
BIOGRAPHICAL SKETCH

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NAME Tomasz Heyduk	POSITION TITLE Professor		
eRA COMMONS USER NAME (credential, e.g., agency login) heydukt			
EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	MM/YY	FIELD OF STUDY
Univ. of Wroclaw, Poland	M.S	1979	Chemical Sciences
Tech. Univ. of Wroclaw, Poland	Ph.D.	1986	Chemistry

A. Personal statement

My undergraduate, graduate and post-doctoral training was in physical chemistry, protein biochemistry and biophysics. The initial focus of my independent research was on basic science questions related to the mechanism of transcription initiation. While this has been and continues to be a very fruitful and successful research direction, over the years I've developed a desire to utilize my physical chemistry background for research that could produce outcomes of more immediate practical benefits to the society. This led us to the interest in utilizing our understanding of physical mechanisms of binding phenomena for developing new methodologies for detection of biomolecules of medical importance. Our initial success in this endeavor was the development of molecular beacons for DNA binding proteins. This success provided further motivation to continue this avenue of research resulting in a variety of novel detection methodologies for targets ranging from small molecules to whole cells. This research has resulted in 13 publications, numerous patent applications and a successful collaboration with biotech industry. In the course of these studies we accumulated invaluable experience and expertise in assay design, detection methodologies and we gained understanding of challenges of analyzing complex biological samples. I believe our laboratory is now uniquely well prepared to deal with any challenges that assay development process typically involves. I find it extremely gratifying to see our ideas rooted in basic science research being developed to practical applications that could benefit disease diagnosis and treatment.

B. Positions and Honors

Positions:

1980-1986 Graduate Student and Teaching Assistant, Technical University of Wroclaw, Poland.

1986-1987 Research Associate, Technical University of Wroclaw, Poland

1987-1989 Postdoctoral Fellow, Department of Biochemistry and Molecular Biology, St. Louis University School of Medicine, St. Louis, MO

1989-1991 Research Assistant Professor, Department of Biochemistry and Molecular Biology, St. Louis University School of Medicine, St. Louis, MO

1991-1992 Research Assistant Professor, The University of Texas Medical Branch, Galveston, TX

1992-1998 Assistant Professor, Department of Biochemistry and Molecular Biology, St. Louis University School of Medicine, St. Louis, MO

1998-2003 Associate Professor, Department of Biochemistry and Molecular Biology, St. Louis University School of Medicine, St. Louis, MO

2003-present Professor, Department of Biochemistry and Molecular Biology, St. Louis University School of Medicine, St. Louis, MO

2007-present Associate Director for Basic Science, Saint Louis University Cancer Center

Honors and membership in advisory committees

Polish Ministry of Higher Education. Outstanding Ph.D. dissertation in 1986

Outstanding Faculty/Mentor (Graduate Student Association), 1996

Ad hoc reviewer for NSF grant applications

Ad hoc member of American Cancer Society Advisory Committee on Personnel for Research - A (1994)

Ad hoc member of NIH NIAID Special Emphasis Panel "Innovation Grant Program for Approaches in HIV Vaccine Research" (June 1998).

Ad hoc member of NIH BBCA study section, June 1999.

NIH Special Emphasis Panel and Project Site Visit to the Fluorescence Dynamics Resource, Urbana, IL (2000)

Permanent member of NIH BBCA study section (October 2002 - October 2004).

Permanent member of NIH MSFC study section (February 2005 - October 2007).

Ad hoc member of NIH Special Emphasis Review Panel NIH ZRG1 F04B-L (20) (post-doctoral and predoctoral)

(November 2008)

Ad hoc member of NIH ZRG1 GGG-F (53) Review Panel (November 2009)

C. Selected Peer-reviewed Publications (from a total of 77)

Most relevant to the current application

1. **Heyduk, T.** and Heyduk, E. Molecular beacons for detecting DNA binding proteins. *Nature Biotechnology*, **20**, 171-176, 2002.
2. Heyduk, E., Knoll, E., and **Heyduk, T.** Molecular beacons for detecting DNA binding proteins: mechanism of action. *Analyt. Biochem.* **316**, 1-10, 2003.
3. Heyduk, E., Fei, Y., and **Heyduk, T.** Homogenous fluorescence assay for cAMP. *Combinatorial Chemistry and High-throughput Screening* **6**, 183-194, 2003.
4. Knoll, E., and **Heyduk, T.** Unimolecular beacons for detection of DNA binding proteins. *Analyt. Chem.* **76**, 1156-1164, 2004
5. Heyduk, E., and **Heyduk, T.** Nucleic-acid based sensors for proteins. *Analyt. Chem.* **77**, 1147-1156, 2005.
6. Heyduk, E., Dummit, B., Chang, Y.C and **Heyduk, T.** Molecular pincers – new antibody-based homogeneous protein sensors. *Anal. Chem.* **80**, 5152-5159, 2008. PMC2631435.
7. Tian, L., and **Heyduk, T.** Bivalent ligands with long nanometer-scale flexible linkers. *Biochemistry*, **48**, 264-275, 2009.
8. Tian, L. and **Heyduk, T.** Antigen Peptide-Based Immunosensors Rapid Detection of Antibodies and Antigens. *Anal. Chem.* **81**, 5218-5225, 2009. PMC2767237
9. Heyduk, E. and **Heyduk, T.** Fluorescent homogeneous sensors for detecting pathogenic bacteria. *Analytical Biochemistry* **396**, 298-303, 2010. PMC2790005.
10. Heyduk, E., Moxley, M.M., Salvatori, A., Corbett, J.A., and Heyduk, T. Homogeneous insulin and C-peptide sensors for rapid assessment of insulin and C-peptide secretion by the islets. *Diabetes* **59**, 2360-5, 2010.
11. **Heyduk, T.** Practical biophysics: Sensors for rapid detection of biological targets utilizing target-induced oligonucleotide annealing. *Biophysical Chemistry*, **151**, 91-95, 2010. PMC2926194

Other relevant publications

1. **Heyduk, T.** Luminescence resonance energy transfer analysis of RNA polymerase complexes. *METHODS: A Companion to Methods in Enzymol.* **25**, 44-53, 2001.
2. Heyduk, E., and **Heyduk, T.** Conformation of fork junction DNA in a complex with *E. coli* RNA polymerase. *Biochemistry*, **41**, 2876-2883, 2002.
3. **Heyduk, T.** Measuring protein conformational changes by FRET/LRET. *Current Opinions in Biotechnology* **13**, 292-296, 2002.
4. Niedziela-Majka, A. and **Heyduk, T.** Escherichia coli RNA polymerase contacts outside the -10 promoter element are not essential for promoter melting. *J. Biol. Chem.* **280**, 38219-38227, 2005.
5. Heyduk, E., Kuznedelov, K., Severinov, K., and **Heyduk, T.** A consensus adenine at position -11 of the notemplate strand of bacterial promoter is important for nucleation of promoter melting. *J. Biol. Chem.* **281**, 12362-12369, 2006.

6. Sztiller-Sikorska, M., Heyduk, E. and **Heyduk, T.** Promoter spacer DNA plays an active role in integrating functional consequences of RNA polymerase contacts with -10 and -35 promoter elements. *Biophys. Chem.* May 13 E published, 2011.

D. Research Support

Ongoing Research Support

RO1 GM 50514-14 Heyduk, T. (PI) 05/01/2009-04/30/2013
Inter and intramolecular communications in transcription.
The major goal of this project is to understand the role of σ^{70} subunit of RNA polymerase in transcription initiation.
Role: PI

R42 GM079891-02 Heyduk, T. (PI) 05/01/2009-04/30/2012
Rapid homogeneous antibody-based detection of proteins
The major goal of this project is to develop antibody-based homogeneous molecular pincer assay for detecting proteins. This is Phase II STTR proposal.
Role: PI

Completed Research Projects

R21NR011228-01 Metheny, N.. (PI) 04/07/09-03/31/11
NIH
Development of "nurse-friendly" bedside test for aspiration
The goal of this project is to develop a simple assay for measuring pepsin in biological samples.
Role:colaborator

R41HG003964 Heyduk, T. (PI) 09/19/2006-08/31/2009
Microarrays for DNA binding proteins
The goal of this project is to develop highly multiplexed microarrays for detecting sequence-specific DNA binding proteins.
Role:PI

AHA Heyduk, T. (PI) 01/01/2007-12/31/2009
Enhanced affinity bivalent ligands and inhibitors no cost extension
The major goal of this project is to develop bivalent enhanced affinity ligands for thrombin.
Role: PI

Leonard Wood Institute Heyduk, T. (PI) 09/08/2008-09/30/2009
Quick detection of pathogenic biothreats.
This was a subcontract to a grant awarded by Leonard Wood Institute to Mediomics, LLC. The goal of this project was to develop innovative sensors and a companion portable reader for pathogen detection.
Role: PI