

# Tural Aksel

Nautilus Biotechnology  
201 Industrial Rd #310  
San Carlos, CA

turalaksel@gmail.com  
+1 410 369 6615  
turalaksel.com  
github.com/turalaksel

## 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 nanotechnology 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](https://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 nanotechnology 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](https://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/IsingBul.o](https://github.com/turalaksel/IsingBul.o).
  - 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 cloud computing.
- Languages: Python, C, C++, Perl, Shell scripting.
- Operating Systems: Unix/Linux, Windows, Mac OS.
- Biomolecular Modeling: Pymol, PyRosetta, Cadnano.

## LABORATORY SKILLS

- Cryogenic electron microscopy (cryo-EM).
- 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

Doug Barrick	Shawn M. Douglas	James Spudich
Professor and Chair of Biophysics Johns Hopkins University 216 Jenkins Hall Baltimore, MD 21218 Phone: (410) 516-0409 Email: barrick@jhu.edu	Assistant Professor University of California, San Francisco 600 16th St. San Francisco, CA 94143 Phone: (415) 502-1947 Email: shawn.douglas@ucsf.edu	Professor Stanford University Beckman Center B400 Stanford, CA 94305 Phone: (650) 723-7634 Email: jspudich@stanford.edu

Ronald D. Vale

HHMI Vice President and Executive Director  
Janelia Research Campus  
19700 Helix Dr  
Ashburn, VA 20147  
Phone: (571) 209-4000  
Email: valer@janelia.hhmi.org

## PROFESSIONAL REFERENCES

Michael Dorwart	Elvis Ikwa	Wayne Rainey
Director of Research Illumina <i>Former director</i> <i>Nautilus Biotechnology</i> Email: michaeldorwart@gmail.com	Associate Scientist Nautilus Biotechnology Email: elvisokiring@gmail.com	Self employed <i>Former HR Manager</i> <i>Nautilus Biotechnology</i> Email: wrainey929@gmail.com

Updated November 2021