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Simulations in Biophysics

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Grand Challenges:

National Academy of Science Report (2007):

- How do complex phenomena emerge from simple ingredients?

- What is the physics of life?

- What happens far from equilibrium and why?

The Physics of Chromatin

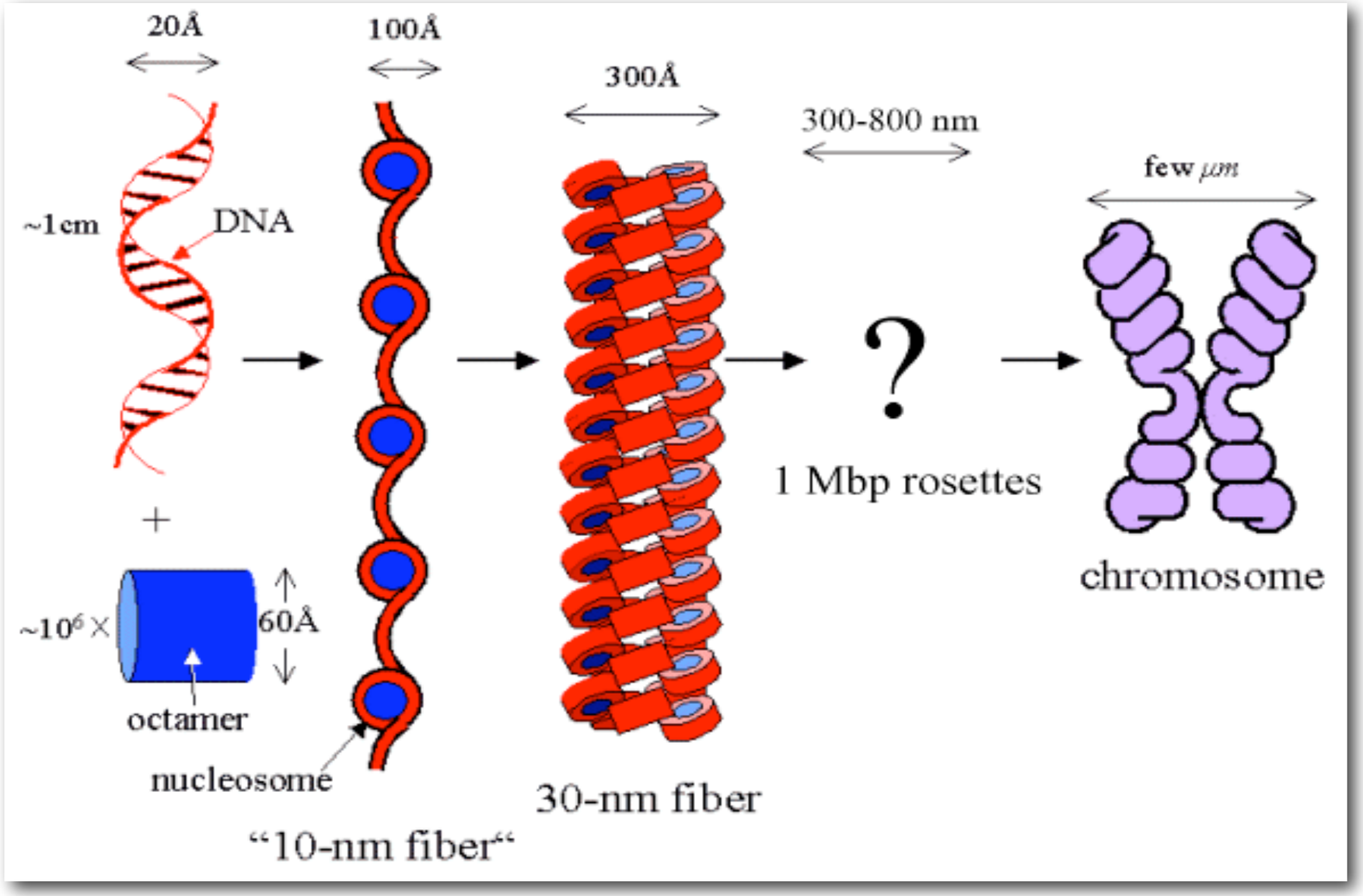


Image: H. Schiessel

The Fundamental Problem

What is the structure of chromatin on the 30nm scale?

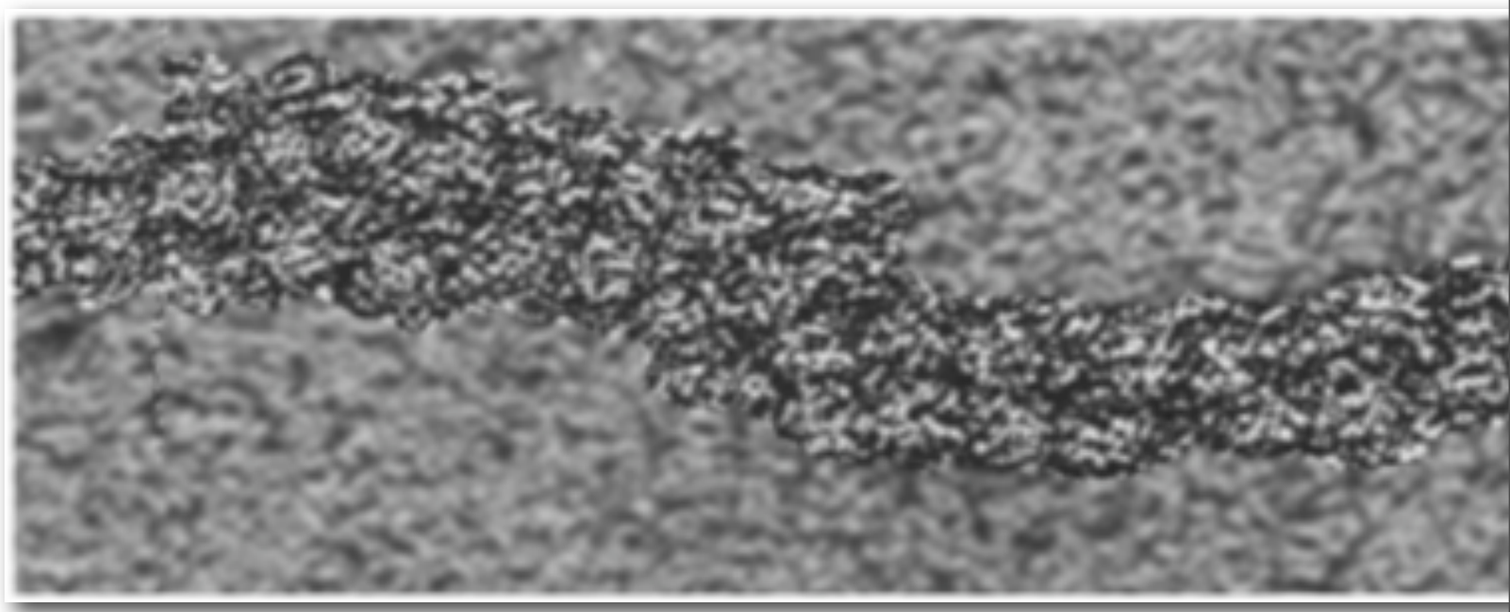
What are the close packed structures?

What influences most the packing

What is the structure on scale of a chromosome in the interphase?

30nm Fiber

Image: Waterborg, UMKC



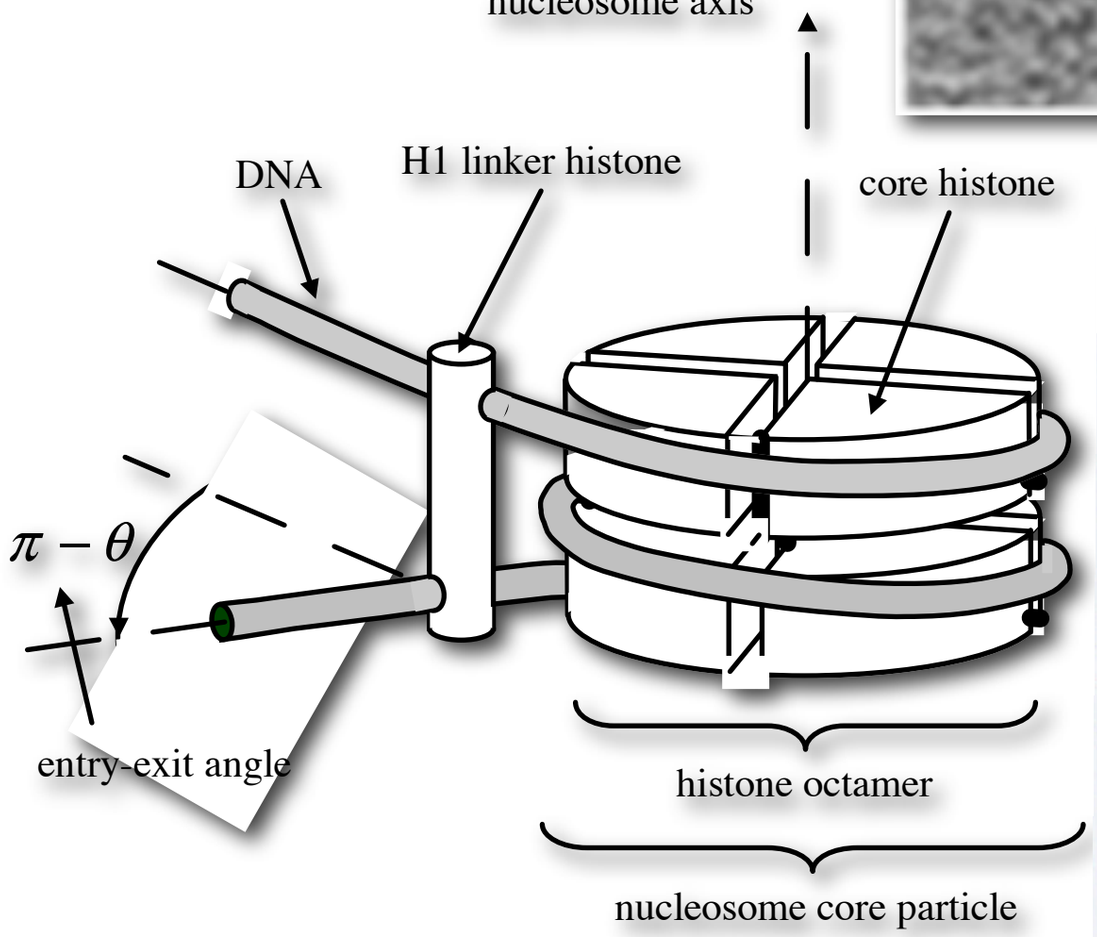
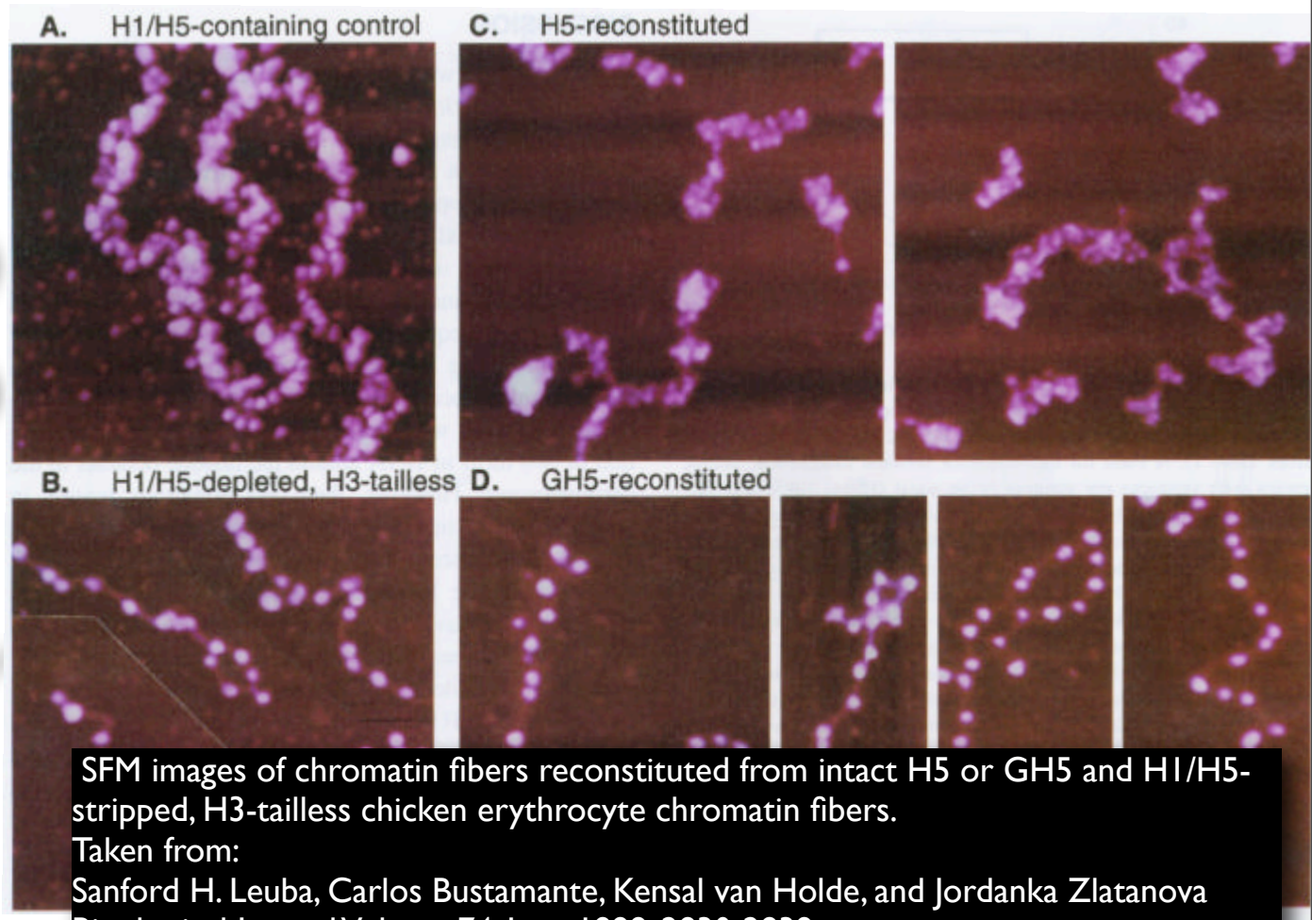
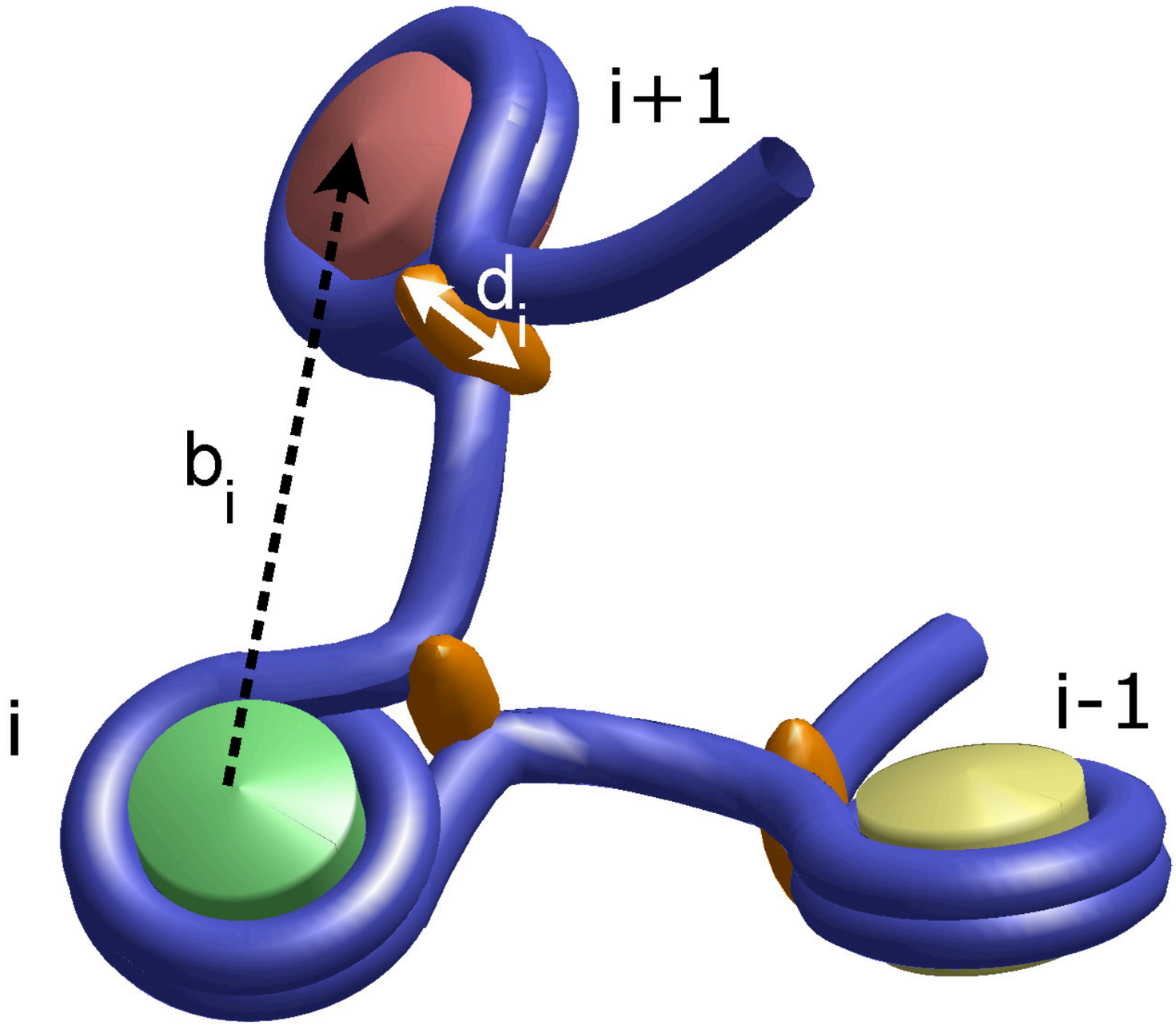


Image: H. Schiessel, Leiden Univ



SFM images of chromatin fibers reconstituted from intact H5 or GH5 and H1/H5-stripped, H3-tailless chicken erythrocyte chromatin fibers.
Taken from:
Sanford H. Leuba, Carlos Bustamante, Kensal van Holde, and Jordanka Zlatanova
Biophysical Journal Volume 74, June 1998, 2830-2839

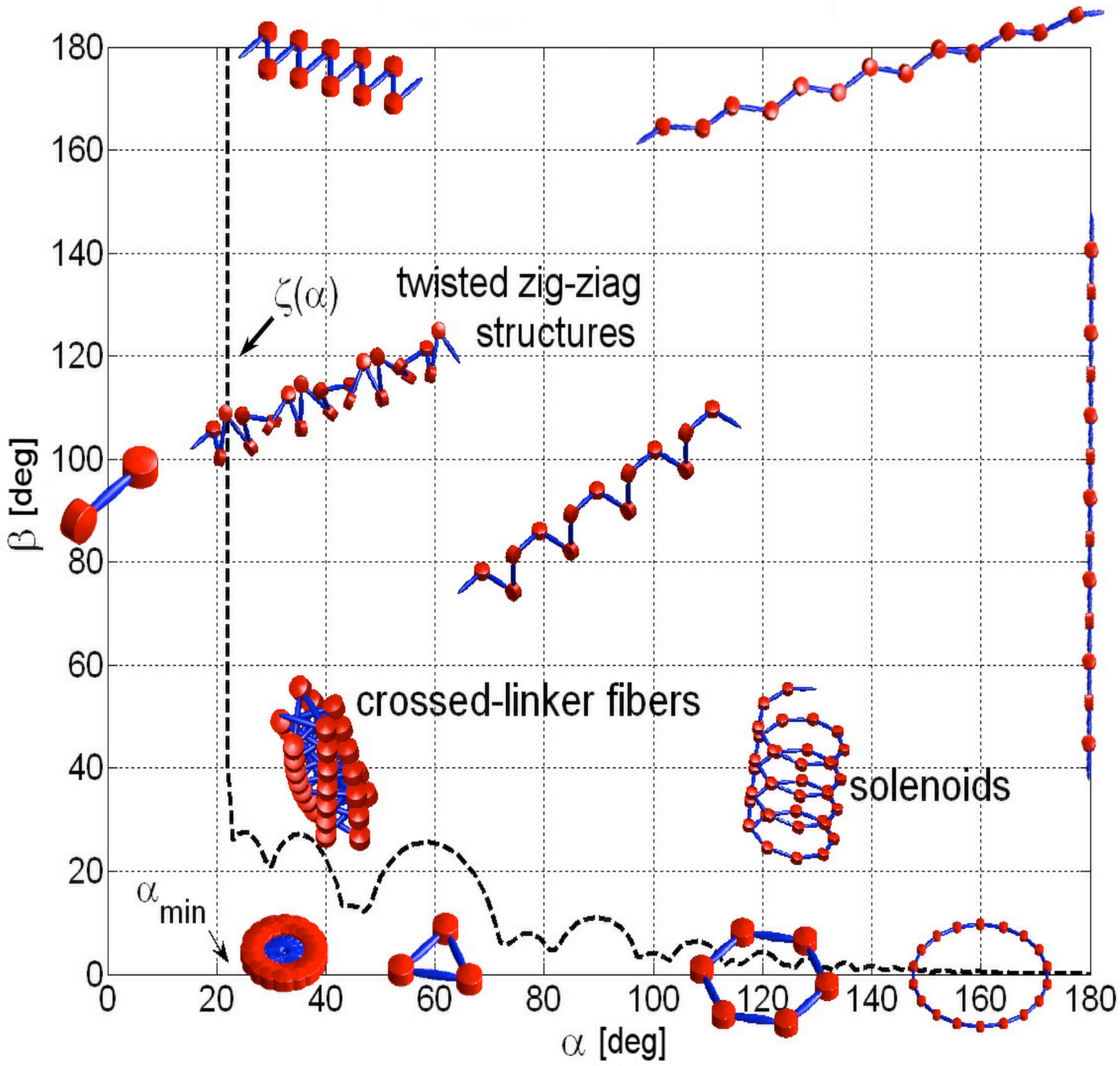
30nm Fiber: Extended Two-Angle Model (E2A)



Basic definitions of the extended two-angle model

- The entry-exit angle
- The linker length b
- The rotational angle
- The pitch d

30nm Fiber: Extended Two-Angle Model (E2A)



P. Diesinger, DWH
Phys. Rev. E 74, 031904
(2006)

30nm Fiber: H1 Defects