

Introduction

- structural informatics is about structures of life's basic elements: proteins, DNA, RNA
- by structure, we mean shapes, geometry, motion

Scale concept

- atom: about 1\AA
- amino acid: $< 1nm$
- protein: $< 10nm$
- cell: $10\mu m$

Protein functions

- AcrB trimer, Seeger et al, Science, 313:1295-8, 2006
- Aquaporin water channel, Peter Agre, Nobel laureate chemistry, 2003
- Myoglobin

Intracellular signaling pathways

- protein-protein interaction and a kinase activation cascade
- regulation by phosphorylation
- the last kinase phosphorylates a number of gene regulatory proteins

The grand challenge question: what is life?

- In 1944, physicist Erwin Schrödinger published a short book that changed course of modern biology
- Asked whether the events inside a living organism be explained solely by physics and chemistry.
- How does life function? This is a very significant question.