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(1) BRIEF CV

CURRENT POSITION

December 2004 – present University Lecturer in Biological Physics, Department of Physics, Univ. of Oxford, Oxford, UK (tenured to retirement)

EDUCATION

PhD in Biological Chemistry, Rutgers University, New Brunswick, New Jersey, USA (GPA: 3.92/4.0)

MSc in Food Chemistry, Rutgers University, New Brunswick, New Jersey, USA (GPA: 4.0/4.0)

BSc in Chemistry, Aristotelian University of Thessaloniki, Thessaloniki, Greece (GPA: 8.75/10; highest honours)

PROFESSIONAL EXPERIENCE

2005 - University Lecturer in Biological Physics, Department of Physics and Fellow of St. Cross College, University of Oxford, Oxford, UK

- Group leader of a team (4 postdoctoral fellows, 11 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 proteins and DNA.
- The group is part of the Biological Physics Research Group (7 groups in total)

2001 - 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 motions and interactions within nucleoprotein complexes.
- Co-developed and patented alternating-laser excitation of single molecules

2000 - 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.

1995 - 2000 PhD Candidate (Advisor: Prof. Richard H. Ebright), Department of Chemistry, Rutgers University, New Brunswick, New Jersey, USA

- Developed fluorescence methods and probes for the ensemble and single-molecule analysis of protein-DNA and protein-protein interactions in transcription.

1993- 1994 MSc Candidate (Advisor: Prof. Tung-Ching Lee), Department of Food Chemistry, Rutgers University, New Brunswick, New Jersey, USA

- Developed strategies for increasing the bioavailable iron in foods.

(2) RESEARCH-RELATED INFORMATION (***: important papers)

Publications (Hirsch Index = 19; citations as of Dec 20, 2012)

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. ***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. (cited 217 times)
5. 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.
6. 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. (cited >90 times)
7. **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. (cited 35 times)
8. **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. (cited >90 times)
9. 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. (cited 150 times)
10. **Kapanidis AN**, Weiss S. Fluorescent probes and bioconjugation chemistries for single-molecule fluorescence analysis of biomolecules. *J Chem Phys.* 2002;117:10953-10964. (cited >65 times)
11. 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. (cited >120 times)
12. 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 >40 times)
13. 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.
14. ****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. (cited >187 times)
15. Lee NK*, **Kapanidis AN***, Michalet X, Mukhopadhyay J, Ebright RH, Weiss S. Accurate FRET measurements within single diffusing biomolecules using alternating-laser excitation. *Biophys J*, 2005, 88, 2939-2953. *Equal contribution. (cited >130 times)
16. **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. (cited >75 times)
17. ****Kapanidis AN**, Margeat E, Laurence T, Doose S, Ho SO, Mukhopadhyay J, Kortkhonjia E, Ebright RH, Weiss S. Retention of transcription initiation factor σ^{70} in transcription elongation: single-molecule analysis. *Mol Cell*, 2005, 20, 347-56. Highlighted in "Single RNA polymerases on the stage", *Nat Meth*, 2006, 3, 3. (cited 56 times)
18. Margeat E, **Kapanidis AN**, Tinnefeld P, Wang Y, Mukhopadhyay J, Ebright RH, Weiss S. Direct observation of promoter escape and abortive initiation in single immobilized transcription complexes. *Biophys J*, 2006, 90, 1419-31. (cited 48 times)
19. ****Kapanidis AN**, Margeat E, Ho SO, Kortkhonjia E, Weiss S, Ebright RH. Initial transcription by RNA polymerase proceeds through a DNA-scrunching mechanism. *Science*, 2006, 314, 1144-7. See also related Perspective in *Science* 2006, 314, 1097-8. (cited >130 times)
20. Lee NK, **Kapanidis AN**, Koh HR, Wang Y, Ho SO, Kim Y, Gassman N, Kim SK, and Weiss S. Three-color alternating-laser excitation of single molecules: monitoring multiple interactions and distances. *Biophys J*, 2007, 92, 303-12. (cited 74 times)
21. Doose S, Heilemann M, Michalet X, Weiss S, **Kapanidis AN**. Periodic acceptor excitation spectroscopy of single molecules. *Eur Biophys J*, 2007, 36, 669-74.

22. Heilemann M, Lympereopoulos K, Wigneshweraraj S, Buck M, **Kapanidis AN**. Single-molecule studies of sigma54-dependent transcription. *Proceedings of SPIE-The Intl Soc for Optical Eng* 2007, 6633, 6632K.
23. Harding PJ, Attrill H, Ross S, Koeppe JR, **Kapanidis AN**, Watts A. Neurotensin Receptor Type 1: *E.coli* expression, purification, characterisation and biophysical study. *Biochem Soc Trans*, 2007, 35, 760-3. ([cited 17 times](#))
24. Goodman R, Heilemann M, Dose S, Erben C, **Kapanidis AN**, Turberfield AJ. Reconfigurable, braced, three-dimensional DNA nanostructures. *Nature Nanotech*, 2008, 3, 93-6. ([cited 79 times](#))
25. Santoso Y, Hwang L, Le Reste L, **Kapanidis AN**. Red light, green light: probing single molecules using alternating laser excitation. *Biochem Soc Trans*, 2008, 36:738-44.
26. **Kapanidis AN**, Strick T. Biology, one molecule at a time. *Trends in Biochem Sci*, 2009, 34, 234-43. ([cited 40 times](#))
27. Goodman R, Erben C, Malo J, Ho W-M, **Kapanidis AN**, Turberfield AJ. A facile method for reversibly linking recombinant proteins to DNA. *ChemBiochem*, 2009, 10, 1551-7. ([cited >15 times](#))
28. Carstairs HM, Lympereopoulos K, **Kapanidis AN**, Bath J, Turberfield A. DNA monofunctionalisation of quantum dots. *ChemBiochem*, 2009, 10, 1781-3. ([cited 7 times](#))
29. Santoso Y, and **Kapanidis AN**. Probing biomolecular structures and dynamics of single molecules using in-gel alternating-laser excitation. *Anal Chem*, 2009, 81, 9561-70. ([cited 6 times](#))
30. ****Santoso Y, Joyce C, Potapova O, Le Reste L, Hohlbein J, Torella JP, Grindley N, Kapanidis AN.** Conformational changes in DNA polymerase I revealed by single-molecule FRET. *Proc Natl Acad Sci.*, 2010, 107, 715-20. ([cited 50 times](#))
31. Lympereopoulos K, Crawford R, J Torella, Heilemann M, Hwang L, Holden S, **Kapanidis AN**. Single-molecule DNA biosensors for transcription factor and ligand detection, *Angewandte Chemie*, 2010, 49, 1316-1320. ([cited 7 times](#))
32. Santoso Y, Torella JP, **Kapanidis AN**. Characterizing single-molecule FRET dynamics using probability distribution analysis, *ChemPhysChem*, 2010, 11, 2209-19. ([cited 9 times](#))
33. Hohlbein J, Gryte K, Heilemann M, **Kapanidis AN**. Surfing on a new wave of single-molecule fluorescence methods. *Physical Biology*, 2010, 7, 031001. ([cited 13 times](#))
34. ****Uphoff S, Holden SH, Le Reste L, van der Linde S, Heilemann M, Kapanidis AN.** Using single-molecule photoswitching to measure multiple distances within a single molecule. *Nature Methods*, 2010, 7, 831-6. Highlighted by *Chemical Engineering News*, 2010, 88, 7, 26-27; *Nature Chemical Biology*, 2010, 6, 790-1; and *Biotechniques* 2010, 49(6), 875-8. ([cited 14 times](#))
35. Holden SJ, Uphoff S, Hohlbein J, Yadin D, Le Reste L, Britton OJ, **Kapanidis AN**. Defining the limits of single-molecule FRET resolution in TIRF microscopy. *Biophysical Journal*, 2010, 99, 3102-11. ([cited 7 times](#))
36. Cordes T, Santoso Y, Tomescu AI, Gryte K, Hwang LC, Camara B, Wigneshweraraj S, **Kapanidis AN**. Sensing DNA opening in transcription using quencher FRET. *Biochemistry*, 2010, 49, 9171-80. ([cited 4 times](#))
37. Torella JP, Hohlbein J, Santoso Y, Holden S, **Kapanidis AN**. Identifying molecular dynamics in single-molecule FRET experiments with burst variance analysis. *Biophysical Journal*, 2011, 100, 1568-77. ([cited 6 times](#))
38. Uphoff S, Gryte K, Evans G, **Kapanidis AN**. High temporal resolution and linked hidden Markov modeling for switchable single-molecule FRET. *ChemPhysChem*, 2011, 12, 571-9.
39. ****Holden SJ, Uphoff S, Kapanidis AN.** DAOSTORM: an algorithm for high-density super-resolution microscopy, *Nature Methods*, 2011, 8, 279-80. ([cited 24 times](#))
40. Crawford R, Kelly D, **Kapanidis AN**. A protein sensor that relies on the bending of single DNA molecules. *ChemPhysChem*, 2012, 13, 918-22.
41. **Kapanidis AN** and Crawford R. Colorful Molecular Diagnostics. *Clin Chem*, 2012, 58, 659-60.
42. Le Reste L, Hohlbein J, **Kapanidis AN**. Characterization of dark quencher chromophores as non-fluorescent acceptors for single-molecule FRET. *Biophysical Journal*, 2012, 102, 2658-8.
43. Finan K, Torella JP, **Kapanidis AN**, Cook PR. T7 RNA polymerase functions in vitro without clustering. *PLoS One*, 2012, 7, e40207.
44. Pinkney J, Zawadzki P, Mazuryk J, Arciszewska LK, Sherratt D, **Kapanidis AN**. Capturing reaction paths and intermediates in Cre-*loxP* recombination using single-molecule fluorescence. *PNAS*, 2012, doi: 10.1073/pnas.1211922109. Highlighted by *PNAS*, Nov 30, 2012, doi:10.1073/pnas.1218768110
45. Craggs TD and **Kapanidis AN**. Six steps closer to FRET-driven structural biology. *Nature Methods*, 2012, 9, 1157-8.
46. Crawford R, Erben CM, Brown T, Turberfield AJ, **Kapanidis AN**. Non-covalent single transcription factor inside a DNA cage. *Angewandte Chemie*, 2013, in press.
47. Robb N, Cordes T, Hwang LC, Gryte K, Duchi D, Craggs T, Santoso Y, Weiss S, Ebricht RH, **Kapanidis AN**. The transcription bubble of the RNA polymerase-promoter open complex exhibits conformational

heterogeneity and millisecond-scale dynamics: implications for transcription start-site selection. *J Mol Biol*, 2013, in press.

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.
5. PCT application PCT/GB2008/000488 on "DNA-Based Biosensors", February 2008 (12/2/08).
6. PCT application, PCT/GB08/003669, entitled "Polymerase-based single-molecule sequencing", October 2008 (30/10/08).
7. UK priority application, entitled "Biosensor", filing number 1002924.7, February 2010 (22/2/10).

Thesis And Book Chapters: 9 (from 1994-2009)

1. **Kapanidis AN**. *In vitro* iron bioavailability of three raw and processed cruciferous vegetables. MSc thesis. New Brunswick, New Jersey: Rutgers Univ.; 1994.
2. 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.
3. **Kapanidis AN**. Fluorescence resonance energy transfer (FRET) studies of DNA bending induced by the *Escherichia coli* catabolite activator protein (CAP). PhD thesis. New Brunswick, New Jersey: Rutgers Univ.; 1999.
4. Mukhopadhyay J, Mekler V, Kortkhonjia E, **Kapanidis AN**, Ebricht, YW, Ebricht RH. Fluorescence resonance energy transfer (FRET) in analysis of transcription-complex structure and function. In: Adhya S, ed. *RNA Polymerases and Associated Factors, Part D. Methods in Enzymology*. 2003;37: 144-59.
5. **Kapanidis AN**, Heilemann, Margeat E, Kong X, Nir E, Weiss S. Alternating-laser excitation of single molecules. Chapter 5 in "Single-molecule techniques: a laboratory manual", CSHL Press, Cold Spring Harbor, NY (Paul Selvin and Taekjip Ha, eds). 2008; 85-119.
6. Heilemann M, Hwang LC, Lymperopoulos K, **Kapanidis AN**. Single-molecule FRET analysis of protein-DNA complexes. In: Moss T, ed. *"DNA-protein interactions: principles and protocols"*, 3rd edition. 2008.
7. **Kapanidis AN** and Weiss S. Single-molecule fluorescence analysis of RNA polymerase function. Chapter 5 in "RNA polymerases as Molecular Motors", Royal Society of Chemistry, (Henri Buc and Terence Strick, eds.); 2009.
8. Hwang L, Hohlbein J, Holden S, **Kapanidis AN**. Single-Molecule Studies by Fluorescence Resonance Energy Transfer. Chapter 5 in "Handbook of single-molecule biophysics", Springer-Verlag, (Peter Hinterdorfer and Antoine van Oijen, eds.); 2009.
9. Holden S, **Kapanidis AN**. Alternating-laser excitation and pulsed interleaved excitation. Chapter 6 in "Single Particle Tracking and Single Molecule Energy Transfer: Applications in the Bio and Nano Sciences", Springer-Verlag, (C Bräuchle, J Michaelis and D C. Lamb, eds.); 2009.

Invited Talks: have given ~100 invited talks worldwide.

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).

UK-wide administration

- Member of the Facility Access Panel, Central Laser Facility, Research Complex at Harwell, STFC Rutherford Appleton Laboratory (since 2011)
- Member of the committee of the Nucleic Acids Group of the Royal Society of Chemistry
- 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 meeting with 130 participants; August 2012)

Professional affiliations

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

Editorial and reviewing activities

Reviewer for many journals including: *Science*, *Nature*, *Physical Review Letters*, *Nature Methods*, *ChemPhysChem*, *Biophysical Journal*, *Biochemistry*, *Journal of Molecular Biology*, *Nucleic Acids Research*; 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 Research Commission of EPFL (Switzerland), the Greek Ministry of Education, and the European Research Council (ERC).