Supplementary Information

for

Redox Activity Distinguishes Solid-State Electron Transport from Solution-Based Electron Transfer in a natural and artificial protein: *Cytochrome C and Hemin-Doped Human Serum Albumin*

Nadav Amdursky,[a,b] Doron Ferber,[a] Israel Pecht,[c] Mordechai Sheves,[b,*] David Cahen[a,*]

Departments of [a]Materials and Interfaces, [b]Organic Chemistry, and [c]Immunology, Weizmann Institute of Science, Rehovot, 76100, Israel

Corresponding Authors

David Cahen

Phone: +972-8-934-2246

e-mail: david.cahen@weizmann.ac.il

Mordechai Sheves

Phone: +972-8-934-4320

e-mail: mudi.sheves@weizmann.ac.il

Table S1

Summary of experimental results of this study

	CytC	Fe-free CytC	HSA hemin	HSA	HSA PPIX
K_{et} (sec^{-1})	18.5	-	4.8	-	-
J (A/cm^2) (at V=0.1)	6.35 E-9	3.15 E-9	4.74 E-9	1.31 E-9	6.73 E-9
Ea (meV)	105	-	100	220	-

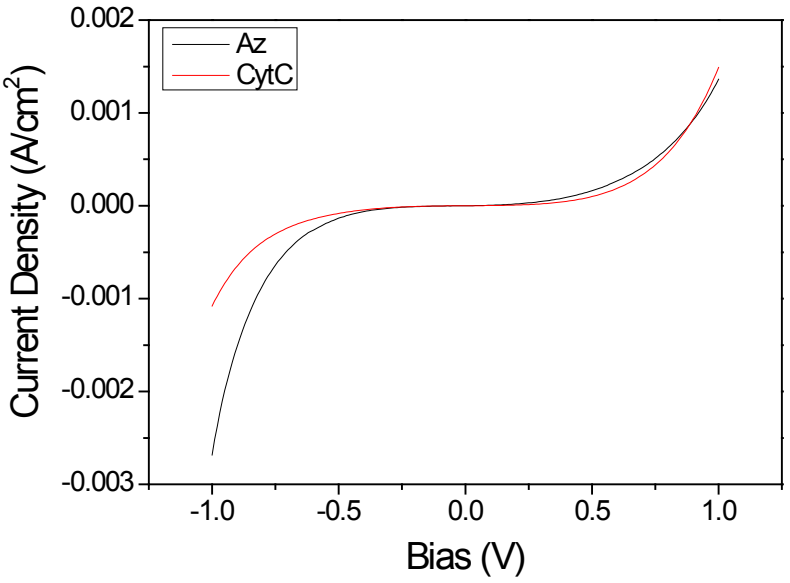


Figure S1. *I-V* at room temperature via CytC and Azurin.

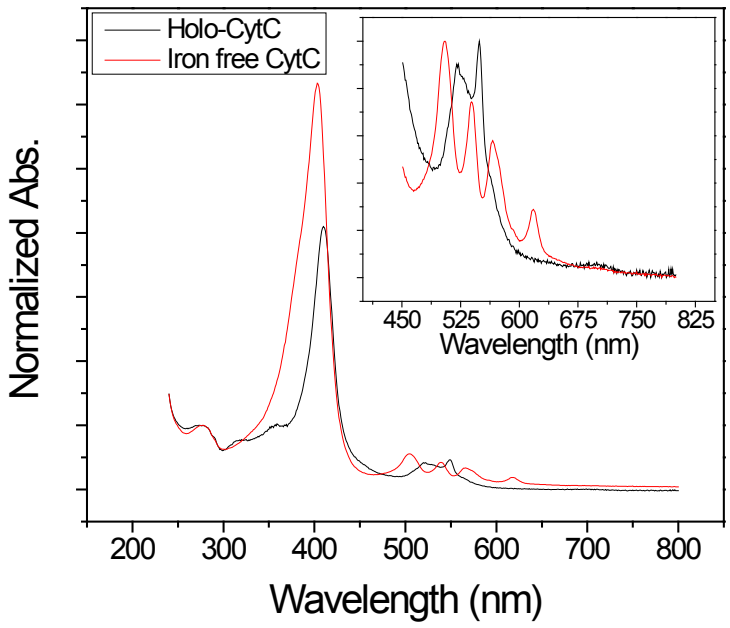


Figure S2. (a) Normalized UV-Vis of holo-CytC and Iron-free CytC. The inset shows a magnification of the long wavelength regime

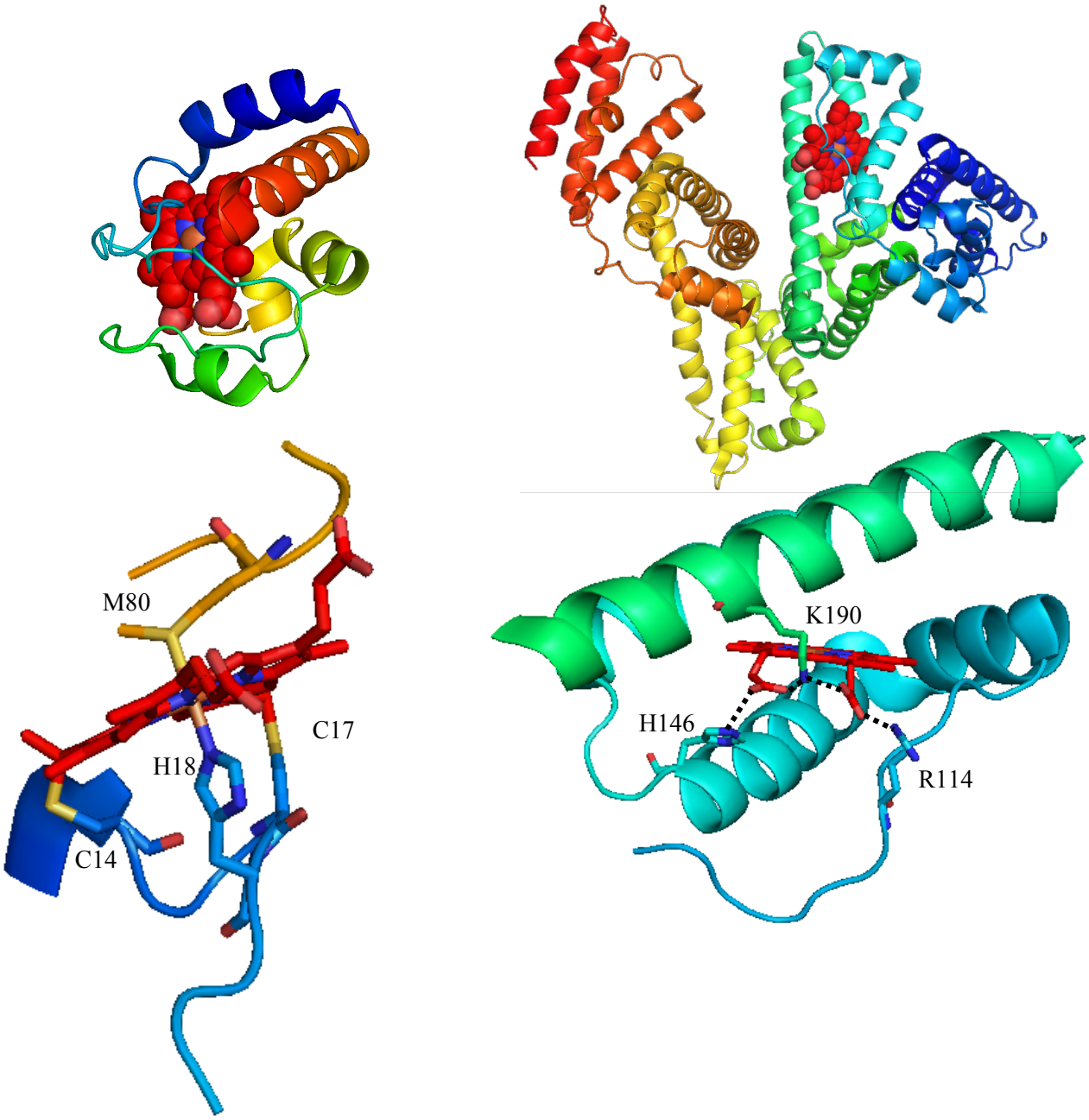


Figure S3. Crystal structures of (**top left**) WT horse heart CytC, PDB ID: 1HRC; (**top right**) HSA with the hemin located in its binding site of subdomain I, PDB ID: 1O9X. The bottom images are magnifications of the binding sites.

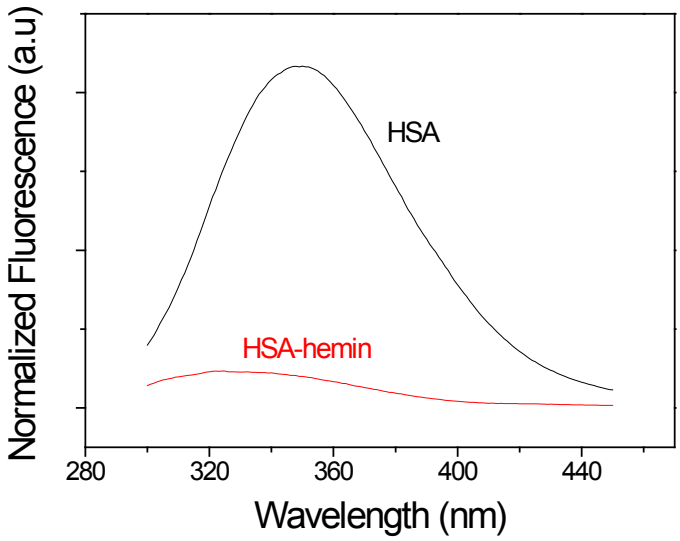


Figure S4. Fluorescence spectra (λ_{ex}=290 nm) of HSA alone and of HSA with one equimolar of hemin ("HSAhemin").

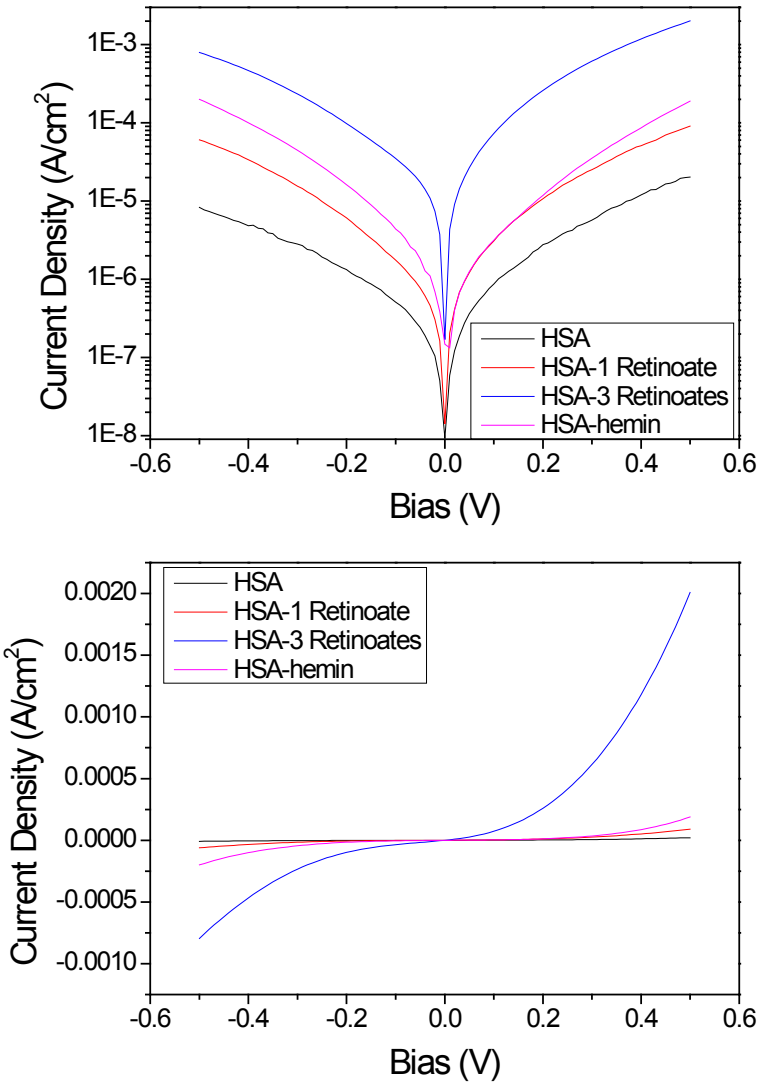


Figure S5. Comparison between the *I-V* curves (on semi-logarithmic and linear scales, top and bottom, respectively) at RT via monolayers of HSA, HSA with 1 retinoate, HSA with 3 retinoate molecules and HSA with 1 hemin.

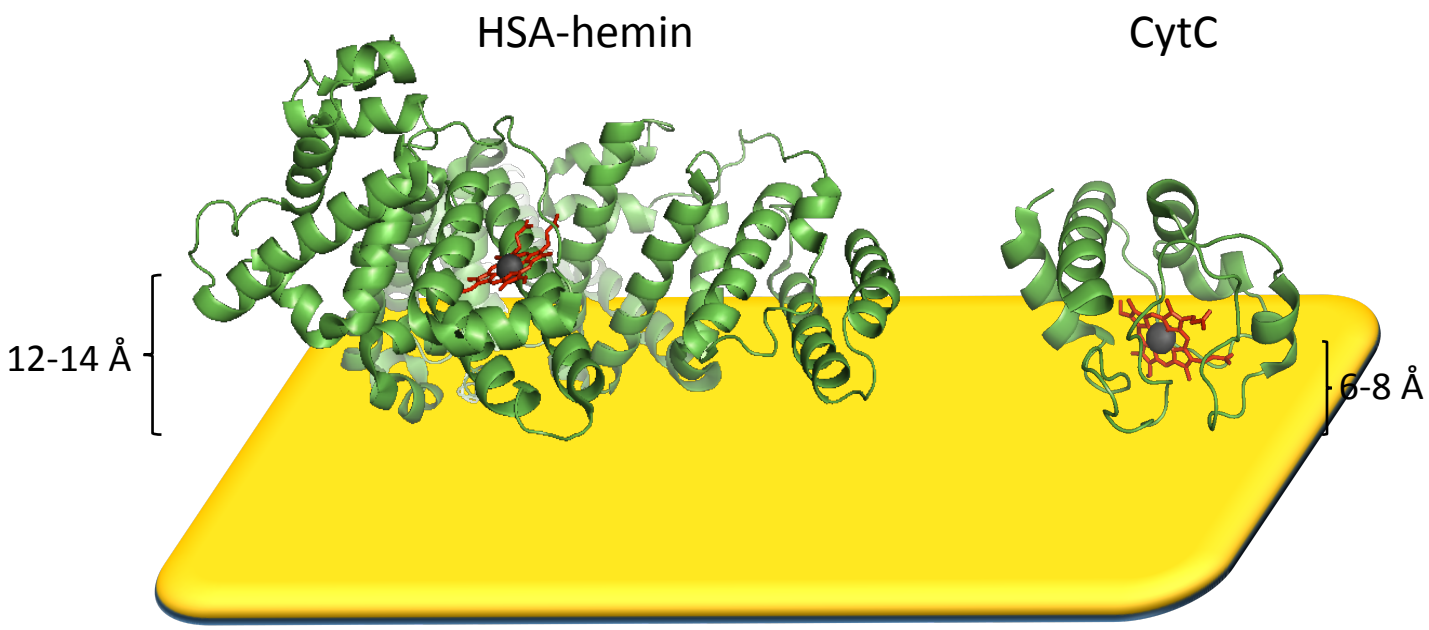
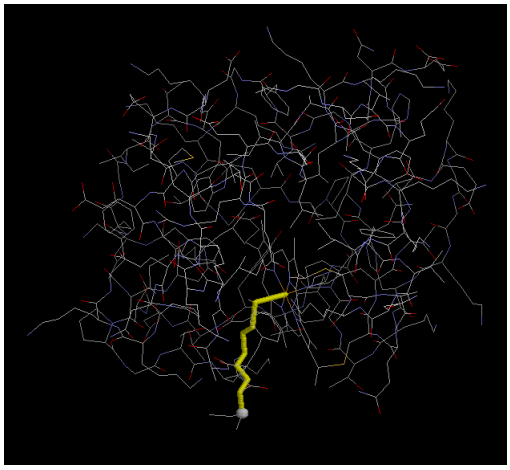


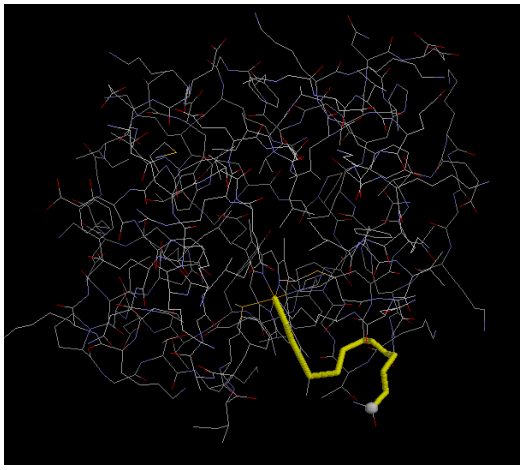
Figure S6. Proposed binding orientation of HSA-hemin (left) and CytC on the gold electrode, along with the distance between the heme cofactor and the electrode.

ET pathway: from Fe to Ile81



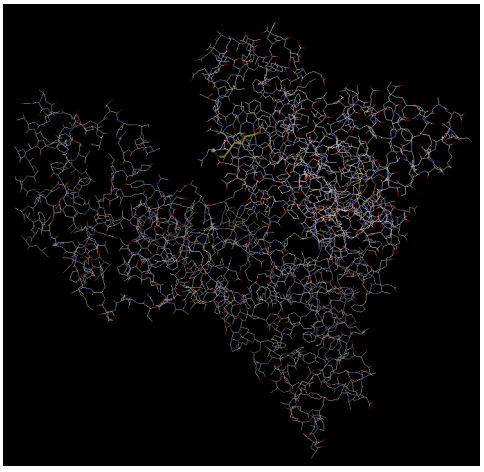
$H_{DA} = 1.68 \cdot 10^{-2}$

ET pathway: from Fe to Gln16



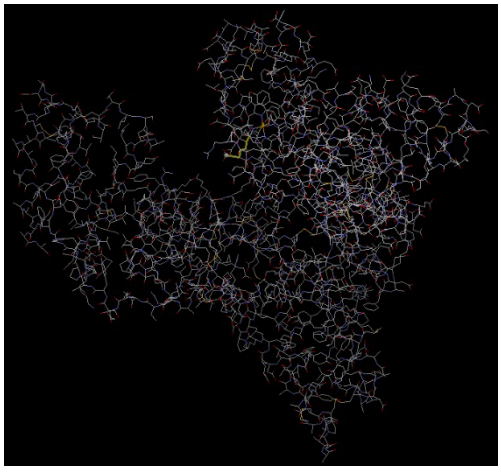
$H_{DA} = 1.31 \cdot 10^{-3}$

ET pathway: from Fe to Arg114



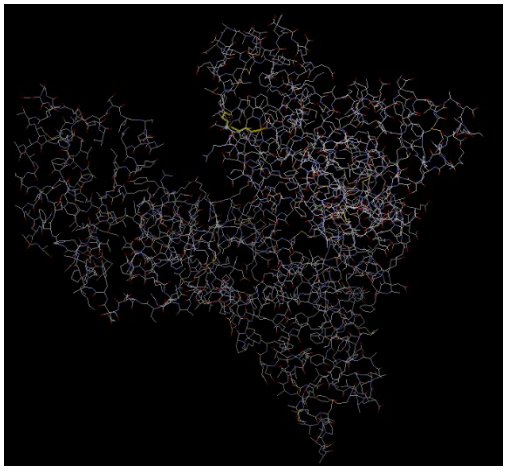
$H_{DA} = 4.17 \cdot 10^{-4}$

ET pathway: from Fe to Asp187



$H_{DA} = 1.03 \cdot 10^{-4}$

ET pathway: from Fe to Leu115



$H_{DA} = 6.63 \cdot 10^{-4}$

Figure S7. Electron coupling calculations, along with the suggested electron pathway for the most-likely pathways of CytC (upper) and HSA-hemin (bottom) in the electrochemical setup.

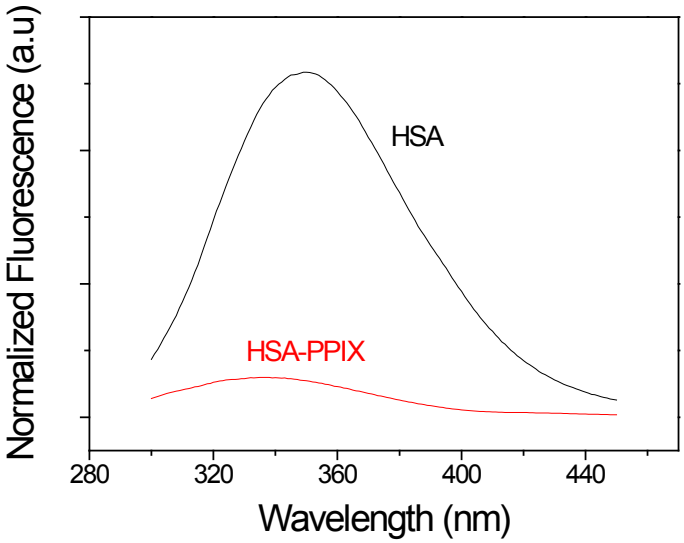


Figure S8. Normalized fluorescence spectra (λ_{ex}=290 nm) of HSA alone and of HSA with one equimolar of PPIX, "HSA-PPIX" (cf. to Fig. S4, where the spectrum for "HSA-hemin" is shown).