Tural Aksel

Nautilus Biotechnology
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RESEARCH INTERESTS

- Development of DNA nanotechnology tools for structural biology, proteomics, immunotherapy and bioenergy production.
- Scientific software development for biomolecular design, image processing and data analysis.
- Protein engineering and design for hybrid DNA Origami-protein complexes.

EDUCATION

Ph.D. Biophysics — 2012
Johns Hopkins University, Baltimore, MD
Thesis Advisor: Doug Barrick

B.S. Biological Sciences and Bioengineering — 2006
Sabanci University, Istanbul, Turkey
Thesis Advisor: Ugur Sezerman

PROFESSIONAL & ACADEMIC EXPERIENCE

2019– Nautilus Biotechnology, San Carlos
Senior Scientist, DNA Nanotechnology

- I lead a team to develop DNA Origami devices for proteomics research. I direct day-to-day and long term research activities of my team members.
- I have developed the key DNA Origami technologies for Nautilus platform.
- My research achievements have led to three patent applications as the lead inventor.

2018–20 University of California, San Francisco
Applications Programmer III
PI: Shawn Douglas

- I developed a DNA Origami platform and image processing pipeline on AWS cloud for high-resolution cryo-EM studies of small proteins. The technology enables structural studies of small DNA binding proteins that wouldn't be otherwise studied using conventional cryo-EM. The method is published in Nature Biotechnology.

  Publication: Aksel T et al.(2021) *Nature Biotechnology*.

  Cryoorigami software package: github.com/douglaslab/cryoorigami.

- I developed new methods and software for 1) Thermodynamically optimized DNA Origami designs, and 2) DNA Origami structure prediction. The tools will be made publicly available in a webserver (in progress).

2015–18 University of California, San Francisco
Postdoctoral Fellow, Department of Cellular and Molecular Pharmacology
PI: Shawn Douglas

- I worked on the development of a DNA nanotechology platform for high-resolution cryo-EM studies of small proteins.
- I developed a scalable technology for the production of custom DNA Origami scaffolds.
- I designed a DNA Origami structure for tunable activation of Car-T cells. The DNA Origami design and the results for the publication are published in PNAS.

  Publication: Dong R, Aksel T et al.(2021) *PNAS*
- I designed a chimeric adapter protein for the display of non-DNA binding proteins on our DNA Origami platform (in progress).

2013–15 Stanford University
Postdoctoral Fellow, Biochemistry Department
PI: James Spudich

- I developed a loaded actin gliding assay to quantify the power output generated by cardiac myosins.
- I developed an image processing software for automated filament tracking. The assay and the filament tracking software helped us quantify the power output generated by cardiac myosin mutants.

  Publication: Aksel T et al.(2015) *Cell Reports*.

  FASTrack filament tracking software: github.com/turalaksel/FASTrack.

2006–12 Johns Hopkins University
Ph.D. student, Department of Biophysics
PI: Doug Barrick

- I studied the origins of cooperativity and pathway diversity in protein folding using consensus Ankyrin repeat proteins (CARPs). I generated CARPs from identical consensus Ankyrin repeat units by a modular cloning method.

  Publication: Aksel T et al.(2011) *Structure*
- I developed a nearest-neighbor statistical physical model called Ising model to dissect folding energetics into individual repeat stability and repeat-repeat interface terms for repeat proteins from experimental data. I developed a python package to fit the Ising model to a series of equilibrium and kinetic folding data to determine the folding energy for single repeat folding and repeat-repeat interface formation.

  Publication: Aksel T et al.(2009) *Methods in Enzymology*

  Isingbul data fitting software: github.com/turalaksel/IsingBul1.0.
- I developed an efficient software, written in C++, to calculate the 3D Ising Model partition function for biological systems. I used this tool to predict the pKa values of titratable residues from protein structure.

2006 Sabanci University, Istanbul, Turkey
Instructor Computer Science Department
Course: Data Structures

- I taught the summer school Data structures course in computer science department.

• I developed an homology model algorithm for structure prediction of protein sequences. The algorithm recursively finds the best matching patterns between two protein sequences using dynamic algorithm.

PROGRAMMING SKILLS

- Computing Environments: Matlab, IPython, Scilab, R, AWS clound computing.
- Languages: Python, C, C++, Perl, Shell scripting.
- Operating Systems: Unix/Linux, Windows, Mac OS.
- Biomolecular Modeling: Pymol, PyRosetta, Cadnano.

LABORATORY SKILLS

- Bioconjugation.
- DNA Nanotechnology, DNA Origami design, production and scale-up.
- Cryogenic electron microscopy (cryo-EM), negative-stain TEM.
- Recombinant DNA technologies, bacterial and mammalian protein expression, protein chromatography.
- CD and fluorescence spectroscopy, biomolecular NMR, SAXS/WAXS, analytical ultracentrifugation, stopped-flow kinetics.
- Single molecule force spectroscopy, fluorescence microscopy.

SELECTED PUBLICATIONS

Journal Articles

For Complete list of publications, please see Google scholar

2021 Dong R, **Aksel T**, Chan W, Germain RN, Vale RD, Douglas SM "DNA origami patterning of synthetic T cell receptors reveals spatial control of the sensitivity and kinetics of signal activation." *Proc. Natl. Acad. Sci. U. S. A.* 118 (40) e2109057118 doi:10.1073/pnas.2109057118

2021 **Aksel T**, Yu Z, Cheng Y , Douglas SM "Molecular goniometers for single-particle cryo-EM of DNA-binding proteins." *Nature Biotechnology* 39 (3):378–386. doi:10.1038/s41587-020-0716-8

2015 **Aksel T**, Yu EC, Sutton S, Ruppel KM, Spudich JA. "Ensemble Force Changes that Result from Human Cardiac Myosin Mutations and a Small-Molecule Effector." *Cell Reports* 11 (6):910–920. doi:10.1016/j.celrep.2015.04.006

2011 **Aksel T**, Majumdar A, Barrick D. "The contribution of entropy, enthalpy, and hydrophobic desolvation to cooperativity in repeat-protein folding." *Structure* 19 (3):349–360 doi:10.1016/j.str.2010.12.018

PATENTS

2021 Coinventor of US Patent Application assigned to Nautilus Biotechnology, Filed 2021, Confidential.

2021 Coinventor of US Patent Application assigned to Nautilus Biotechnology, Filed 2021, Confidential.

2020 Coinventor of US Patent Application assigned to Nautilus Biotechnology, Filed 2020, Confidential.

GRANTS AND AWARDS

Awards and Honors

2008 Brian Key PhD Student Travel Award.

2001–06 High Honor Scholarship, Sabanci University. Istanbul, Turkey. Full tuition and accommodation coverage.

2001 Ranked 62nd in Turkish university entrance exam among 1.4 million participants.

1998 Ranked 56th in Turkish high school entrance exam among 0.5 million participants.

Grants and Fellowships

2016–17 F32 Ruth L. Kirschstein Postdoctoral Individual National Research Service Award (NIGMS:F32GM119322).

ACADEMIC REFERENCES

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PROFESSIONAL REFERENCES

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Updated November 2021