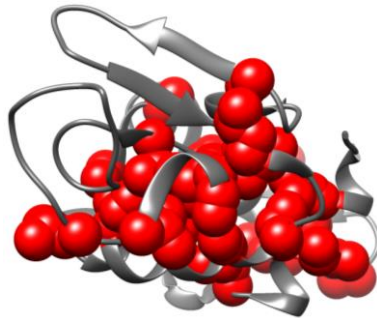
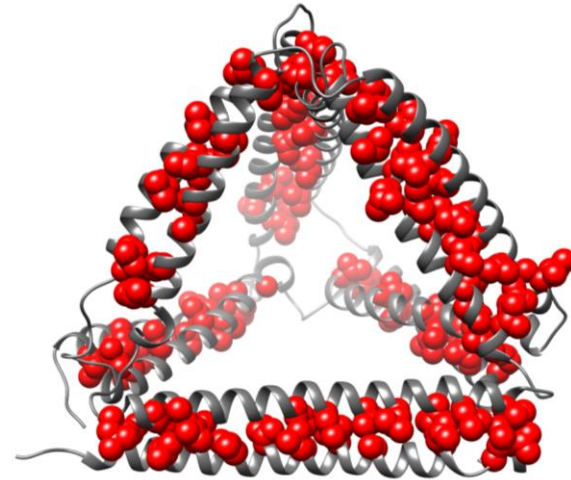


Natural and coiled-coil protein origami fold

**NATURAL COMPACT
PROTEIN FOLD**

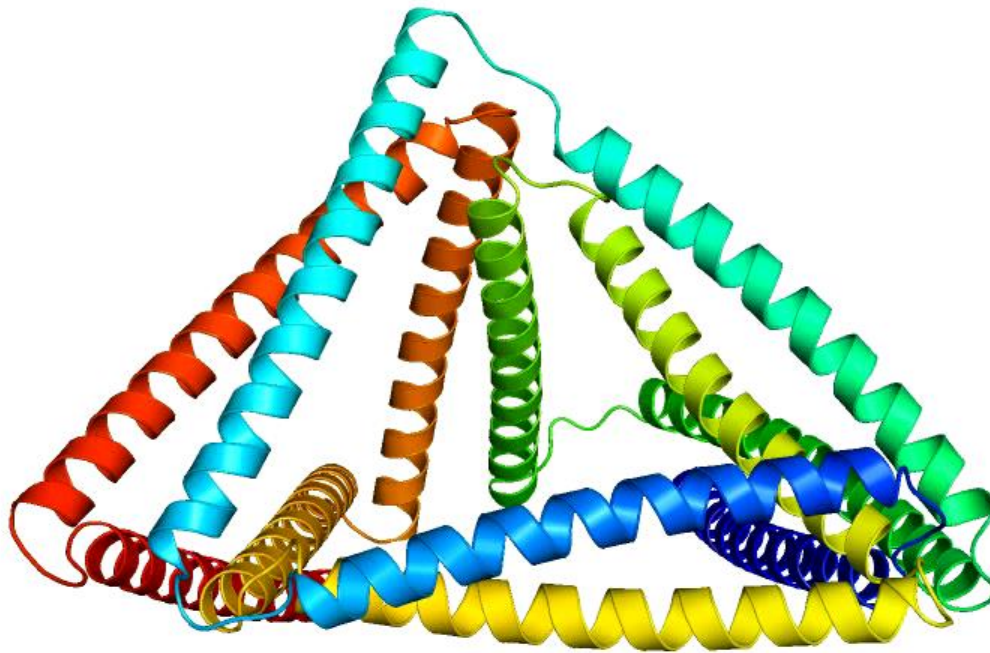


COILED-COIL PROTEIN ORIGAMI



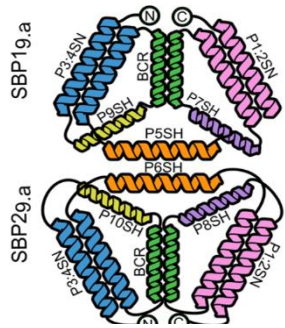
Topology defines the fold

Designed tetrahedral protein cage

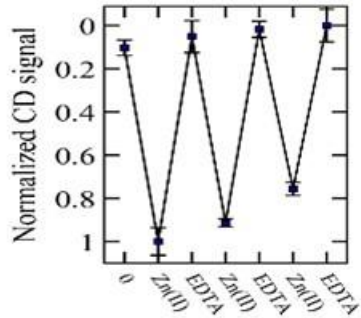


Explore the frontiers of modular coiled-coil-based assemblies

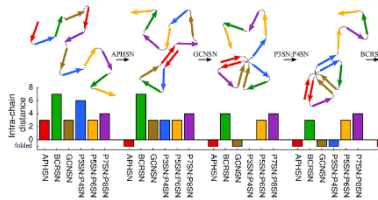
Achievements



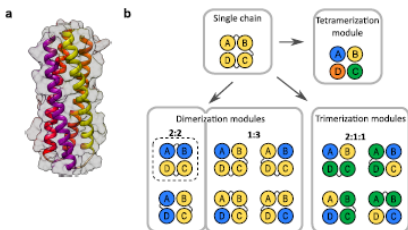
Multichain assembly



Metal-regulated CC pairs & assemblies



Design of protein folding pathways



Segmentation of 4HB for logic functions



ARTICLE

<https://doi.org/10.1038/s41467-021-2184-6>

OPEN

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Self-assembly and regulation of protein cages from pre-organised coiled-coil modules

Fabio Lapenta^{1,2}, Jana Aupič¹, Marco Vezzo¹, Žiga Strmšek¹, Stefano Da Vela⁴, Dmitri I. Svergun⁴, José María Carazo⁵, Roberto Melero⁵ & Roman Jerala^{1,2,5*}

Lapenta et al., Nat.Comm. 2021

SCIENCE ADVANCES | RESEARCH ARTICLE

SYNTHETIC BIOLOGY

Metal ion-regulated assembly of designed modular protein cages

Jana Aupič^{1,†}, Fabio Lapenta^{1,2,‡}, Žiga Strmšek¹, Estera Merljak^{1,3}, Tjaša Plaper^{1,3}, Roman Jerala^{1,2,*}

Aupič et al., Sci.Adv. 2022



Designed folding pathway of modular coiled-coil-based proteins

Jana Aupič^{1,3}, Žiga Strmšek^{1,2,3}, Fabio Lapenta^{1,3}, David Pahovnik⁴, Tomaž Pisanski^{3,5}, Igor Drobnak¹, Ajazja Ljubetič¹ & Roman Jerala^{1,3,6*}

Aupič et al., Nat.Comm. 2021

nature communications



Article

<https://doi.org/10.1038/s41467-022-27765-6>

Segmentation strategy of de novo designed four-helical bundles expands protein oligomerization modalities for cell regulation

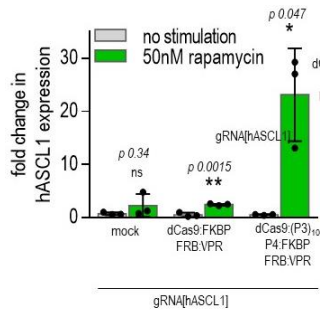
Received: 30 November 2022

Estera Merljak^{1,3}, Benjamin Malovrh¹ & Roman Jerala^{1,3*}

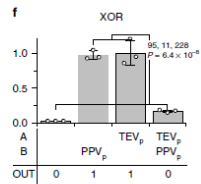
Accepted: 30 March 2023

Merljak et al., Nat.Comm. 2023

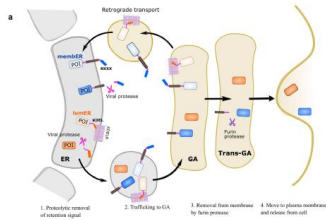
Achievements



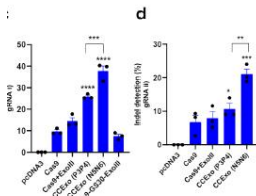
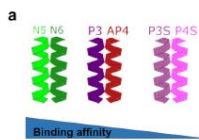
CC in mammalian cells



Protein logic based on CCs



Fast protein secretion



CC-assisted improvement of CRISPR genome editing



A tunable orthogonal coiled-coil interaction toolbox for engineering mammalian cells

Tina Lebar, Duško Lainšček, Estera Merljak, Jana Aupič and Roman Jerala

Lebar et al., Nat.Comm. 2020



Design of fast proteolysis-based signaling and logic circuits in mammalian cells

Tina Fink, Jan Lonžarić, Arne Praznik, Tjaša Plaper, Estera Merljak, Katja Leben, Nina Jerala, Tina Lebar, Žiga Strmšek, Fabio Lapenta, Mojca Benčina and Roman Jerala

Fink et al., Nat.Chem.Biol.2019



Regulation of protein secretion through chemical regulation of endoplasmic reticulum retention signal cleavage

Arne Praznik, Tina Fink, Nik Franko, Jan Lonžarić, Mojca Benčina, Nina Jerala, Tjaša Plaper, Samo Rožnik and Roman Jerala

Praznik et al., Nat.Comm. 2022



Coiled-coil heterodimer-based recruitment of an exonuclease to CRISPR/Cas for enhanced gene editing

Duško Lainšček, Vida Forstnerič, Veronika Mikolič, Špela Malenšek, Peter Pečarič, Mojca Benčina, Matjaž Sever, Helena Podgoršek and Roman Jerala

Lainšček et al., Nat.Comm. 2022

Results and impact of the ERC project MaCChines

Scientific achievements
(publications, invited talks at
conferences)

Translation towards applications

Exploration of initially unseen directions,
experimental work in life sciences is
expensive (reagents, equipment)

Funding of training of PhDs and
postdocs- (academia, industry, future
ERC candidates)

Science communication

