

Oklahoma Center for Infrared Structural Biology

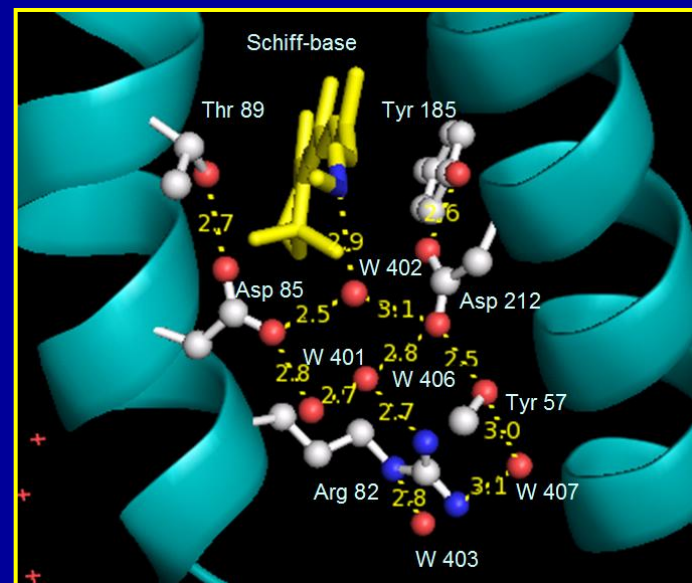
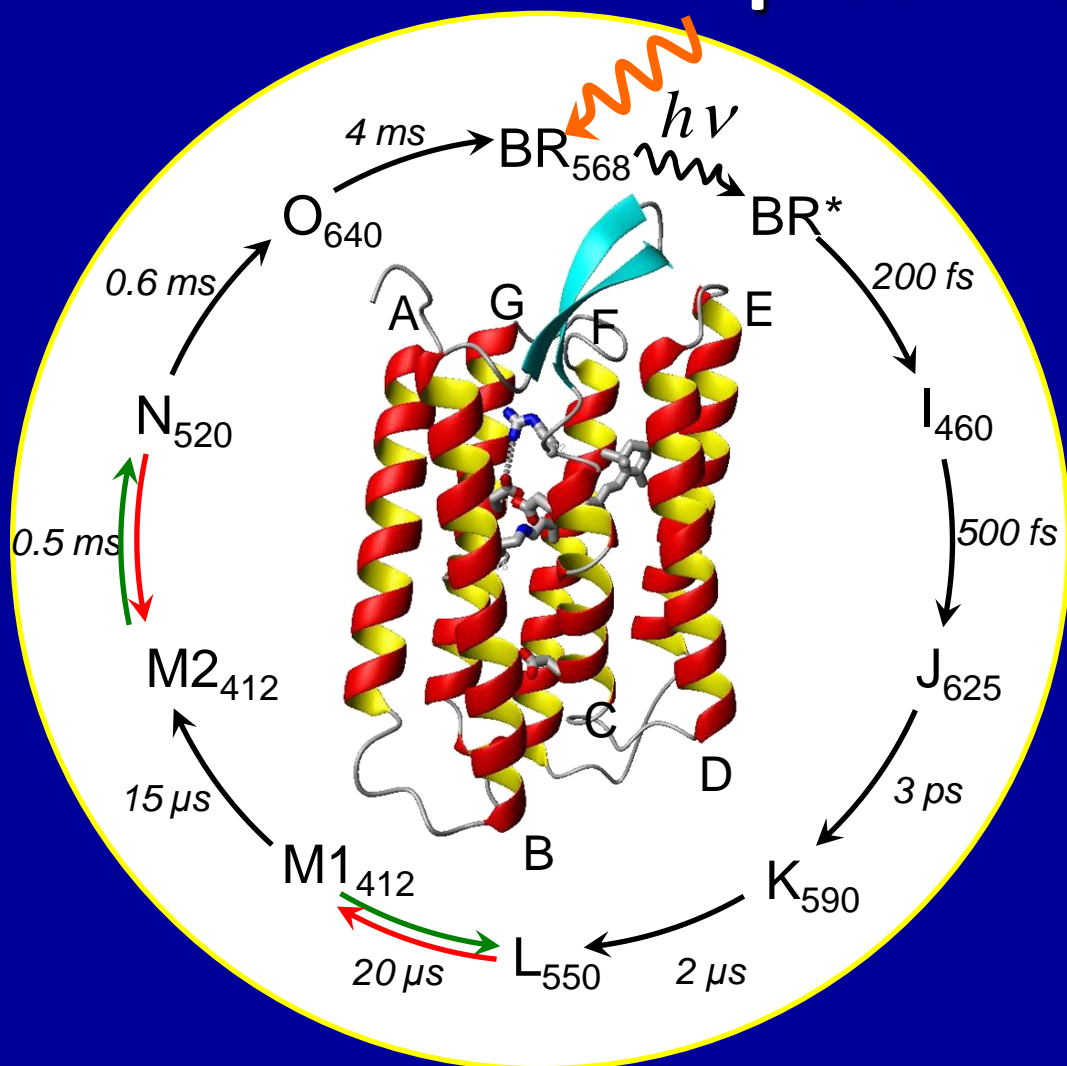
2012 NSF EPSCoR

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Why do we need
infrared structural biology?

Functionally important structural motions in proteins



Phatak et al. PNAS **105**:19672-19677 (2008); Phatak P. et al. JACS **131**:7065-7078 (2009)
 Lanyi: Many aspects of proton transfer in bR remain not understood (Oct. 2009).

How to detect functionally important structural motions?

Protein structural motions:

Proton transfer

Electron transfer

Changes in hydrogen bonding interactions

Protein quake

Broad dynamic range: picoseconds to minutes

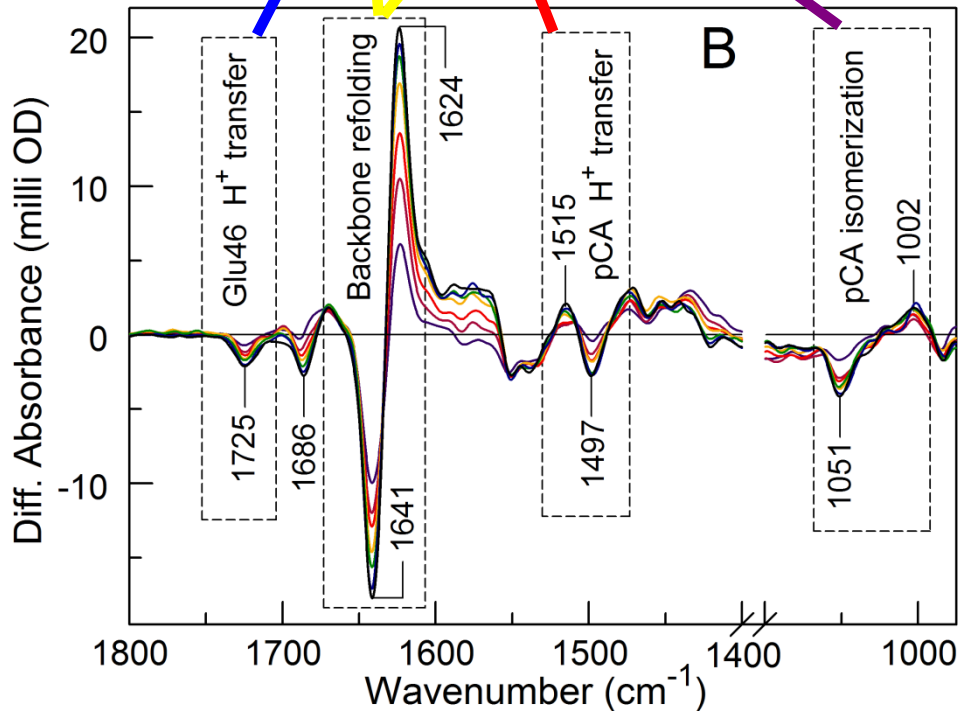
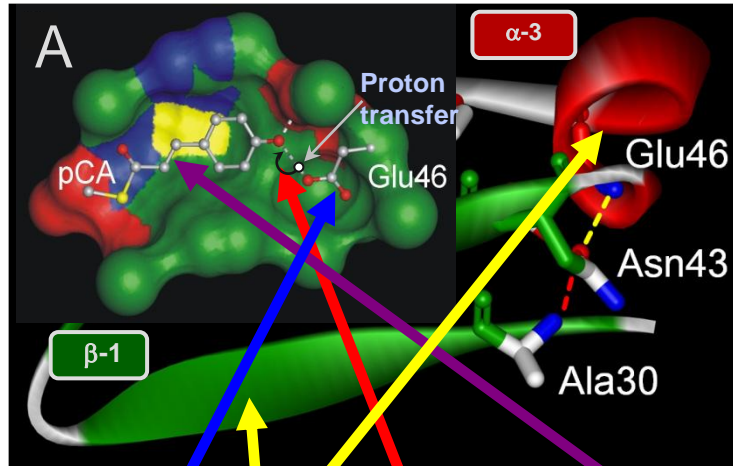
X-ray crystallography? No

NMR Spectroscopy? No

Time-resolved infrared structural biology? Yes!

What is
infrared structural biology?

Infrared Structural Biology



Protein Structure

VSM

Infrared Signals

Team for Infrared Structural Biology

- **Technique team:**

- Quantum chemical computations

- Picosecond infrared pump-probe systems (experimental)

- Isotope labeling & total chemical synthesis (organic chemistry)

- Cell free protein synthesis

- **Collaborative Team:**

- Photoactive proteins

- Proton transfer systems

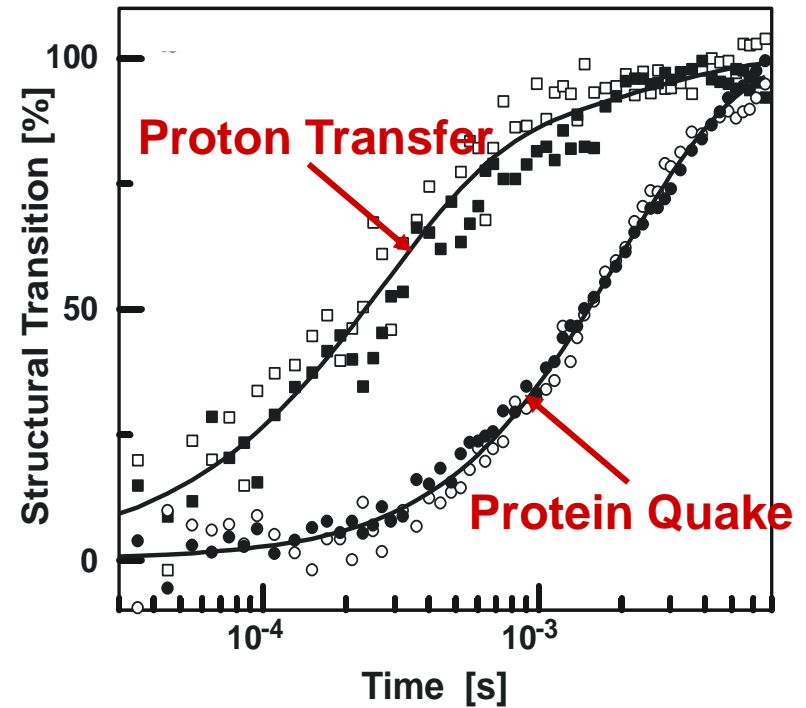
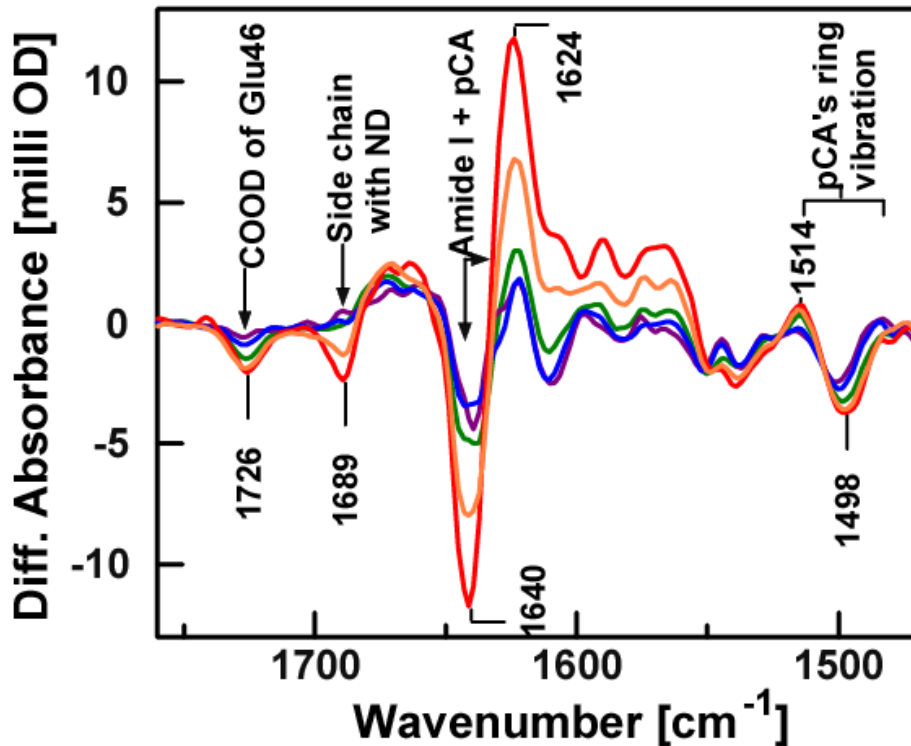
- Structural collaborations with X-ray & NMR groups

- Catalytic proteins (water soluble)

Additional Information

Time-resolved Step-Scan FTIR of PYP

Time-resolved FTIR difference spectra: 25 μ s \rightarrow 6.6 ms

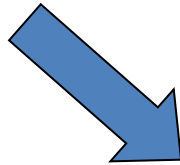
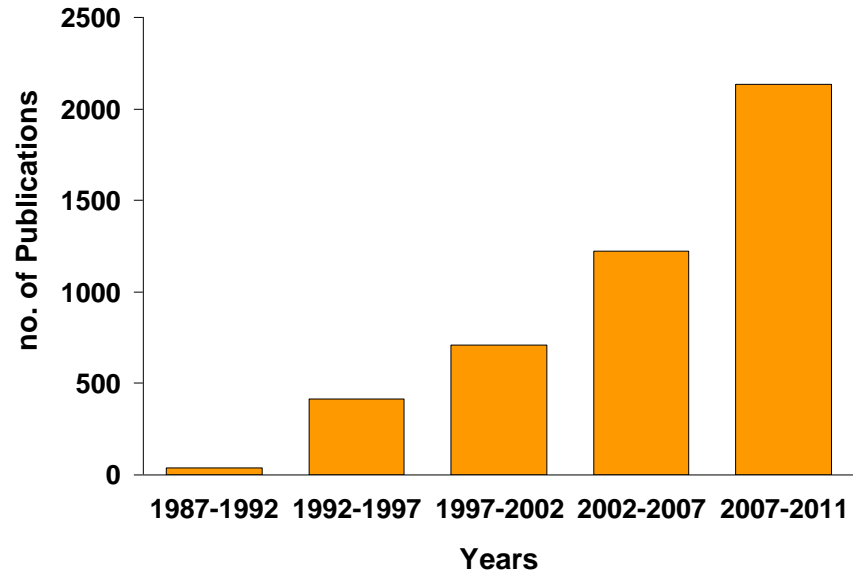


Xie *et al.* (2001) *Biochemistry* 40: 1510. Accelerated publication. Cited 147 times.

FTIR studies of proteins: a rapid growing field

Web of Science: TS=(FTIR AND Proteins)

Period	number of publications
1987-1991:	38
1992-1996:	417
1997-2001:	707
2002-2006:	1223
2007-2011:	2061



The above data indicate a rapid-growing market for “THE-controlled multi-sample exchanger system”.