

Christoforos Nikolaou



Assistant Professor of Bioinformatics, Department of Biology,
University of Crete
Affiliated Researcher, IMBB-FORTH, Heraklion, Crete

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facebook: <https://www.facebook.com/cg2uoc/>
twitter: <https://twitter.com/guilderstern>

PERSONAL INFORMATION

Date of Birth: February 21st, 1978
Citizenship: Greek

EDUCATION

2005, PhD in Biology

Department of Biology, National and Kapodistrian University of Athens, Athens, Attica, Greece
Thesis: "Study and Quantification of non-randomness in genomic sequences at various length scales and in relation to their functional role"
<http://dx.doi.org/10.12681/eadd/23869>

2000, MSc in Journalism

NY College (Greek Branch), Athens, Greece

1999, BSc in Chemistry

Department of Chemistry, University of Patras, Patras, Achaia, Greece

POSITIONS

January 2018-present

Affiliated Researcher

Institute of Molecular Biology and Biotechnology, FORTH, Heraklion, Greece

February 2014-present

Assistant Professor of Bioinformatics

Department of Biology, University of Crete Department of Biology, Heraklion, Greece

January 2012-January 2014

Post-doctoral Fellow

Biomedical Sciences Research Center "Alexander Fleming", Athens, Greece

January 2010-December 2014

Course Instructor

Department of Biology, University of Crete Department of Biology, Heraklion, Greece

April 2010-December 2011

Post-doctoral Fellow

Institute of Biology, National Centre for Scientific Research "Demokritos", Athens, Greece

May 2007-July 2007

Visiting Fellow

Department of Chemistry, Boston University (BU), Boston, MA, USA

January 2006-April 2009

Post-doctoral Fellow

Bioinformatics and Genomics Group, Centre de Regulació Genòmica (CRG), Barcelona, Catalunya, Spain

October 2010-December 2005

PhD Fellow

Institute of Biology, National Centre for Scientific Research "Demokritos", Athens, Greece

RESEARCH

Originally trained in Biochemistry, I moved to Theoretical Biology during my PhD. My expertise lies in the fields of *Computational Genomics, Chromatin Structure* and *Gene Regulation*.

My principal research interests are related to chromatin structure and genome architecture and evolution and how they may shape gene regulation programs. Among my main contributions are:

- The discovery of [a link between nucleosome positioning preferences and exon definition](#), which directly suggested the existence of co-transcriptional splicing.
- A [model for statistical nucleosome positioning](#), according to which only a small subset of a genome's nucleosomes are guided by intricate structural constraints in the underlying DNA sequence.
- Aspects of genome architecture in [prokaryotic](#) and [eukaryotic](#) (yeast) genomes that point towards underlying principles that link genome evolution, the spacing and orientation of genes with the processes of DNA replication and gene transcription.

My current research activities are focused on the study of genome structure at two levels:

1. The discovery and quantification of structural constraints in the genomic sequence of eukaryotes. By structural constraints we define features of the primary sequence that are conserved through evolution without necessarily being maintained in the nucleotide composition. Such ["hidden" structural conservation](#) may form the basis of sequence-dependent properties that link the genetic to the epigenetic level.

2. The evolution of genome architecture in one and three dimensions. In particular, the way the order, orientation and spatial clustering of genes, promoters, enhancers etc is shaped through evolution and how this "segregation" of genomic elements may reflect the organization of the genome in a way that couples homeostasis with the ability to respond to external

stimuli. Regarding the latter, we are actively studying [changes in the one- and three-dimensional positions of deregulated genes in pathological conditions](#).

MEMBER OF

Secretary of the Hellenic Society for Computational Biology and Bioinformatics
Deputy Representative for the University of Crete - ELIXIR Greek Node

TEACHING

Undergraduate

- Computational Biology: Biology Dept, University of Crete, (<https://sites.google.com/site/uocomputationalbiology/>)
- Introduction to Programming: Biology Dept, University of Crete, (<https://sites.google.com/site/uocintroprogramming/>)
- Biological Databases: Biology Dept, University of Crete, (<https://sites.google.com/site/pcuseanddb/>)

Graduate

- Algorithms in Bioinformatics: MSc in “Bioinformatics”, University of Crete, (<https://sites.google.com/site/uocdataanalysis/lectures/algorithms-in-bioinformatics>)
- Introduction to Bioinformatics: MSc in “Molecular Biology and Biomedicine”, University of Crete, (<https://sites.google.com/site/uocdataanalysis/lectures/ngs-data-analysis>)
- Introduction to Bioinformatics: MSc in “Protein Biotechnology”, University of Crete, (<https://sites.google.com/site/uocdataanalysis/lectures/ngs-data-analysis>)
- Bioinformatics Analyses in Biomedicine: MSc in “Molecular Biomedicine”, University of Athens (<https://sites.google.com/site/uocdataanalysis/lectures/mobiomedclass>)
- Data Analysis: MSc in “Management of Environmental Resources”, University of Crete (<https://sites.google.com/site/uocdataanalysis/lectures/data-analysis-with-r>)
- Systems Biology: MSc in “Systems Biology”, Agricultural University of Athens (<https://sites.google.com/site/uocdataanalysis/lectures/genome-structure-and-architecture>)

Books/Publications

Υπολογιστική Βιολογία. (2015) Νικολάου Χ, Χουβαρδάς Π., [ηλεκτρ. βιβλ.] Αθήνα:Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών. ISBN:978-960-603-124-3. (Greek)
<http://hdl.handle.net/11419/1577>

ADMINISTRATIVE

- Erasmus Academic Coordinator for the Biology Department (since 2016)
- Coordinator of the Course Evaluation Committee for the Biology Department (since 2014)
- Coordinator of the Committee for Computational and Network Resources
- Member of the Selection Committees for the MSc Programs in:
 - Molecular Biology & Biomedicine
 - Protein Biotechnology
 - Bioinformatics

LANGUAGES

Fluent in Greek (mother tongue), English, Spanish
Very Good French
Good German

MENTORING

Have supervised >10 undergraduate theses
Have supervised 2 post-graduate theses
Currently supervising 3 PhD students:

- Stylianos Mavropoulos
- Dimitrios Konstantopoulos
- Panagiotis Chouvardas (joint supervision with G. Kollias)

<http://computational-genomics-uoc.weebly.com/group-members.html>

SOCIAL OUTREACH

Website: <http://computational-genomics-uoc.weebly.com>
Personal Blog: <http://computational-genomics-uoc.weebly.com/blog>
twitter: <https://twitter.com/guilderstern>
facebook: <https://www.facebook.com/cg2uoc>

AWARDS SCHOLARSHIPS

May 2000: Scholarship from the Greek National Institute of Scholarships for an MSc Thesis on "Applied Biochemistry-Biotechnology" (was not used)

September 2000: Student Scholarship from the National Research Center for Physical Sciences "Demokritos" for the preparation of a Doctoral Thesis

October 2002: Assistance Grant from the Greek Society for Biochemistry and Molecular Biology for contributing in the 54th Annual Conference of the Society

February 2004: "Akougiounoglou" Award for exceptional student progress, Institute of Biology, NRCPS "Demokritos"

July 2004: Assistance grant from the Onassis Foundation for attendance of the Onassis Foundation Science Lecture Series 2004 on "Genomics, Bioinformatics and Beyond" FORTH, Heraklion, Greece.

September 2005: Assistance Grant for contributing in the 5th

INVITED TALKS

European Conference on Computational Biology

June 2007: "Predicting nucleosome positions from the primary DNA sequence", Chemistry Department, Boston University, MA, USA (host: Dr Zhiping Weng)

October 2007: "Nucleosome Positioning controls gene expression in eukaryotes", Laboratoire de Biométrie et Biologie Évolutive, Lyon, France (host: Dr. Jean Lobry)

October 2009: "Spatial and structural properties of nucleosome positions in the genome of *S. cerevisiae*". 60th Meeting of the Hellenic Society of Biochemistry and Molecular Biology, Athens, Greece

May 2010: "Exon definition through chromatin. A structural code for gene regulation in higher eukaryotes". BRFAA, Athens, Greece (host: Dr. Dimitris Thanos)

October 2010: "Chromatin Landscapes in Eukaryotic Genomes", Dept. of Biology, University of Crete. (host: Prof. Michalis Kokkinidis)

July 2011: "Ultra-conserved sequence analysis through the application of N-Gram Graphs", Summer School 2011, National Research Center "Demokritos", July 2011 (host: Dr. Giorgos Paliouras)

May 2012: "From DNA structure to the organization of the eukaryotic nucleus. Topological domains in the genome of *S. cerevisiae*", Dept. of Biology, University of Athens, May 2012 (host: Prof. George Diallinas)

May 2012: "Chromatin-mediated co-transcriptional splicing in the human genome", TheRALeAD Meeting, Athens, Greece (host: Dr. George Kollias)

July 2014: "Topological aspects of genome architecture in *S. cerevisiae*", IMBB, FORTH Seminar Series (host: Dr. Babis Spilianakis)

November 2016: "Bioinformatics Applications in the Study of Cancer", Conference on Clinical and Translational Oncology. Heraklion, Crete

October 2016: "Analyzing different cancer types with functional-topological bipartite networks", Cancer and Biosciences Conference, Athens, Greece.

November 2017: "Topological-functional gene networks in the elucidation of cancer subtypes", Conference of Clinical and Translational Oncology. Heraklion, Crete

November 2017: "Invisible Cities: Segregated domains in the genome of eukaryote with distinct functional and structural properties". Young Scientists Symposium of the 68th Annual Meeting of the Greek Society of Biochemistry and Molecular Biology, Athens, Greece

December 2017: "Chromatin Structure and Transcriptional Activity shaping Genomic Landscapes in Eukaryotes", IMBB, FORTH Seminar Series (host: Dr. Iannis Talianidis)

PUBLICATIONS

Peer-reviewed articles: 26

As first author: 9

PUBLICATION STATISTICS

As corresponding author: 8

Citations: 675

h-index: 10

Complete Full Papers available here: <https://tinyurl.com/m3ydpvg>

FULL LIST OF PUBLICATIONS

A1. **Nikolaou C** and Almirantis Y (2002) A study of the middle-scale nucleotide clustering in DNA sequences of various origin and functionality, by means of a method based on a Modified Standard Deviation. *Journal of Theoretical Biology*, 217, 479-492
<http://dx.doi.org/10.1006/jtbi.2002.3045>

A2. **Nikolaou C** and Almirantis Y (2003) Mutually symmetric and complementary triplets: Differences in their use distinguish systematically between coding and non-coding genomic sequences. *Journal of Theoretical Biology*, 223, 477-487
[http://dx.doi.org/10.1016/S0022-5193\(03\)00123-1](http://dx.doi.org/10.1016/S0022-5193(03)00123-1)

A3. **Nikolaou C** and Almirantis Y (2004) Measuring the Coding Potential of Genomic Sequences through a combination of Triplet Occurrence Patterns and RNY Preference. *Journal of Molecular Evolution*, 59, 309-316
<http://dx.doi.org/10.1007/s00239-004-2626-7>

A4. Almirantis Y and **Nikolaou C** (2005) Multi-criterial Coding Sequence Prediction. Combination of GeneMark with two novel, coding character-specific quantities. *Computers in Biology and Medicine*, 35, 627-643
<http://dx.doi.org/10.1016/j.compbiomed.2004.04.002>

A5. **Nikolaou C** and Almirantis Y (2005) 'Word' preference in the genomic text and genome evolution. Different modes of n-tuplet usage in coding and noncoding sequences. *Journal of Molecular Evolution*, 61, 23-35
<http://dx.doi.org/10.1007/s00239-004-0209-2>

A6. **Nikolaou C*** and Almirantis Y (2005) A Study on the correlation of nucleotide skews and the positioning of the Origin of Replication. Different modes of replication in bacterial species. *Nucleic Acids Research*, 33, 6816-6822

<https://doi.org/10.1093/nar/gki988>

A7. **Nikolaou C*** and Almirantis Y (2006) Deviations from Chargaff's second parity rule in organellar DNA Insights into the evolution of organellar genomes. *Gene*, 381:34-41

<http://dx.doi.org/10.1016/j.gene.2006.06.010>

A8. Tilgner H[#], **Nikolaou C[#]**, Althammer S, Sammeth M, Beato M, Valcárcel J and Guigo R. (2009) Nucleosome positioning as a determinant of exon recognition. *Nature Structural & Molecular Biology*, 16(9):996-1001.

<http://dx.doi.org/10.1038/nsmb.1658>

A9. **Nikolaou C***, Althammer S, Beato M and Guigo R. (2010) Structural constraints revealed in consistent nucleosome positions in the genome of *S. cerevisiae*. *Epigenetics and Chromatin* 3 (1) 20

<http://dx.doi.org/10.1186/1756-8935-3-20>

A10. Haupl T, Sorensen T, Smiljanovic B, Bonin M, Grutzkau A, **Nikolaou C**, Pandis I, Kollias G and Rowe A (2013) Comparative Transcriptome Analysis of Human and Mouse Synovial Fibroblast Responses to TNF. *Annals of Rheumatic Diseases* 72: A50

<http://dx.doi.org/10.1136/annrheumdis-2013-203221.6>

A11. **Nikolaou C**, Bermudez I, Manichanh C, García-Martínez J, Guigo R, Perez-Ortín JE and Roca J (2013) Topoisomerase II regulates yeast genes with singular chromatin architectures. *Nucleic Acids Research* 41 (20): 9243-9256

<http://dx.doi.org/10.1093/nar/gkt707>

A12. Polychronopoulos D, Krithara A, **Nikolaou C**, Paliouras G, Almirantis Y and Giannakopoulos G (2014) Analysis and Classification of Constrained DNA Elements with N-gram Graphs and Genomic Signatures. *AlCoB 2014: Algorithms for Computational Biology* (220-234). *Lecture Notes in Bioinformatics (LNBI)*

http://dx.doi.org/10.1007/978-3-319-07953-0_18

A13. Roulis M, **Nikolaou C**, Kotsaki E, Kaffe E, Karagianni N, Koliaraki V, Salpea K, Ragoussis J, Aidinis V, Martini E, Becker C, Herschman HR, Vetrano S, Danese S and Kollias G (2014) Intestinal myofibroblast-specific Tpl2-Cox-2-PGE2 pathway links innate sensing to epithelial homeostasis. *Proceedings of the National Academy of Sciences, U.S.A.* 111 (43): E4658-E4667

<http://dx.doi.org/10.1073/pnas.1415762111>

A14. Andreadis C, **Nikolaou C**, Fragiadakis GS, Tsiliki G and Alexandraki D (2014) Rad9 interacts with Aft1 to facilitate genome surveillance in fragile genomic sites under non-DNA damage-inducing conditions in *S. cerevisiae*. *Nucleic Acids Research* 42 (20): 12650-12667

<https://doi.org/10.1093/nar/gku915>

- A15. **Nikolaou C***. (2014) Menzerath–Altmann law in mammalian exons reflects the dynamics of gene structure evolution. *Computational Biology and Chemistry*, 53: 134-143
<http://dx.doi.org/10.1016/j.compbiolchem.2014.08.018>
- A16. Tsiagkas K, **Nikolaou C** and Almirantis Y. (2014) Orphan and gene related CpG Islands follow power-law-like distributions in several genomes: Evidence of function-related and taxonomy-related modes of distribution. *Computational Biology and Chemistry*, 53: 84-96
<http://dx.doi.org/10.1016/j.compbiolchem.2014.08.013>
- A17. Hadjimichael C, **Nikolaou C**, Papamatheakis J and Kretsovali A. (2016) MicroRNAs for Fine-Tuning of Mouse Embryonic Stem Cell Fate Decision through Regulation of TGF- β Signaling. *Stem Cell Reports* 6 (3): 292-301
<http://dx.doi.org/10.1016/j.stemcr.2016.01.004>
- A18. Chouvardas P, Kollias G and **Nikolaou C***. (2016) Inferring active regulatory networks from gene expression data using a combination of prior knowledge and enrichment analysis. *BMC Bioinformatics* 17(5):181
<http://dx.doi.org/10.1186/s12859-016-1040-7>
- A19. Apostolou-Karampelis K, **Nikolaou C** and Almirantis Y. (2016) A novel skew analysis reveals substitution asymmetries linked to genetic code GC-biases and PolIII α -subunit isoforms. *DNA Research* 23 (4): 353-363
<https://doi.org/10.1093/dnares/dsw021>
- A20. Michopoulos F, Karagianni N, Whalley NM, Firth MA, **Nikolaou C**, Wilson ID, Critchlow SE, Kollias G, Theodoridis GA (2016) Targeted Metabolic Profiling of the Tg197 Mouse Model Reveals Itaconic Acid as a Marker of Rheumatoid Arthritis. *Journal of Proteome Research* 15 (12): 4579-4590
<http://pubs.acs.org/doi/abs/10.1021/acs.jproteome.6b00654>
- A21. Hadjimichael C, Chanoumidou K, **Nikolaou C**, Klonizakis A, Theodosi GI, Makatounakis T, Papamatheakis J and Kretsovali A. (2017) Promyelocytic Leukemia (PML) protein is an essential regulator of stem cell pluripotency and somatic cell reprogramming. *Stem Cell Reports*, 8 (5), 1366-1378
<http://dx.doi.org/10.1016/j.stemcr.2017.03.006>
- A22. Tsochatzidou M, Malliarou M, Papanikolaou N, Roca J and **Nikolaou C***. (2017). Genome urbanization: Clusters of topologically co-regulated genes delineate functional compartments in the genome of *S. cerevisiae*. *Nucleic Acids Research*, 45 (10), 5818-5828.
<https://dx.doi.org/10.1093/nar/gkx198>
- A23. Ntougkos E, Chouvardas P, Roumelioti F, Ospelt C, Frank-

Bertoncelj M, Fihler A, Buckley CD, Gay S, **Nikolaou C**[#] and Kollias G[#] (2017) Genomic responses of mouse synovial fibroblasts during TNF-driven arthritogenesis greatly mimic those of human rheumatoid arthritis. *Arthritis and Rheumatology*, 69 (8): 1588-1600.

<https://dx.doi.org/10.1002/art.40128>

A24. **Nikolaou C**^{*} (2018) Invisible Cities: Segregated Domains in the yeast genome with distinct structural and functional attributes. *Current Genetics*, 64 (1), 247-258.

<https://dx.doi.org/10.1007/s00294-017-0731-6>

A25. Joshi RS, **Nikolaou C** and Roca J (2018) Structural and Chromosomal Organization of Yeast Genes Regulated by Topoisomerase II. *International Journal of Molecular Sciences*. 19 (1), 134

<https://dx.doi.org/10.3390/ijms19010134>

A26. Papadaki C, Stratigos M, Markakis G, Spiliotaki M, Mastrostamatis G, **Nikolaou C**, Mavroudis D and Agelaki S (2018) Circulating microRNAs in the early prediction of disease recurrence in primary breast cancer. *Breast Cancer Research*. 201820:72

<https://doi.org/10.1186/s13058-018-1001-3>

A27. Chanoumidou K, Hadjimichael C, Athanasouli P, Ahlenius H, Klonizakis A, **Nikolaou C**, Drakos E, Kostouros A, Stratidaki I, Grigoriou M, Kretsovali A. (2018) Groucho related gene 5 (GRG5) is involved in embryonic and neural stem cell state decisions. *Sci Rep*. 2018 Sep 13;8(1):13790.

<https://doi.org/10.1038/s41598-018-31696-9>