About the exercises

background information

on request

on topics not, or insufficiently covered during main lectures

questions about the lectures, or exercises

exercises

home work (aufgaben)

background information

worked out in next exercise session

mini-seminars

you!!

5 - 10 mins. about general topics in biophysics

presentation skills

literature research

proteins are nanomachines

convert light into chemical energy

photosynthesis

convert forms of chemical energy

growth

signalling

motion

replication

aim of biophysics

structure (x-ray, NMR, cryo-EM)

dynamics (NMR, FRET, AFM, MD)
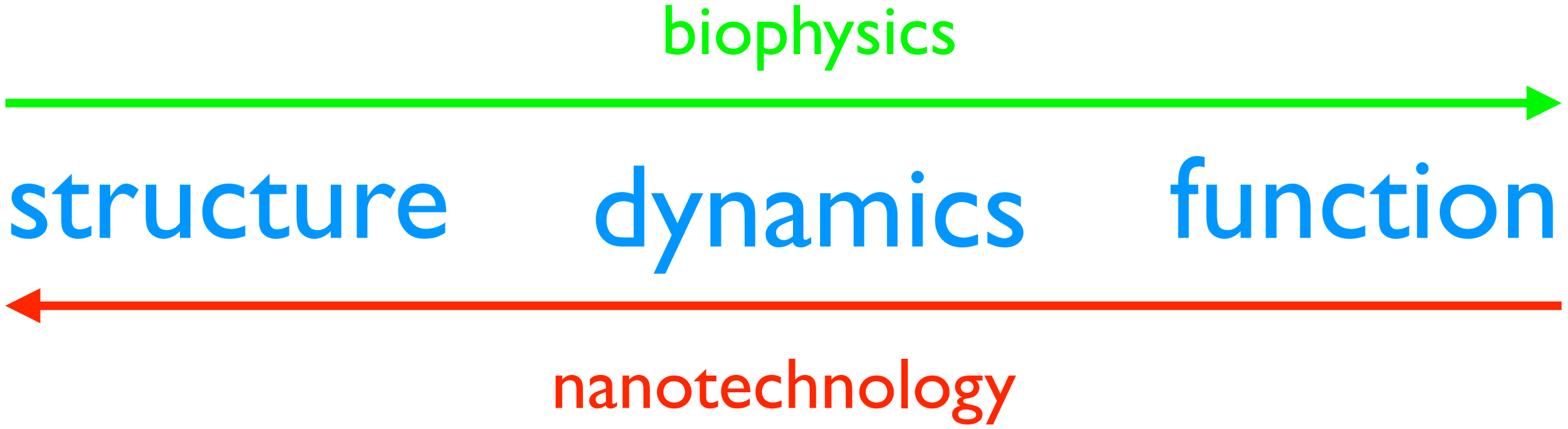
function

proteins are nanomachines

biophysics

structure dynamics function

proteins are nanomachines
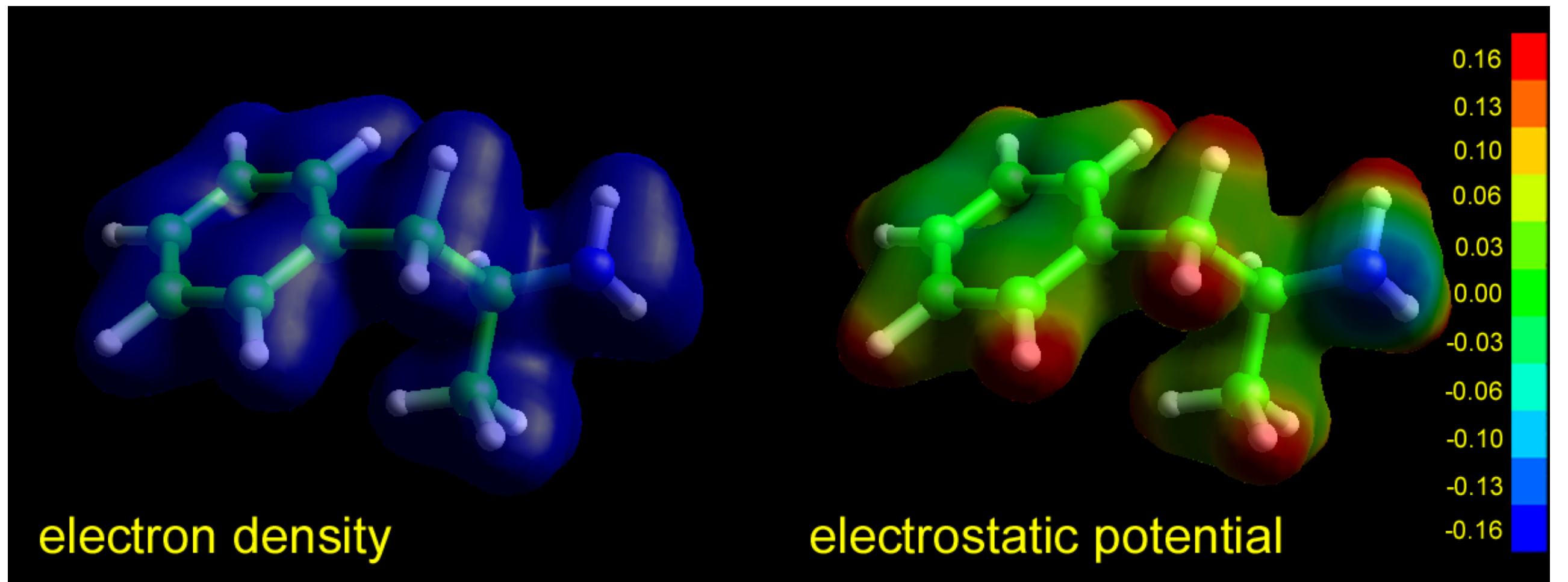
protein structure

chemical bonds

electrons (-) and nuclie (+)

many body Schrodinger equation:

$$H^{\text{tot}}(\mathbf{r}_e, \mathbf{R}_N)\Phi^{\text{tot}}(\mathbf{r}_e, \mathbf{R}_N) = E^{\text{tot}}\Phi^{\text{tot}}(\mathbf{r}_e, \mathbf{R}_N)$$

electron density

electron density   electrostatic potential

0.16
0.13
0.10
0.06
0.03
0.00
-0.03
-0.06
-0.10
-0.13
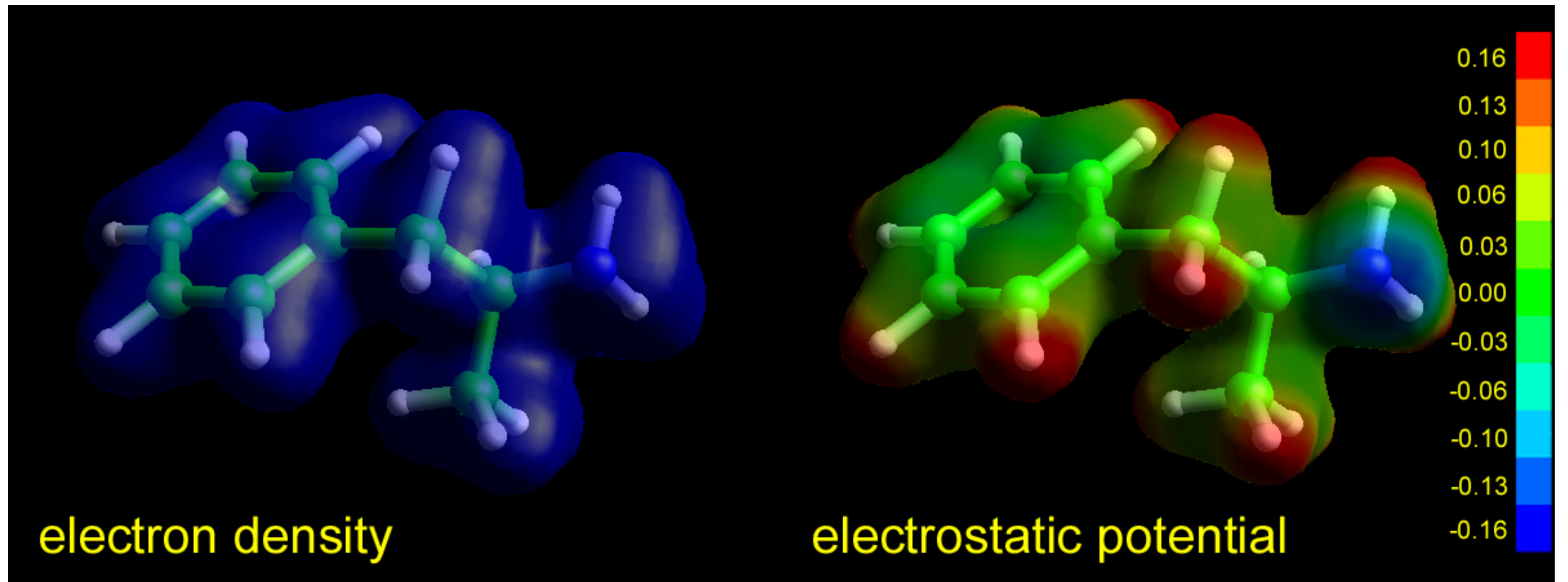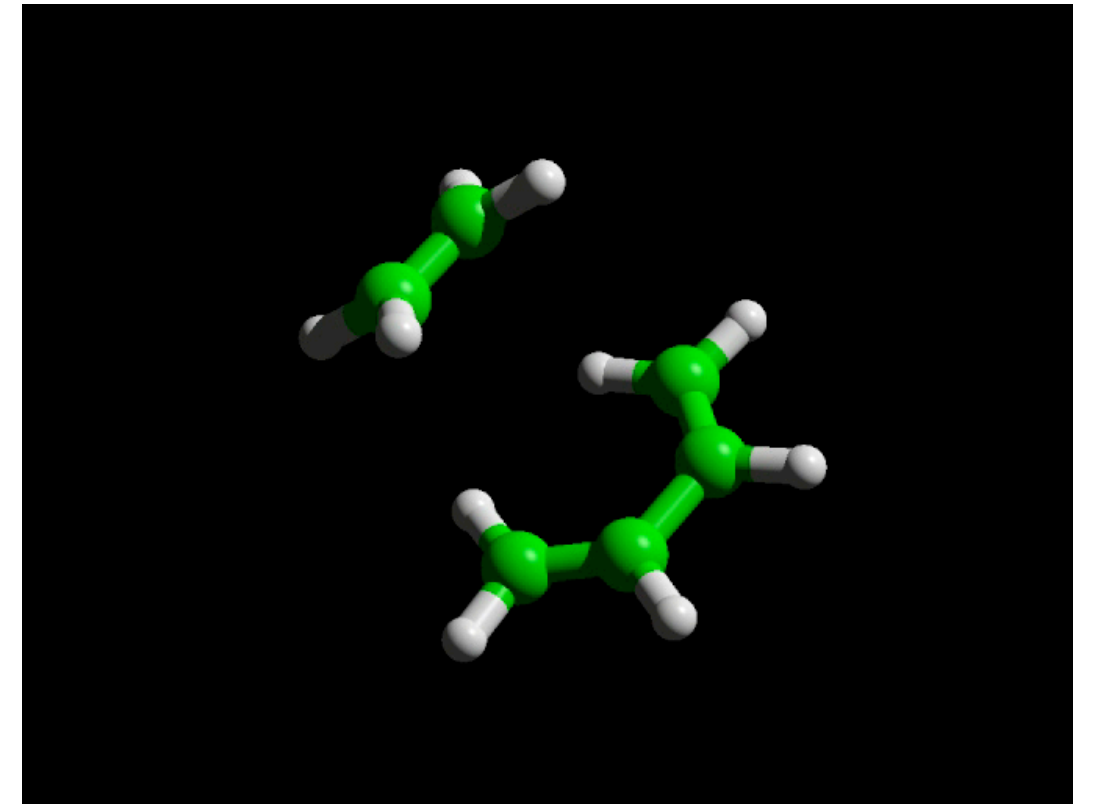-0.16

protein structure

chemical bonds

electrons (-) and nuclie (+)

many body Schrodinger equation:

$$H^{\text{tot}}(\mathbf{r}_e, \mathbf{R}_N)\Phi^{\text{tot}}(\mathbf{r}_e, \mathbf{R}_N) = E^{\text{tot}}\Phi^{\text{tot}}(\mathbf{r}_e, \mathbf{R}_N)$$

electron density

electron density

electrostatic potential

0.16
0.13
0.10
0.06
0.03
0.00
-0.03
-0.06
-0.10
-0.13
-0.16

protein structure

potential energy surface

electrons "averaged out"

$$V(\mathbf{R}) = \langle \Psi^{\mathrm{eln}} | H^{\mathrm{eln}}(\mathbf{R}) | \Psi^{\mathrm{eln}} \rangle$$

forcefield for nuclei