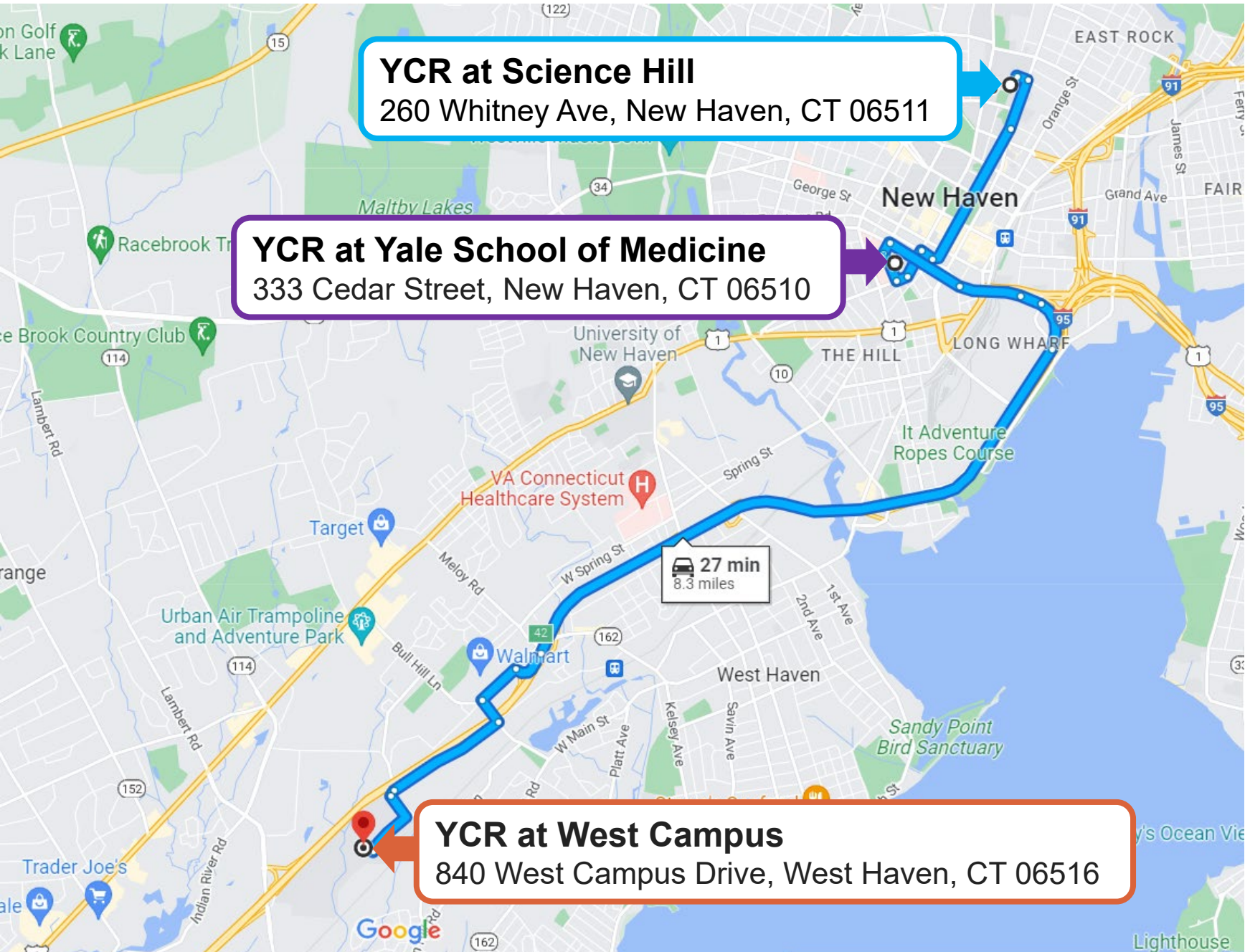
Introduction of the Yale CryoEM Resource

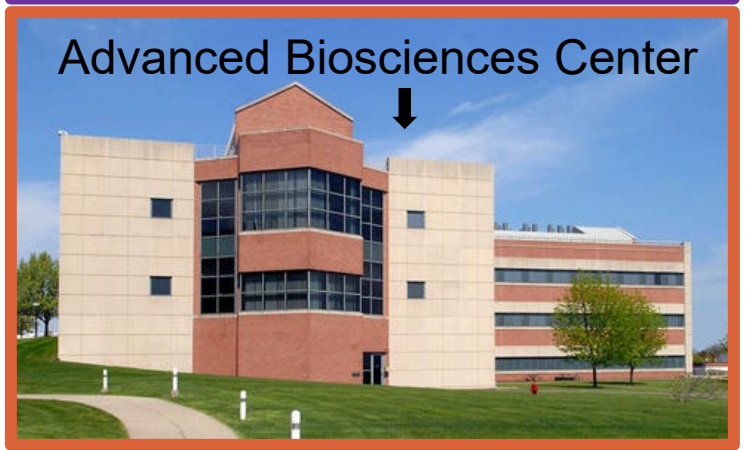
Jianfeng Lin

Yale CryoEM Resource

FY2026

Yale CryoEM Resource (YCR) is a CryoEM core facility comprising three sites





YCR has multiple cryo sample preparation devices

West Campus

Pelco easiGlow

Vitrobot Mark IV

Science Hill

Pelco easiGlow

Vitrobot Mark IV

Fischione NanoClean

UVOCS

Yale School of Medicine

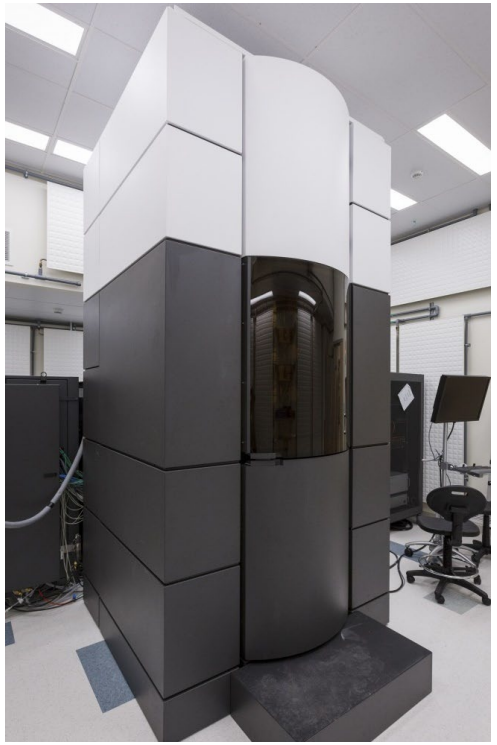
Chameleon

Gatan Solarus

Vitrobot Mark IV

YCR currently has five TEMs

West Campus



Titan Krios

- 300-kV
  Energy filter, VPP, K3
- CryoEM data collection

Science Hill

Glacios

- 200-kV
  microED package, Ceta-D & K3
- TEM imaging, Sample screening & CryoEM data collection

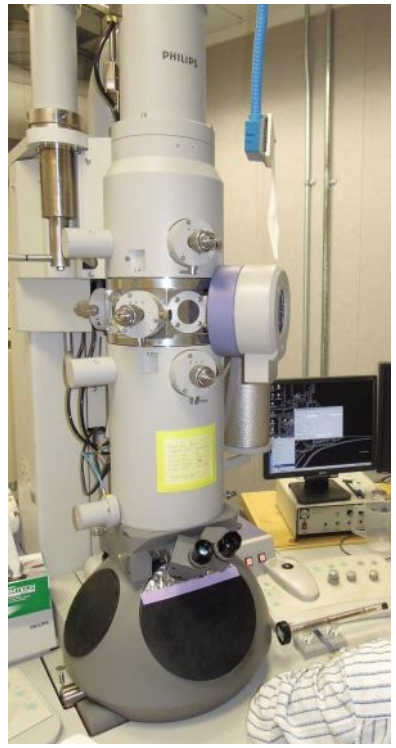
Talos L120C

- 120-kV
  Ceta
- TEM imaging, Sample screening & Negative Stain EM data collection

Yale School of Medicine

Glacios

- 200-kV
  VPP, Ceta & K3
- TEM imaging, Sample screening & CryoEM data collection



Tecnai T12

- 120-kV
  UltraScan 4000
- TEM imaging, Sample screening & Negative Stain EM data collection

YCR is operated by a team of CryoEM experts

Yale School of Medicine

Xinran Liu

20%

Technical Coordinator

Kimberley Gibson

25%

Staff

Marc C Llaguno

100%

Site Director

West Campus

Kangkang Song

100%

Site Director

Science Hill

Vacant

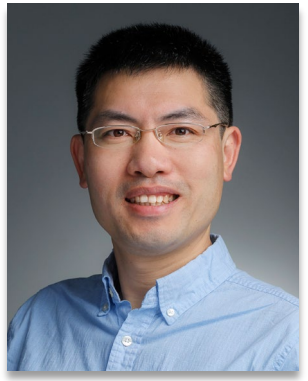
100%

Staff

Paul Raccuia

Casual

Staff



Jianfeng Lin

100%

Site Director

Managing Director

YCR receives strong support from Yale & CryoEM community

Yale University's Office of the Provost & the School of Medicine's Dean's Office

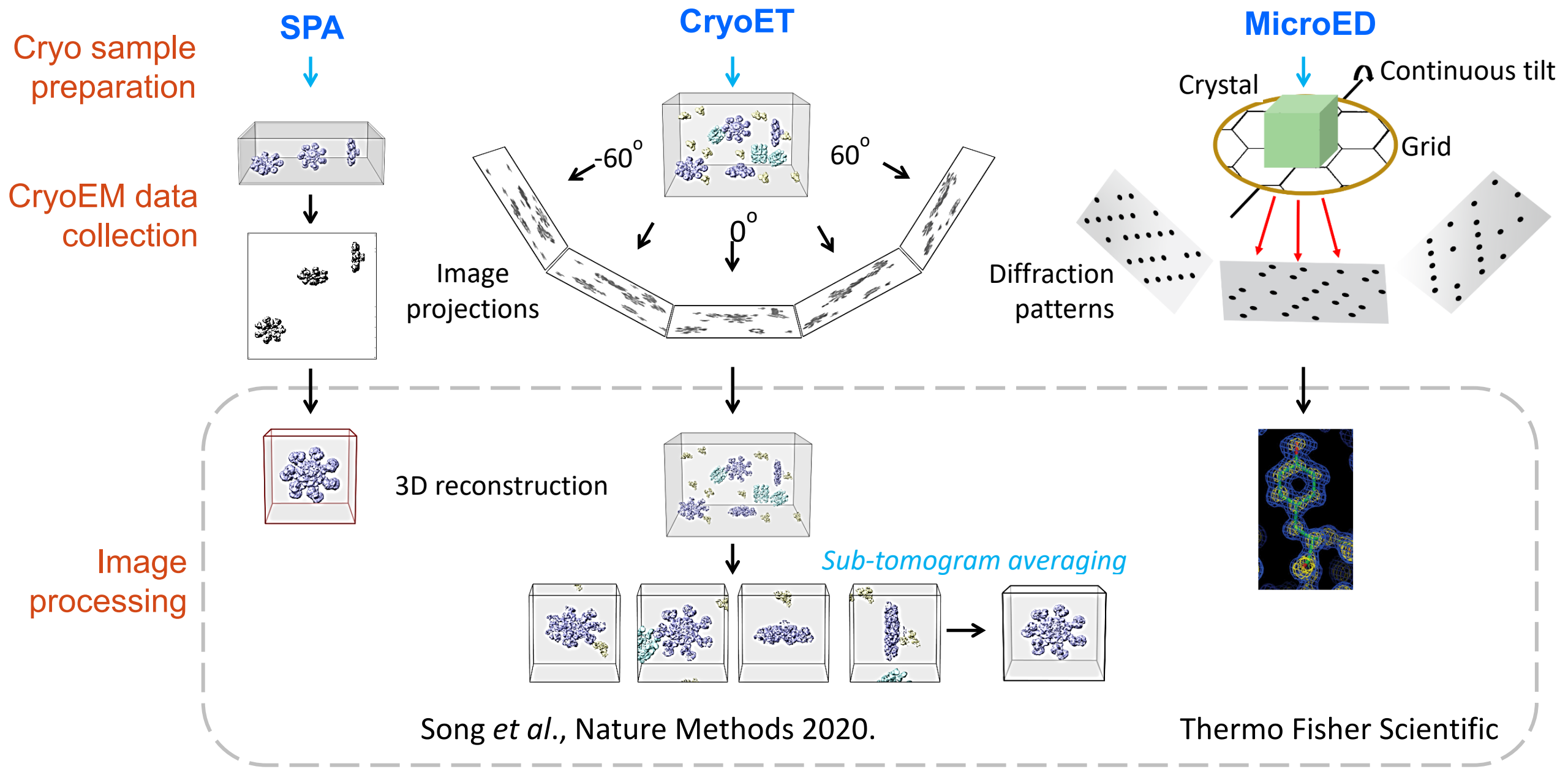
YCR users

129 active users in FY25

YCR Advisory Committee

Frederick Sigworth (Chair of the YCR Advisory Committee; Professor, C&MP)
Amy Blanchard (Director of Research Cores, YSM)
Michael Crair (Vice Provost for Research)
Lisa D'Angelo (Associate Provost for Research)
Anthony Koleske (Deputy Dean for Research (Basic Science), YSM, Professor, MB&B)
Mark Lemmon (Professor, Pharmacology)
Jun Liu (Professor, Microbial Pathogenesis)
Ben Myers (Director of Research Cores, Central)
Harley Pretty (Director of Finance and Administration)
Anna Marie Pyle (Professor, MCDB)
Karin Reinisch (Professor, Cell Biology and MB&B)
Brian Smith (Deputy Dean for Research (Clinical and Translational), YSM)
Yong Xiong (Professor, MB&B)

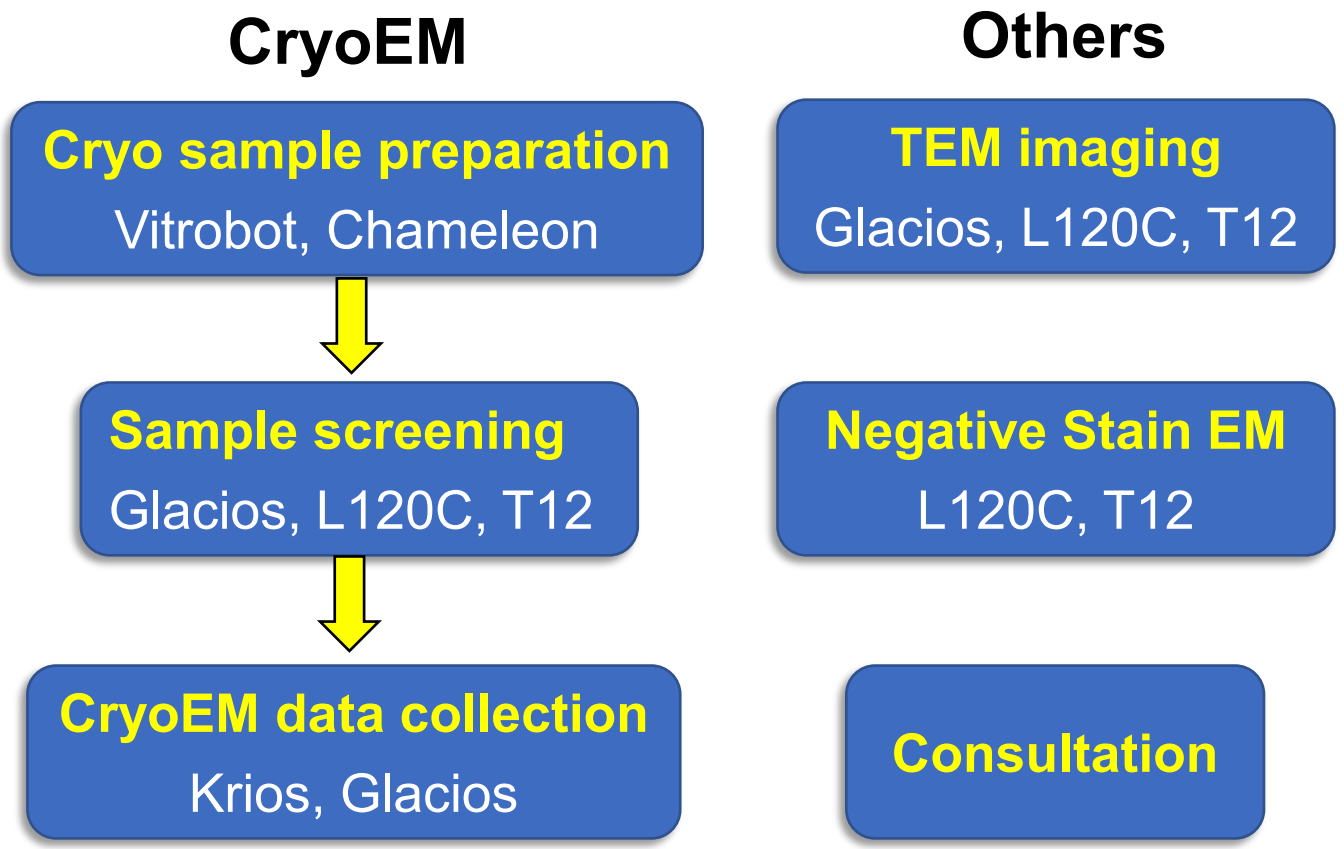
YCR provides access to three prevailing CryoEM techniques



YCR provides flexible services for researchers at all levels

Four types of services:

- **Full-service:** YCR staff conducts all experiments
- **Partial-service:** User conducts some experiments
- **Training:** In-person trainings & Virtual workshops
- **Self-service:** User conducts all experiments



- More details about becoming a YCR user are introduced in https://cryoem.yale.edu/get-started-as-a-ycr-user.
- More details about trainings are introduced in https://cryoem.yale.edu/training and the **YCR Policies** (https://cryoem.yale.edu/policies-and-rates).

YCR rates in FY26 (7/1/2025-6/30/2026)

Instrument, Service, or Consumables	Location[1]	Internal Rate	External Academic	External For-Profit
Titan Krios Daily (Attended)[2]	WC	$1236/day	$3138/day	$6276/day
Titan Krios Daily (Unattended)	WC	$817/day	-	-
Glacios Daily (Unattended)	YSM, SH	$707/day	$1948/day	$3895/day
Glacios Night[3] (Unattended)	YSM, SH	$441/night	-	-
Glacios	YSM, SH	$72/hr Peak[4] $56/hr Off-Peak	$163/hr Peak	$324/hr Peak
Talos L120C	SH	$56/hr Peak $44/hr Off-Peak	$125/hr Peak	$260/hr Peak
Tecnai T12	YSM	$56/hr Peak $44/hr Off-Peak	$125/hr Peak	$260/hr Peak
Talos L120C Daily (Unattended)	SH	$300/day	-	-
Tecnai T12 Daily (Unattended)	YSM	$300/day	-	-
Negative Stain EM training	YSM, SH	$883 flat fee	$1969 flat fee	$3247 flat fee
Vitrobot	WC, YSM, SH	$49/hr	$146/hr	$173/hr
Chameleon	YSM	$82/hr	$206/hr	$346/hr
Carbon Coating	YSM, SH	$33/hr	$157/hr	$173/hr
Plasma Cleaner	YSM, SH	$0/hr	$163/hr	$216/hr
Staff Support or Training	YSM, SH	$82/hr	$138/hr	$173/hr
Autogrid ring and C-clip[5]	WC, YSM, SH	Market price	$31/set	$36/set

[1] The three YCR sites: West Campus (WC), Yale School of Medicine (YSM), and Science Hill (SH) sites.

[2] **Attended Krios sessions cover instrument and staff costs, while unattended sessions only include the instrument fee.**

[3] Nights are 5 pm-next 9 am at SH and 6 pm-next 10am at YSM.

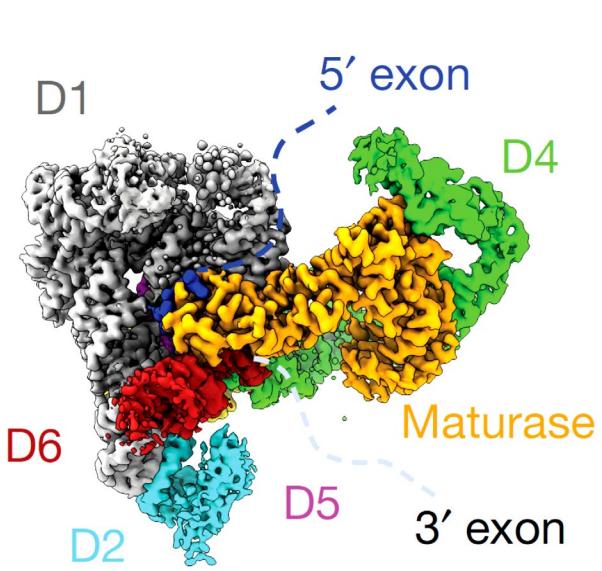
[4] Peak hours are weekdays 9 AM–5 PM at SH and 10 AM–6 PM at YSM. All other times, including weekends and Yale holidays, are off-peak.

[5] Users are responsible for the cost of consumables like Auto-grid rings, C-clips, Autogrid boxes, and EM grids, and they can use their own.

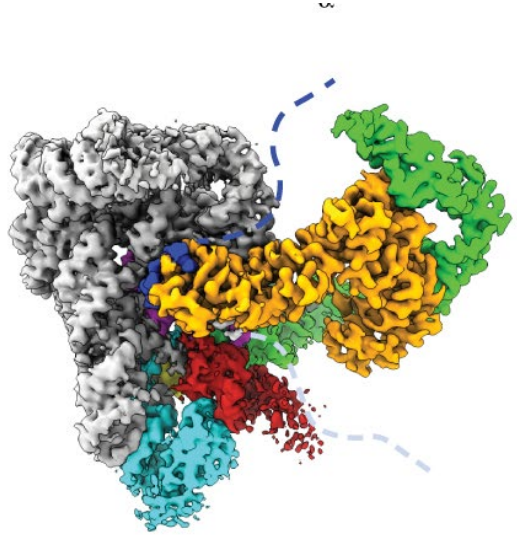
Example results: Chameleon addressed the preferred orientation issue

Chameleon

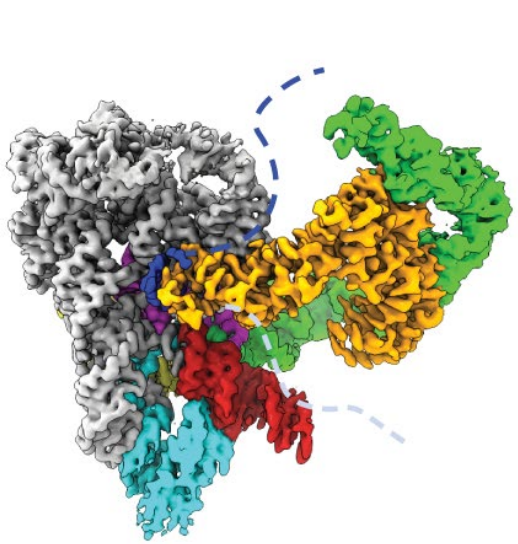
Composite cryoEM maps of RNP complexes



Prebranching (pre-1F)



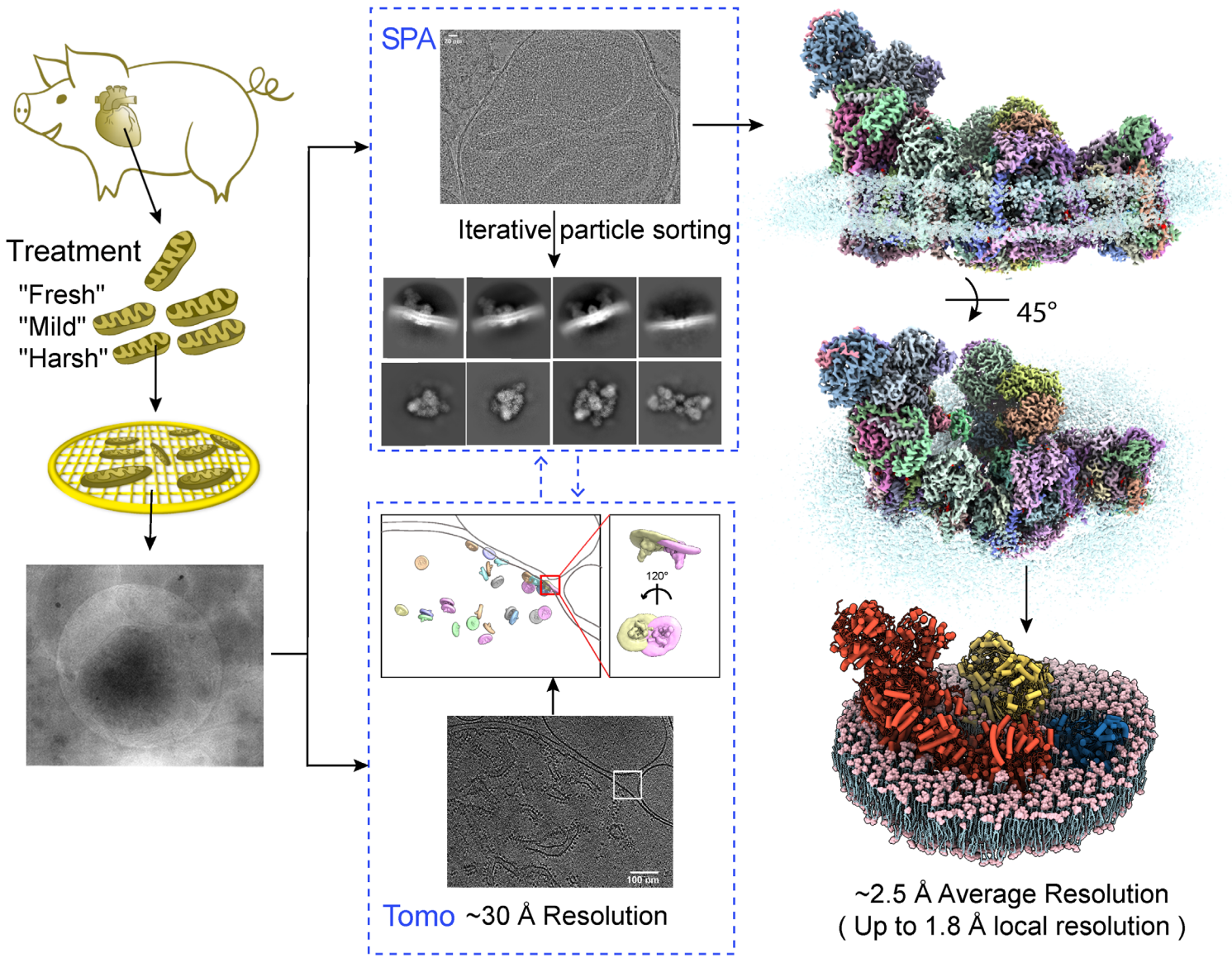
Preligation (pre-2F)



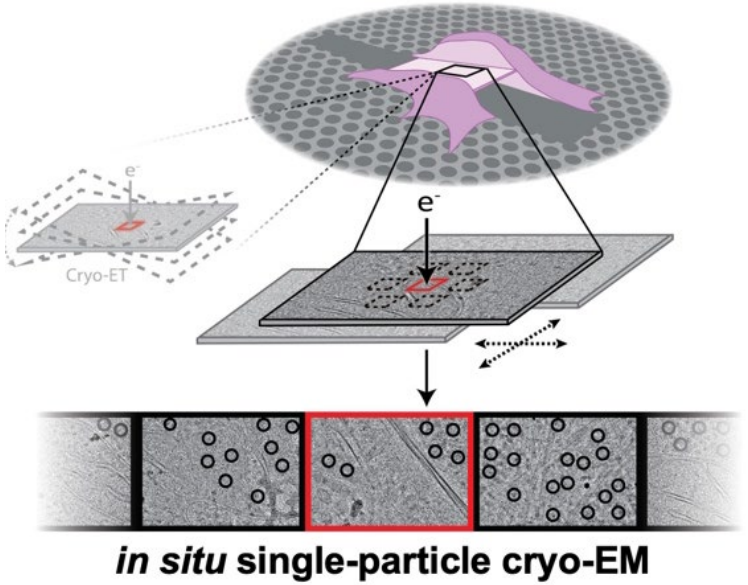
Postligation (post-2F)

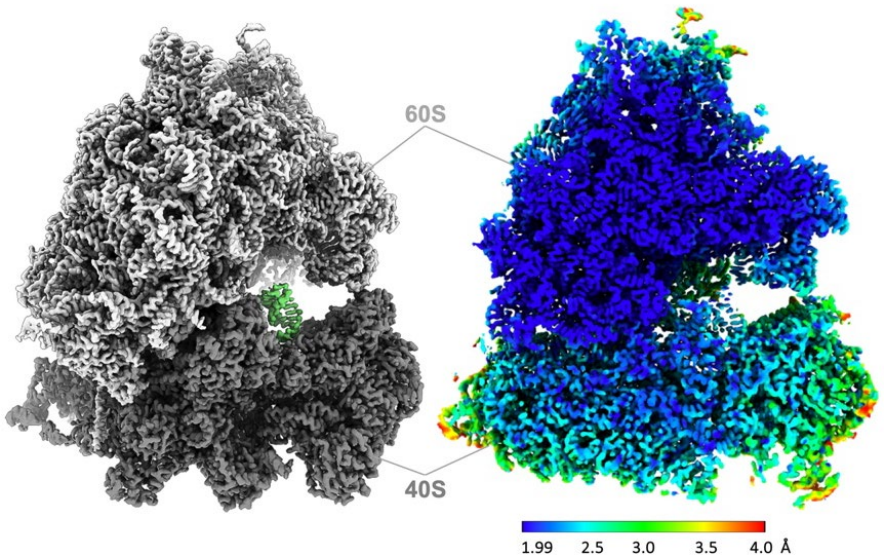
Xu *et al.*, Nature 2023.

Example results: *In situ* single-particle cryoEM and cryoET



Wan Zheng, *et al.,* Nature 2024.



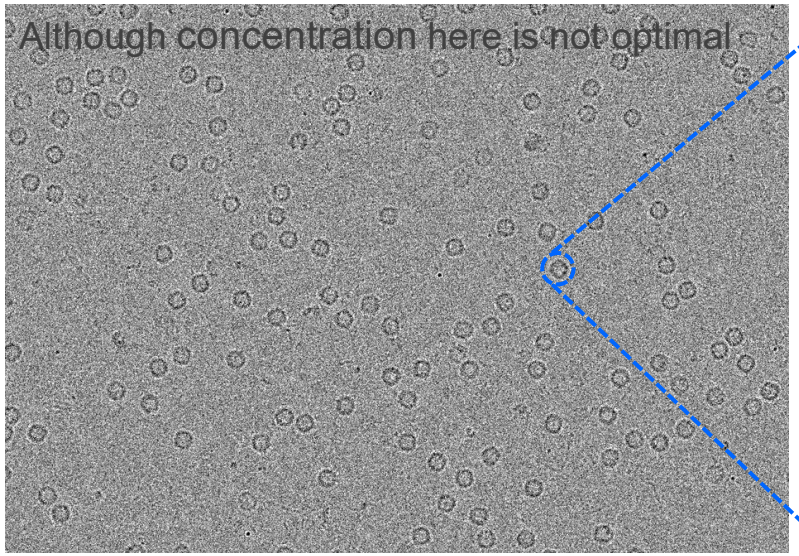


Wei Zheng, *et al.,* Nature Commun 2025.

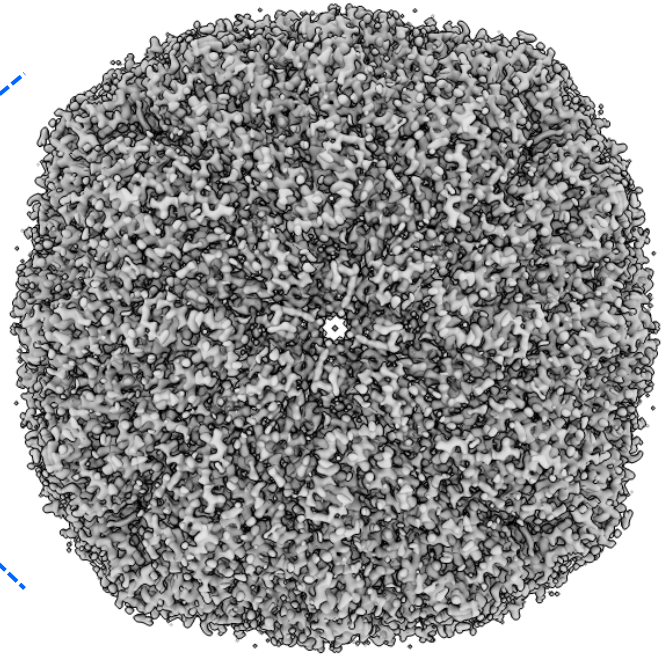
Example results: Glacios produces outstanding results with optimal samples

450-540 movies/hour

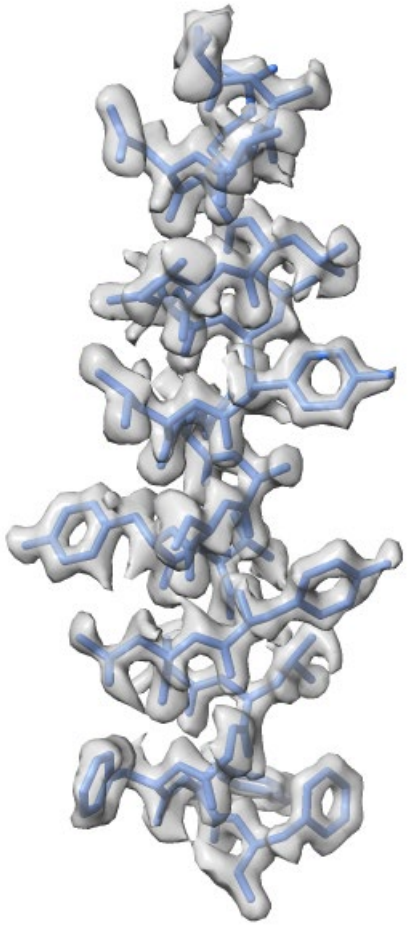
Glacios



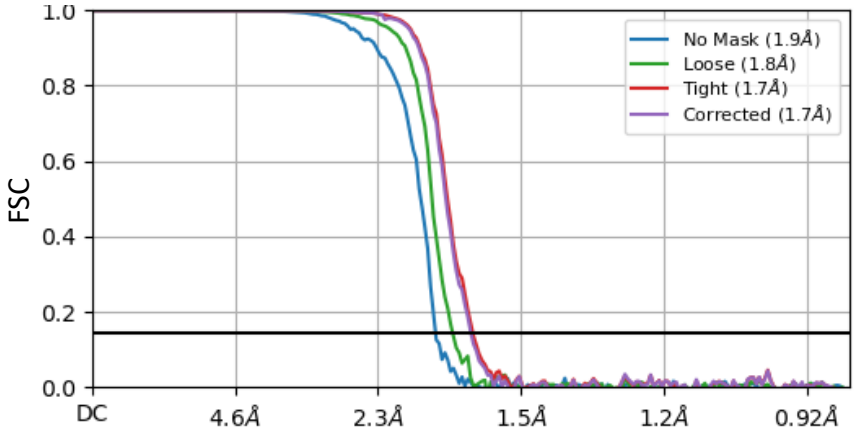
Representative TEM image
with Quantifoil R2/1 grids



Horse spleen apoferritin



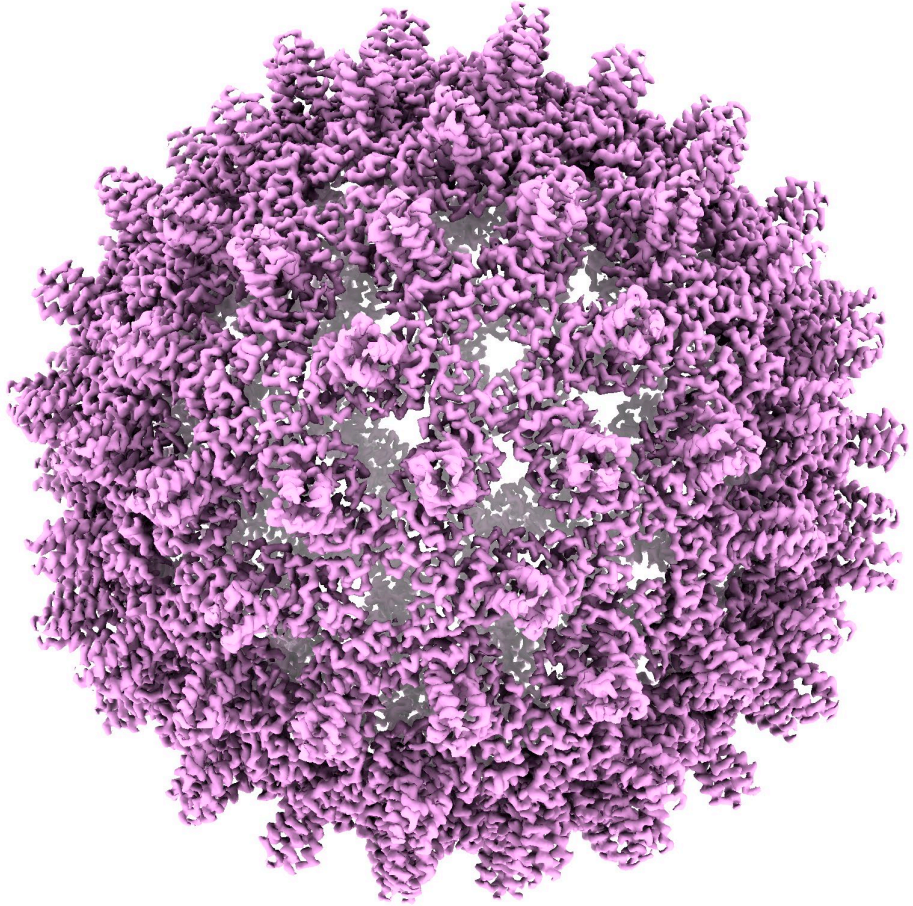
x-ray structure
(2W0O) docking



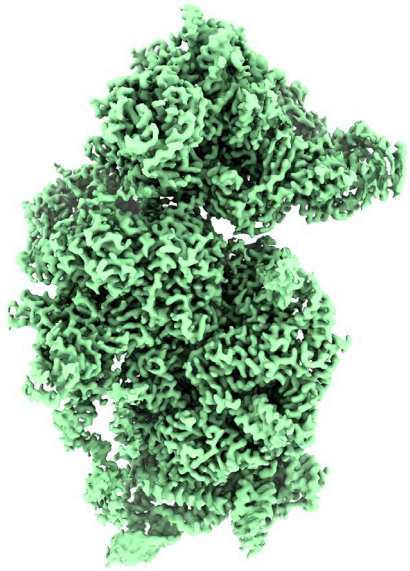
GSFSC Resolution: 1.74 Å
by Homogeneous refinement
with cryoSPARC

Example results: Glacios produces outstanding results with optimal samples

2.74 Å
Hepatitis B virus

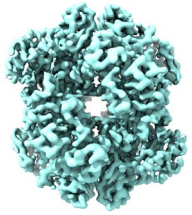


2.77 Å
40S ribosome subunit



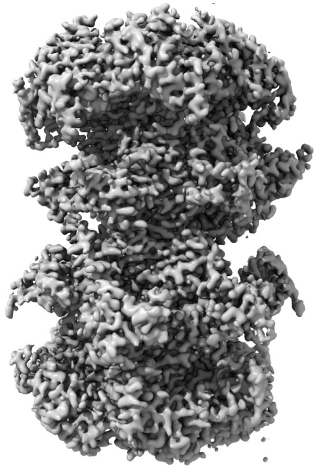
2.73 Å

200 kD protein complex



Dynein

2.6 Å Chai *et al*., Nat Struct Mol Biol 2025.
2.71 Å Yang *et al*., Nat Chem Biol 2025.
2.85 Å Ton *et al*., Nat Struct Mol Biol 2023.



3.17 Å MCM2-7 double hexamer

Yang R, *et al*., Nature 2024.

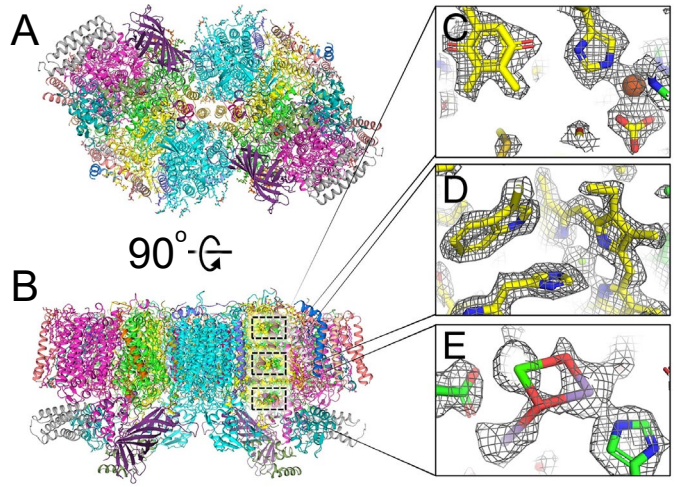
Unpublished data provided by Yong Xiong Lab

Data acquired at YCR have been published in over 150 peer-reviewed articles (2018.4-2026.1)

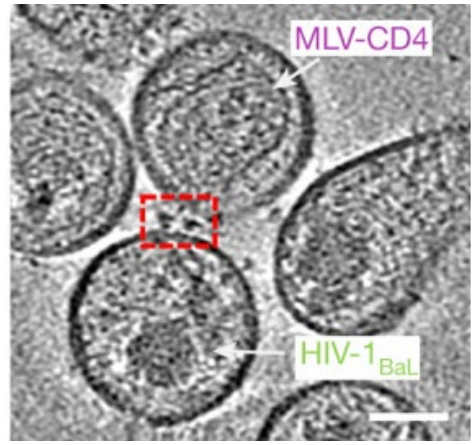
Examples:

Yang *et al*., Nature 2024
Grunst *et al*., Science 2024
Zheng *et al*., Nature 2024
Gomes *et al*., Nature 2024
Zhu *et al*., Science 2024
Xu *et al*., Nature 2023
Li *et al*., Nature 2023
Krypotou *al*., Science 2023

Ravera *et al*., Nature 2022
Chung *et al*., Science 2022
Huang *et al*., Nature 2021
Gu *et al*., Nature 2021
Gaudet *et al*., Science 2021
Liu *et al*., Science 2021
Xiang *et al*., Cell 2021
Liu *et al*., Nature 2019
Wang *et al*., Cell 2019

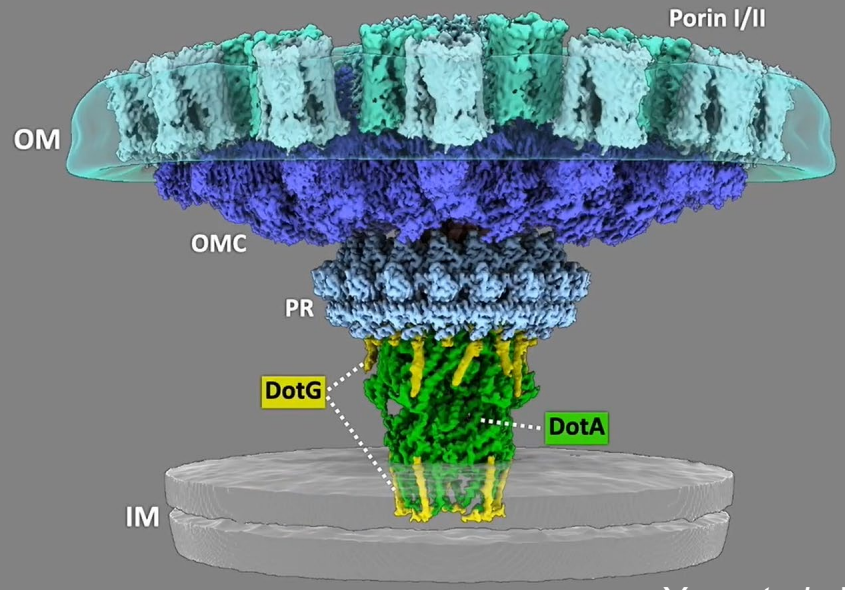


1.93 Å Photosystem II Gisriel *et al*., PNAS 2022

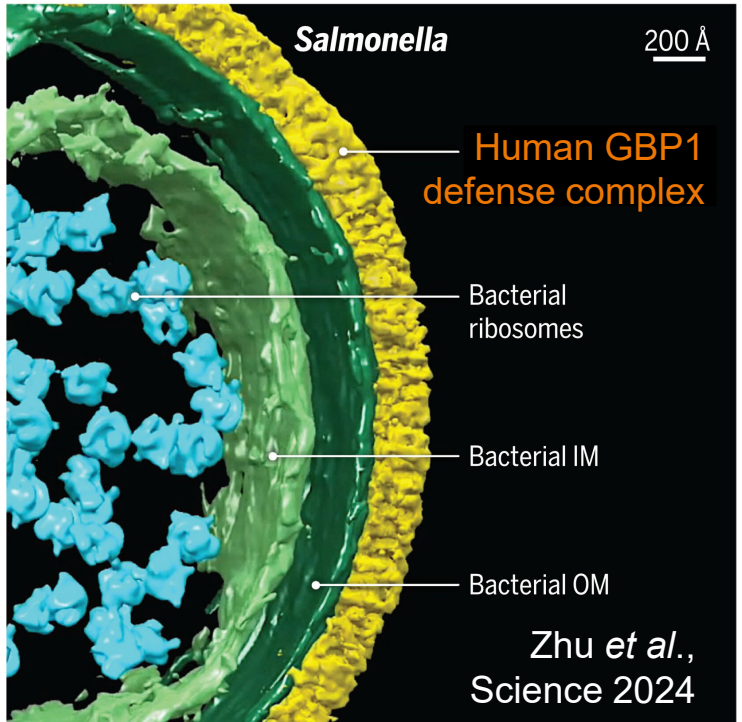


Env–CD4 interactions
Li *et al*., Nature 2023

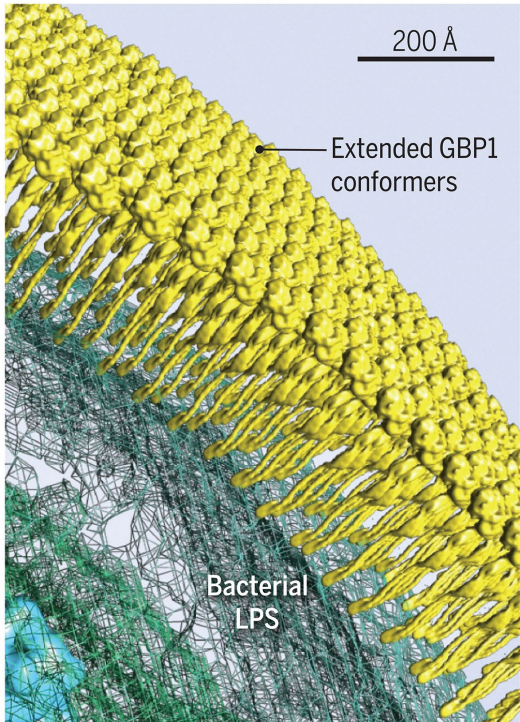
Dot/Icm type IV secretion system



Yue *et al*., PNAS 2025



Zhu *et al*., Science 2024



Acknowledgment of the Yale CryoEM Resource in publications

YCR policy:

Considerable and continued funding is essential for the YCR to provide high-end support at subsidized rates. To help sustain this support, it is critical that the YCR and its funding are acknowledged in publications. Therefore, publications resulting from work conducted at the Yale CryoEM Resource are required to include an acknowledgment of the YCR and applicable grants, such as:

- "CryoEM data were collected at the Yale CryoEM Resource that is funded in part by the NIH grant S10OD023603." (if the SH Glacios is used)
- "CryoEM data were collected at the Yale CryoEM Resource." (if any other YCR instrument is used, excluding the SH Glacios)

More YCR Polices are introduced in *https://cryoem.yale.edu/policies-and-rates*.

Thank you!

Questions are welcome to Jianfeng.lin@yale.edu