel real-time, single-molecule fluorescence assays for the direct analysis of protein-DNA and protein-protein interactions in transcription.

November 1999-July 2000 *Post-doctoral Fellow (Advisor: Prof. Richard H. Ebright), Waksman Institute, Rutgers University, New Brunswick, New Jersey, USA*

- Developed a novel fluorescence methodology for ensemble and single-molecule fluorescence analysis of protein-DNA and protein-protein interactions in transcription.

July 1994-October 1999 *PhD Candidate (Advisor: Prof. Richard H. Ebright), Department of Chemistry, Rutgers University, New Brunswick, New Jersey, USA*

- Developed fluorescence methods and probes for the analysis of protein interactions in transcription.

February 1992-June 1994 *MSc Candidate (Advisor: Prof. Tung-Ching Lee), Department of Food Chemistry, Rutgers University, New Brunswick, New Jersey, USA*

(2) RESEARCH-RELATED INFORMATION

Publications (as of Jan 4th 2024: Hirsch Index = 50; 11269 total citations; 28 papers with >100 citations; source: Google Scholar)

1. **Kapanidis AN**, Lee TC. Heating cruciferous vegetables increases *in vitro* dialyzability of intrinsic and extrinsic iron. *J Food Sci.* 1995;60:128-131,141.
2. **Kapanidis AN**, Lee TC. A novel method for the production of color-compatible ferrous sulfate-fortified rice through extrusion. *J Ag Food Chem.* 1996;44:522-525.
3. Ling P, Ruzhitsky V, **Kapanidis AN**, Lee TC. Measuring the color of food. *Chem Tech.* 1996;23:46-53.
4. Ling P, Ruzhitsky V, **Kapanidis AN**, Lee TC. Strong correlation between Color Machine Vision and colorimeter: focus on food applications. In: Lee TC, Kim HJ, eds. *Chemical Markers for Processed and Stored Foods*. Washington, DC: ACS Press; 1996. ACS Symposium Series No. 631.
5. Lagrange T, **Kapanidis AN**, Tang H, Reinberg D, Ebright RH. New core promoter element in RNA polymerase II-dependent transcription: sequence-specific DNA binding by transcription factor IIB. *Genes Dev.* 1998;12:34-44.
6. Berk AJ, Boyer TG, **Kapanidis AN**, Ebright RH, Kobayashi NN, Horn PJ, Sullivan SM, Koop R, Surby MA, Triezenberg SJ. Mechanisms of viral activators. *Cold Spring Harbor Symposia in Quantitative Biology.* 1998;63:243-252.
7. Mukhopadhyay J*, **Kapanidis AN***, Mekler V, Kortkhonjia E, Ebright YW, Ebright RH. Translocation of σ^{70} with RNA polymerase during transcription: fluorescence resonance energy transfer assay for movement relative to DNA. *Cell.* 2001;106:453-463. *Equal contribution.
8. **Kapanidis AN**, Ebright YW, Ludescher RD, Chan S, Ebright RH. Fluorescence resonance energy transfer analysis of DNA bending induced by the catabolite gene activator protein. *J Mol Biol.* 2001;312:453-468.
9. **Kapanidis AN**, Ebright YW, Ebright RH. Site-specific incorporation of fluorescent probes into protein: hexahistidine-tag-mediated fluorescent labeling using $(\text{Ni}^{2+}:\text{Nitrilotriacetic acid})_n$ -fluorochrome conjugates. *J Am Chem Soc.* 2001;123:12123-12125.
10. Mekler V, Kortkhonjia E, Mukhopadhyay J, Knight J, Revyakin A, **Kapanidis AN**, Niu W, Ebright YW, Levy R, Ebright RH. Structural organization of RNA polymerase holoenzyme and the RNA polymerase-promoter open complex: systematic fluorescence resonance energy transfer and distance-constrained docking. *Cell.* 2002;109:1-20.
11. **Kapanidis AN**, Weiss S. Fluorescent probes and bioconjugation chemistries for single-molecule fluorescence analysis of biomolecules. *J Chem Phys.* 2002;117:10953-10964. (cited >135 times)
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13. Michalet X, **Kapanidis AN**, Laurence T, Pinaud F, Doose S, Pflughoeft M, Weiss S. The power and prospects of fluorescence microscopies and spectroscopies. *Annu Rev Biophys Biomol Struct.* 2003;32:161-182.
14. Laurence T, **Kapanidis AN**, Kong X, Chemla D, Weiss S. Photon Arrival-time Distribution analysis: a novel tool for analysis of interactions. *J Phys Chem B,* 2004;108: 3051-67. (cited >65 times)
15. Trottier C, Davies M, Wabuyele M, Soper SA, **Kapanidis AN**, Lacoste T, Weiss S. Single-photon counting technology for single-molecule detection in biotechnology. *Pharmagenomics,* 2004;4: 25-34.
16. **Kapanidis AN***, Lee NK*, Laurence T, Doose S, Margeat E, Weiss S. Fluorescence-aided molecule sorting: analysis of structure and interactions by alternating-laser excitation of single molecules. *Proc Natl Acad Sci.* 2004;101: 8936-41. *Equal contribution. Article was highlighted in *Chem & Eng News*, 2004, 82, 30; in *Nat Biotech*, 2004, 22, 831; and in *Biophotonics Intl* 2004, 11(8) 57-60.
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18. **Kapanidis AN**, Laurence T, Lee NK, Margeat E, Kong X, Weiss S. Alternating-laser excitation of single molecules. *Acc Chem Res,* 2005, 38, 523-33.
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122. Hickman SJ, Miller H, Bukys A, **Kapanidis AN**, Berks BC. Aberrant Topologies of Bacterial Membrane Proteins Revealed by High Sensitivity Fluorescence Labelling. *J Mol Bio* 2023, Nov 15;436(2):168368. doi: 10.1016/j.jmb.2023.168368.
123. El Sayyed H, Pambos O, Stracy M, Gottesman M, **Kapanidis AN**. Single-molecule tracking reveals the functional allocation, in vivo interactions and spatial organization of universal transcription factor NusG. bioRxiv 2022. doi: <https://doi.org/10.1101/2022.11.21.517430> (*Molecular Cell* 2024, in press).
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129. Montserrat Pagès A, Kummerlin M, **Kapanidis AN**, Spasic D, and Lammertyn J. Single-molecule imaging to unravel the functional diversity of DNA enzymes using the 10-23 DNAzyme as a model case. In preparation.
130. Bauer D, Plochowitz A, Dulin D, Malinen A, Bakermans J, Kaller M, **Kapanidis AN**. Sequence-encoded pause signals modulate initial transcription in bacteria. (*Mol Cell*, under revision).
131. Majumder A, **Kapanidis AN**. Single molecule study of promoter melting intermediates reveal alternate pathways to open complex formation (in preparation).

Patents

1. US Patent 7456954 on "Modulated excitation fluorescence analysis". Issued on November 25, 2008
2. US priority application on "Periodic acceptor excitation spectroscopy". UCLA Case No. 2007-197, September 2006.
3. UK priority application, entitled "Dual fluorophore sensors", filing number 0721340.8, October 2007.
4. UK priority application, entitled "Polymerase-based single-molecule sequencing", October 2007; PCT application, PCT/GB08/003669, entitled "Polymerase-based single-molecule sequencing", October 2008 (30/10/08).
5. PCT application PCT/GB2008/000488 on "DNA-Based Biosensors", February 2008 (12/2/08).

6. UK priority application, entitled "Biosensor", filing number 1002924.7, February 2010 (22/2/10).
7. UK priority application, entitled "Compact microscope", filing number GB1318919.6, October 2013 (25/10/13); PCT application, entitled "Compact microscope", filing number PCT/IB2014/065639, October 2014 (27/10/14).
8. UK priority application, entitled "Compact microscope", filing number F11123GB03, 24/4/2015.
9. UK priority application, entitled "Single-molecule phenotyping and sequencing of nucleic acid molecules", filing number GB1714748.9, Sept 2017; PCT application, PCT/GB2018/052598. Sept 2018.
10. UK priority application on viral particle sensing, entitled "Method", filing number GB1817802.0, Oct 2018. PCT application PCT/GB2019/053073, 30/10/19.

Training record (since 2005)

- 26 post-doctoral fellows and 33 PhD students (13 of which became academic group leaders; 5 are entrepreneurs).
- >20 visitors and >30 MSc students
- mentored two 5-year fellows.

Entrepreneurship. The senior academic co-founder, and former consultant and non-executive director (2016-2018) for Oxford Nanoimaging (ONI), a spin-out from the University of Oxford. Founded in Feb 2016 and based in Oxford, ONI designs, manufactures, and supports high-end desktop microscopes, software and reagents for single-molecule imaging and super-resolution microscopy. The company (www.oxfordni.com) currently has ~200 employees, and substantial sales of microscopes, services and reagents worldwide.

Invited Talks. Gave ~180 talks in the past 20 years (~10 per year).

Honors And Awards

- 1990 Undergraduate Scholarship for Academic Excellence, State Scholarship Foundation, Greece
- 1991 Valedictorian of the Applied Sciences School, Aristotelian Univ. of Thessaloniki, Greece
- 1991 4-Year Fellowship for Graduate Studies, State Scholarship Foundation, Athens, Greece
- 1993 Certificate of Merit for Academic Excellence, Institute of Food Technologists, Chicago, Illinois, USA
- 1996 Dr. F. Valergakis Graduate Research Grant, Hellenic University Club of New York, New York, USA
- 1996 Grant-in-Aid of Research, Sigma Xi, the Scientific Research Society, North Carolina
- 1996 Dr. Lantzounis Summer Graduate Research Grant, Hellenic Medical Society of New York, New York
- 1996 Dr. Rieman Teaching Excellence Award, Dept. of Chemistry, Rutgers U., New Jersey
- 1998 Dr. S. & F. Mandeles Graduate Research Award, Rutgers U., New Brunswick, New Jersey
- 2003 Travel grant for attending the 2nd Aspen Conference on Single-molecule Biophysics
- 2003 Post-doctoral Seminar Award, Dept. of Chemistry and Biochemistry, UCLA, Los Angeles
- 2005 Marie Curie International Reintegration Award, EU
- 2010 European research council (ERC) fellow (starter grant, consolidator category)
- 2013 Promotion of an Oxford Professorship
- 2016 Invited talk in the Biological Fluorescence subgroup of US Biophysical Society, Los Angeles.
- 2016 Wellcome Trust Investigatorship
- 2017 Impact award, University of Oxford
- 2017 Finalist for the BBSRC Innovator of the year Award
- 2019 Winner of Commercial Impact Award in the Innovator of the year BBSRC competition
- 2019 Winner of Overall Award in the Innovator of the year BBSRC competition
- 2020 Highly commended project for Commercial Innovation, University of Oxford
- 2020 Co-Director for the Programme in Antimicrobial Resistance Testing, Oxford Martin School, Oxford.
- 2023 Wellcome Discovery Award

Oxford University administration

- EPSRC Impact Acceleration Account Steering Group members (since 2018)
- Deputy Director for the Kavli Institute of Nanoscience Discovery (since 2021)
- Member of the Electoral Board for the Alexander Mosley Chair in Biological Physics (since 2020)

Conference Organising

- Organizer of the "UK RNA polymerase workshop" at Oxford (80 participants; March 2012)
- Academic co-organiser of the international conference "Machines on Genes" (a Biochemical Society Harden Conference with 130 participants; August 2012)
- Lead academic co-organiser of the international conference "Single-molecule bacteriology" (a Biochemical Society Harden Conference with 102 participants; September 2018)
- Co-Organizer of the "UK RNA polymerase workshop" at Oxford (80 participants; April 2019)

- Co-organizer of the “Physics Meets Biology” meeting at Oxford (~80 participants; Sept 2019)
- Lead Co-Organiser of Early Career Researcher Workshop in Biophysics, Biological Physics Group of the UK Institute of Physics (online 1-day meeting, ~100 registrations, 50-55 attendees throughout the day; Dec 2020)
- Lead academic co-organiser of Early Career Workshop on “Single-molecule bacteriology”, a Biochemical Society event, July 2021
- Lead academic co-organiser of the international conference “Single-molecule bacteriology II” (a Biochemical Society Harden Conference; 92 participants, July 2022)
- *Co-organizer of the “UK RNA polymerase workshop” at Oxford (~80 participants; March 2024)*

UK-wide administration

- Member of the Facility Access Panel, Central Laser Facility, Research Complex at Harwell, STFC Rutherford Appleton Laboratory (2011 - 2014)
- Panel member on the Wellcome Trust committee on Biomedical Resources and Technology Development (2016-2021).
- Member of the Pool of Experts, UK BBSRC (since 2017)
- Associate Member of the Nucleic Acids Group committee of the Royal Society of Chemistry (since 2011)
- Member of the Biological Physics Group committee of the Institute of Physics (2018-2021)

Professional affiliations

Society of Greek Chemists (1991-2000), American Association of University Professors (1994-2000), American Chemical Society (1997-2017), American Association for the Advancement of Science (1999-2001), Biophysical Society (1999-present), Federation of American Societies of Experimental Biology (1999-2017), UK Biochemical Society (2009-present), UK Institute of Physics (2018-present).

Editorial, examining, and reviewing activities

Editor for *Scientific Reports* (2014-2021) and *Journal of Molecular Biology* (2016-2023)

Advisory Board member for the FRET community group of researchers (2020-present; elected)

Reviewer for many journals including: *Science*, *Nature*, *Nature Structural Molecular Biology*, *PNAS*, *Molecular Cell*, *Physical Review Letters*, *Nature Methods*, *Nature Biotech*, *Nature Communications*, *eLife*, *ChemPhysChem*, *Chemical Reviews*, *Biophysical Journal*, *Biochemistry*, *Journal of Molecular Biology*, *Nucleic Acids Research*, *Proteins*.

Reviewer for the UK Engineering and Physical Sciences Research Council (EPSRC), Biotechnology and Biological Sciences Research Council (BBSRC), the Medical Research Council (MRC), the Wellcome Trust, the French National Research Agency (ANR), the Swiss National Science Foundation (SNSF), the Research Commission of EPFL (Switzerland), the Dutch Organization for Scientific Research (NOW), the Greek Ministry of Education, the European Research Council (ERC Starter, Consolidator, and Advanced grants), and the Wallenberg Foundation (Sweden).

External examiner for DPhil candidates in Oxford (UK), Cambridge (UK), Southampton (UK), UCL (UK), Imperial (UK), Leiden (Netherlands), Aarhus (Denmark), Montpellier (France), Uppsala (Sweden), Delft (Netherlands), Tampere (Finland), Zurich (Switzerland), Copenhagen (Denmark).

External reviewer of the Structural and Computational Unit of EMBL (European Molecular Biology Laboratory) at Heidelberg, Germany (May 2014).

Panel member for the National French Agency (2014), and the French ATIP-Avenir program (CNRS program for selecting young group leaders; 2015).

External evaluator for Estonian Centers of Excellence (2015)

Grant funding (2016 onwards)

- MRC grant MR/N010744/1 “Single-molecule analysis of influenza virus transcription and replication” (AK: budget: ~£400k; Co-PI: Ervin Fodor, Dunn School of Pathology), 1/2/2016 – 31/1/2019, £420,000

- Wellcome Trust Investigatorship 110164/Z/15/Z “Molecular mechanisms and regulation of bacterial transcription in vivo”, 24/2/2016 – 30/6/2023, £1,600,000
- BBSRC grant BB/N01s8656/1, “Interplay of bacterial transcription and chromosome organisation in vivo”, 1/7/2016 – 30/6/2019, £392,925
- BBSRC grant BB/S008896/1, “Single-molecule analysis of double-stranded DNA break repair in living bacteria”, 1/4/2019 – 31/3/2022, £377,00 (part of an AK-led consortium with Edinburgh and Bristol, with additional budget of £380,000)
- Oxford Martin School, “Single-Cell Imaging for Rapid Antimicrobial Resistance Testing in the Clinic”, 1/3/2021-31/4/2024, £ 907,210 (an AK-led collaboration with colleagues at John Radcliffe Hospital and Big Data Institute; Oxford Physics component: £554k)
- COVID-19 Oxford Research Response Fund, grant 0009324, “Next-generation viral testing: rapid detection of SARS-CoV-2 and characterization of its interactions with antibodies and drugs for clinical diagnostics and therapeutics”, 1/6/2020-30/11/2020, £99,016 (an AK-led consortium of 4 labs from Physics and Engineering; Oxford Physics component [Kapanidis/Riede] ~£60k)
- BBSRC grant BB/V001868/1, “High-throughput single-molecule analysis of the influenza A genome structure and assembly” 1/4/2019 – 31/3/2022, £ 434,943 (AK budget ~£400k; collaboration with Dunn School of Pathology).
- Wellcome Trust Discovery Award, “Mechanisms of complex transcriptional processes and assemblies in bacteria”, 1/7/2023-30/6/2031, £3,042,794
- BBSRC grant BB/X015637/1, “Single-molecule analysis of transcription-elongation regulation mechanisms in living bacteria” 1/12/2023 – 30/11/2026, £491,763